Customer	:	**ESRIN**	**Document Ref**	:	**SST_CCI-URD-UKMO-001**
WP No	:	10130	**Issue Date**	:	**30 november 2010**
			Issue	:	**2**

Project : **CCI Phase 1 (SST)**

Title : **User requirements document**

Abstract : This document presents the results of an exercise to gather requirements for the SST products to be developed by the CCI project.

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Potential users of SST_cci products

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EUROPEAN SPACE AGENCY
CONTRACT REPORT

The work described in this report was done under ESA contract. Responsibility for the contents resides in the author or organisation that prepared it.

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AMENDMENT RECORD

This document shall be amended by releasing a new edition of the document in its entirety. The Amendment Record Sheet below records the history and issue status of this document.

AMENDMENT RECORD SHEET

ISSUE	DATE	REASON FOR CHANGE
1	29 Oct 2010	Initial Issue
2	30 Nov 2010	Revised following comments from Craig Donlon

EXECUTIVE SUMMARY

The European Space Agency (ESA) Climate Change Initiative (CCI) Sea Surface Temperature (SST) project, SST_cci, aims to improve SST satellite data records to meet the requirements of the climate research community.

This document presents requirements from climate research users, which were gathered via four methods:

1) a literature review of relevant documents from bodies such as the Global Climate Observing System (GCOS),
2) review of lessons learned information provided by other projects,
3) a questionnaire, which asked about
    a) currently available SST data, and
    b) future needs for SST data, five years from now,
4) discussion sessions.

A register of user requirements is given in Table 6. A summary of the requirements is listed below. It is intended that these will be updated throughout the project as new requirements are identified. For some of the questions respondents were asked for three levels of requirements:

Threshold: the limit at which the observation becomes ineffectual and is no use for the application.

Breakthrough: the level at which a significant improvement in this application would be achieved.

Objective: the maximum performance limit for the observation, beyond which no significant improvement in the application would be achieved.

The majority of respondents to the questionnaire require global spatial coverage. The most common response at the threshold requirement level is for temporal coverage of one year (24% of responses). However, temporal coverage of 10 years and >30 years received almost as many responses (22% and 21% respectively). At the breakthrough and objective requirement levels there is a clear requirement for data records longer than 30 years. Backwards compatibility with older data is extremely important. Potential users want to be able to use data before the satellite era but also want to take advantage of the SST_cci products, so it is important that the two are consistent.

A timely flow of data on essential climate variables is needed by climate monitoring and analysis centres. The most common requirements for timeliness of data delivery were: longer than a year (threshold); within a year (breakthrough) and within a month (objective). However, some respondents to the questionnaire have much tighter requirements and some need data as quickly as within half a day. Where a preference was specified, the most common requirements for reliability of data delivery were 75% (threshold) and >99% (breakthrough and objective). There is a continuing need for climate quality data; this can be addressed by ensuring that the data record is extendable in the future when new instrumentation is available. Conversion of the system from research to operational use needs to be promoted, for example by converging climate requirements with operational requirements. Prototype products need to be updated while operationalisation is being set up. When asked how often they would like data to be updated with improvements questionnaire respondents most commonly selected ‘continuous incremental updates’ (28% of responses). A second peak in the distribution of responses occurred at ‘once a year’ (23%).

Uncertainties need to be characterised fully, including the full error budget of the translation from the input data to the products. This needs to be improved relative to

current datasets. The uncertainties need to accompany the products. Confidence in uncertainty estimates needs to be stated. Uncertainty characteristics should be verified by comparison against independent observations. An estimate of total uncertainty (root mean square of the total error distribution) is most commonly required by questionnaire respondents. Additional uncertainty information such as confidence intervals, systematic uncertainty, random uncertainty, stability and probability distributions are useful to a significant proportion of respondents. Where confidence intervals are provided, there is a clear preference for the 95% confidence interval. Information about the correlation structure of errors is essential or desirable for most respondents. Some potential users need uncertainty information in the form of realisations that efficiently sample the uncertainties (of the order ten realisations to match the size of ensembles that are run). Quality information is needed for each SST value that is simple to use, such as a single field indicating "good/bad" or the overall probability that a value is bad.

Data need to be easily accessible, free and unrestricted. Standards should be followed for data storage and information sharing, in order to reduce operating costs. Access to data, products and documentation needs to be provided and version control should be instigated. It is beneficial to users to reduce as much as possible any barriers to obtaining and using data. Questionnaire respondents have widely varying capabilities in the size of individual files (responses range between <100 KB and >10 GB) and datasets (responses between <100 MB and >10 TB) that they can handle. The requirements of users with access to the least developed computing infrastructures need to be addressed. Standards and procedures for storage of metadata should be developed. A majority (64%) of respondents require data in CF-compliant NetCDF format. Within that majority 12% specified the Group for High Resolution SST (GHRSST) GDS2.0 standard. When presented with a range of options for obtaining data, respondents most commonly selected FTP (47%), followed by a webpage (28%), an interactive map (11%), OPeNDAP (7%) and DVD (5%). Requests from users for support need to be dealt with quickly and thoroughly by experts.

All steps taken during product development including algorithm selection and statements about accuracy, resolution and homogeneity should be published. Full information about input data and any processing applied needs to be archived to allow future reprocessing. There is a requirement to publish information about data and algorithm maturity (for example which parts have undergone peer-review), and to say point by point which GCOS guidelines have been followed. The most common service that potential users wish to have provided is the provision of simple documentation to allow them to get started with the data.

SSTskin is the depth most commonly required by respondents, followed by SSTs at depths roughly corresponding to the range of traditional in situ observations (20 cm and 5 m). Reporting of SST is most commonly required for sea-ice affected areas, although 38% of respondents expressing a requirement favoured either ice surface or radiometric temperature.

Analyses with 10 km or finer spatial resolution and daily or more frequent temporal resolution are required for the number of questionnaire respondents considering these characteristics as strengths of the data to strongly outweigh the number viewing them as weaknesses. Overall, the modes of responses for spatial resolution were 1° (threshold), 0.1° (breakthrough) and <1 km (objective). Data need to be available on different resolutions so it is not necessary for users to re-grid the data themselves; the ability to select the time period is also needed. The most common requirements for data frequency at a location are monthly (threshold), daily (breakthrough) and 3 hourly (objective). However, there are also significant numbers of respondents who have more stringent requirements. For the majority of respondents it is acceptable to use temporal averaging when building datasets, but it is not acceptable for a significant minority. SSTs are most commonly required at midnight, 6 am, midday and 6pm; additional data at midpoints between those times are required by many, and SSTs at half hour spacing would be used for some applications. Potential users require the diurnal cycle to be resolved. Annual averages/climatologies are required.

The most common acceptable levels of bias were 0.1 and 0.3°C (threshold), and 0.1°C (breakthrough and objective). The most common response was that 0.1°C is the required level of precision. At the threshold, breakthrough, and objective requirement levels, 0.1°C per decade was the most common response for the acceptable level of drift. However, a significant number of respondents have stricter requirements, particularly at the breakthrough and objective levels. At the threshold, breakthrough and objective requirement levels the most common response for the acceptable drift in relative bias between day and night SSTs is 0.1°C per decade. Again, many users have stricter requirements. At all requirement levels, the most common response was that 0.1°C per decade is the acceptable change in bias over the annual cycle. The most common requirement is that all of the above should be demonstrated over a spatial scale of 100 km. Potential users require independent validation/verification by a separate [independent] group.

Data should be combined where this will allow weaknesses in individual datasets to be overcome. By making available single-sensor records, sensor-series datasets, and multiple-sensor analyses, the needs of different users can be met.

The most common requirement is for level 4 (analysed) data (52%). However, some respondents require level 2 (on native swath or grid, 19%) and level 3 (regridded) data (32%). Respondents have a clear preference that level 3 and level 4 data should be provided on a regular latitude-longitude grid. SST data corresponding to the same universal time is preferred to SSTs at the same local time by the majority of potential users of the SST_cci products. Versions of the data containing gaps (if they exist) and versions without gaps should be provided.

Cloud location and sea ice locations are the most commonly required additional fields. Some questionnaire respondents also want aerosol, sun glint and rain locations, information about phase and amplitude of the diurnal cycle, information adjustments applied to the data and uncertainties in those adjustments, information about atmospheric humidity and the number of pieces of information used to estimate each SST in the data files. Inclusion of ancillary fields for sea ice concentration and wind speed is wanted by most (60% and 69% respectively) respondents. Some respondents are interested in having aerosol optical depth ancillary fields. Heat flux components, irradiance, cloud properties, amount of rain and fraction of land in a grid cell are also relevant to some respondents.

The tools that questionnaire respondents most commonly want data creators to provide are for extracting data on different grids, for data reading and subsetting, and for visualisation/evaluation of uncertainty and quality information. Respondents would prefer that code for these tools is open source. The most common choice of language for a dedicated software library is MATLAB (chosen by 34% of respondents), followed by IDL and Fortran (both 14%).

It is important to foster good communication between the project, users and other interested parties. Appropriate user groups need to be consulted systematically to establish requirements and to inspire global participation in use of data. A mechanism for feedback from users needs to be provided. A high quality website will give users easy access to information, documents, products and contacts. The project will feel open and inclusive to users and other scientists if meeting reports, presentations and minutes are made available. Users need to be kept informed of developments by publishing results throughout the lifetime of the project. Respondents to the questionnaire prefer to receive alerts about data using email and the project webpage.

Feedback is required to producers of data used by the project to inform them of any issues that have been discovered with their data.

For most questionnaire respondents, the following features of the data were either essential or preferable (most essential/preferable first): uncertainty estimates for each SST, verification against independent data, peer-reviewed publication, meta-data describing data sources & processing, discovery metadata, commitment to operational production, diurnal variability information, independence from in situ measurements, and error statistics for a particular region.

1. INTRODUCTION

1.1 Purpose and Scope

The European Space Agency (ESA) Climate Change Initiative (CCI) [RD.6] aims to improve satellite data records for eleven essential climate variables (ECVs) to meet the requirements of the climate research community. This document presents the results of a survey of climate-user requirements for the sea surface temperature (SST) ECV, which was undertaken as part of the SST part of the CCI project, SST_cci, over a nine-week period from 2 August 2010.

The requirements were gathered via four methods:

1) a literature review of relevant documents from bodies such as the Global Climate Observing System (GCOS),
2) review of lessons learned information provided by other projects.
3) a questionnaire, which asked about
    a) currently available SST data, and,
    b) future needs for SST data, five years from now.
4) discussion sessions.

Requirements are each given a unique identifier. The format of the identifier is SST_CCI-UR-SSS-n, where UR stands for User Requirement, SSS is the method of gathering (see the list above), and n is the user requirement number.

The information contained here will be analysed and used as the basis for the specifications of the products to be produced by the project (the “SST_cci products”), which will be published in a separate document.

It is intended that this document will be updated throughout the project as new requirements are identified.

1.2 Referenced Documents

The following is a list of documents with a bearing on the content of this report. Where referenced in the text, these are identified as RD.n, where 'n' is the number in the list below:

[RD-1] Systematic Observation Requirements for Satellite-based Products for Climate: Supplemental Details to the satellite-based component of the “Implementation Plan for the Global Observing System for Climate in support of the UNFCCC (GCOS-92)”, ESA CCI SOW 1 issue 1.4 revision 1 - 09/11/2009 EOP-SEP/SOW/0031-09/SP GCOS-107, September 2006 (WMO/TD No.1338) Available online at http://www.wmo.int/pages/prog/gcos/index.php

[RD-2] Satellite Observation of the Climate System: The Committee on Earth Observation Satellites (CEOS) Response to the Global Climate Observing System (GCOS) Implementation Plan Available online at http://www.ceos.org/pages/CEOSResponse_1010A.pdf

[RD-3] The Second Report on the Adequacy of the Global Observing Systems for Climate in Support of the UNFCCC, GCOS – 82, April 2003 (WMO/TD No. 1143) Available online at http://www.wmo.int/pages/prog/gcos/index.php

[RD-4] IPCC, 2007: Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the

Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland, 104 pp. All 4 documents contributing to the Fourth Assessment Report are available online at http://www.ipcc.ch/publications_and_data/publications_and_data_reports.htm

[RD-5] UNFCCC, 2008, Report of the Conference of the Parties on its thirteenth session, held in Bali from 3 to 15 December 2007: Addendum Part Two: Action taken by the Conference of the Parties at its thirteenth session, FCCC/CP/2007/6/Add.1, 14 March 2008 Available online at http://unfccc.int/meetings/cop_13/items/4049.php

[RD-6] The ESA Climate Change Initiative – Description issue 1 revision 0 - 30/09/09 EOP-SEP/TN/0030-09/SP Available online at: http://earth.esa.int/workshops/esa_cci/ESA_CCI_Description.pdf

[RD-7] GCOS Climate Monitoring Implementation Principles, November 1999

Available online at: http://www.wmo.int/pages/prog/gcos/documents/GCOS_Climate_Monitoring_Principles.pdf

[RD-8] Guideline for the Generation of Satellite-based Datasets and Products meeting GCOS Requirements, GCOS Secretariat, GCOS-128, March 2009 (WMO/TD No. 1488) Available online at: http://www.wmo.int/pages/prog/gcos/index.php

[RD-9] The European Commission 7th Framework Programme: http://cordis.europa.eu/fp7/

[RD-10] Implementation Plan for the Global Observing System for Climate in support of the UNFCCC, GCOS-92, October 2004 (WMO/TD No.1219)

Available online at http://www.wmo.int/pages/prog/gcos/index.php

[RD-11] Second Report on the Adequacy of the Global Observing Systems for Climate in Support of the UNFCCC, GCOS-82, April 2003 (WMO/TD No. 1143) Available online at http://www.wmo.int/pages/prog/gcos/index.php

[RD-12] The ESA Data User Element: http://www.esa.int/due

[RD-13] Information on Essential Climate Variable (ECV) related products to be delivered by FP7 Space projects Geoland-2, MyOcean, MACC and three new projects planned to start up following successful negotiations, can be found at: http://ec.europa.eu/enterprise/policies/space/research/fp7-call-forproposals/climate_change_en.htm

[RD-14] Guideline for the generation of datasets and products meeting GCOS Requirements, GCOS-143 (WMO/TD No.1530), May 2010;

Available online at: http://www.wmo.int/pages/prog/gcos/index.php

[RD-15] ESA Climate Change Initiative phase 1 – scientific user consultation and detailed specification – statement of work, Issue 1.4, Revision 1, 09/11/2009, Reference EOP-SEP/SOW/0031-09/SP; http://earth.eo.esa.int/workshops/esa_cci/ao6207SoW.pdf

[RD-16] Annex G to RD.SOW, Sea Surface Temperature ECV (SST_cci)

1.3 Definitions of Terms

The following terms have been used in this report with the meanings shown.

Term	**Definition**
AGCM	Atmospheric General Circulation Model
AMSR-E	Advanced Microwave Scanning Radiometer – Earth Observing System
Analysis	In the sense of an “SST analysis” this means that the field has been interpolated or smoothed.
AOPC	Atmospheric Observation Panel for Climate
ATSR	Along Track Scanning Radiometer
AVHRR	Advanced Very High Resolution Radiometer
CCI	Climate Change Initiative
CDR	Climate Data Record
CF	Climate and Forecast
CMUG	Climate Modelling User Group
COBE	Centennial in-situ Observation Based Estimates of variability
ECV	Essential Climate Variable
ERSST	Extended Reconstructed Sea Surface Temperature
ESA	European Space Agency
FNMOC	Fleet Numerical Meteorology and Oceanography Centre
GCOS	Global Climate Observing System
GHRSST	Group for High Resolution Sea Surface Temperature
GOOS	Global Ocean Observing System
HadISST	Hadley Centre Sea Ice and Sea Surface Temperature dataset
ICOADS	International Comprehensive Ocean-Atmosphere Data Set
In situ data	SST observations made *in situ* by drifting or moored buoys, Argo floats, Voluntary Observing Ships or ship-borne radiometers, etc

JGOFS	Joint Global Ocean Flux Study
MJO	Madden Julian Oscillation
MWOI	Microwave Optimally Interpolated sea surface temperature
NetCDF	Network Common Data Format
NOAA	National Oceanographic and Atmospheric Administration
NOCS	National Oceanography Centre, Southampton
NWP	Numerical Weather Prediction
OI	Optimal Interpolation
OOPC	Ocean Observations Panel for Climate
OSTIA	Operational Sea surface Temperature and sea Ice Analysis
SEVIRI	Spinning Enhanced Visible and Infrared Imager
S&IA	Seasonal and Inter-Annual monitoring
SST	Sea Surface Temperature
RAMSSA	Regional Australian Multi-Sensor SST Analysis
RSS	Remote Sensing Systems (http://www.ssmi.com/)
RTG SST	Real Time, Global sea surface temperature analysis
TMI	TRMM Microwave Imager
TRMM	Tropical Rainfall Measuring Mission
UNFCCC	United Nations Framework Convention on Climate Change
WCRP	World Climate Research Programme
WMO	World Meteorological Organisation

2. EXISTING SST REQUIREMENTS INFORMATION

2.1 Introduction

Before presenting the results of the SST_cci requirements gathering exercise, we first present requirements for SST data that have been gathered by other organisations and groups. These are provided as a comparison point for the reader for the requirements discussed in the rest of this document. Note that these requirements are not all exclusively for climate applications.

2.2 Climate Modelling User Group (CMUG) requirements

The climate modelling user group (CMUG) was established by the ESA to provide links between the CCI projects that will generate data and climate modelling users. Part of their remit is to determine climate modellers' user requirements for each of the ECVs. The requirements they have determined for SST are shown in Table 1 (reproduced from Climate Modelling User Group Requirement Baseline Document, v1.2, Sept 2010).

	Horizontal resolution (km)	Observing cycle (hours)	Precision (°C)	Accuracy (°C)	Stability (°C/decade)
Analysis	1	3	0.2	0.4	N/A
CDR	1	3	0.05	0.1	0.1

Table 1. Requirements for SST gathered by the CMUG (reproduced from Climate Modelling User Group Requirement Baseline Document, v1.2, Sept 2010).

2.3 Group for High Resolution Sea Surface Temperature (GHRSST) requirements

The Group for High-Resolution Sea Surface Temperature (GHRSST) provides SST data for operational oceanographic, meteorological, climate and other users. A set of requirements for SST data is provided on their webpage (http://www.ghrsst.org/GHRSST-PP-User-Requirements.html). This is reproduced in Table 2.

	Horizontal resolution (km)	Delay (hours)		Accuracy (°C)
		Target	Threshold	
Coastal ocean	At least 1	3	6	<0.3
Open ocean	5-10	6	12	<0.4
Ultra-high resolution	2	3	6	<0.3

Table 2. User requirements for GHRSST data, reproduced from http://www.ghrsst.org/GHRSST-PP-User-Requirements.html. The target column contains the optimal requirements; threshold contains the limiting requirement beyond which the data are no longer useful.

2.4 World Meteorological Organisation (WMO) requirements

The World Meteorological Organisation (WMO) maintains a list of user requirements, gathered by the WMO, the Global Climate Observing System (GCOS), the World Climate Research Programme (WCRP) and the Global Ocean Observing System (GOOS) organisations. The requirements for SST are shown in Table 3.

Database	Application	Horizontal Resolution			Observing Cycle			Delay			Accuracy		
		Goal	B/T	T/H	Goal	B/T	T/H	Goal	B/T	T/H	Goal	B/T	T/H
GCOS	OOPC	1 km	8 km	500 km	1 h	3 h	24 h	3 h	5 h	12 h	0.1 K	0.126 K	0.2 K
GCOS	AOPC	10 km	50 km	500 km	3 h	6 h	24 h	3 h	6 h	12 h	0.25 K	0.4 K	1 K
GOOS	GOOS Climate - large scale	10 km	31.1 km	300 km	6 h	29.6 h	720 h	6 h	29.6 h	720 h	0.1 K	0.215 K	1 K
GOOS	GOOS Surface	1 km	2.2 km	10 km	6 h	7.6 h	12 h	2 h	2.5 h	4 h	0.1 K	0.271 K	2 K
GOOS	Marine biology (coastal water)	1 km	1.7 km	5 km	24 h	30.2 h	48 h	3 h	4 h	7 h	0.1 K	0.171 K	0.5 K
GOOS	Marine biology (open ocean)	10 km	17.1 km	50 km	24 h	30.2 h	48 h	3 h	4 h	7 h	0.1 K	0.171 K	0.5 K
IGBP	JGOFS/Global	50 km	79.4 km	200 km	168 h	272.9 h	720 h	168 h	272.9 h	720 h	0.5 K	0.794 K	2 K
IGBP	JGOFS/Regional	1 km	1.7 km	5 km	12 h	15.1 h	24 h	12 h	15.1 h	24 h	0.5 K	0.794 K	2 K
WCRP	Climate Research	50 km	85.5 km	250 km	1 h	2.3 h	12 h	720 h	907.1 h	1440 h	0.5 K	0.794 K	2 K
WCRP	Climate Research	25 km	39.7 km	100 km	24 h	30.2 h	48 h	720 h	907.1 h	1440 h	0.5 K	0.794 K	2 K
WCRP	Climate Research	10 km	17.1 km	50 km	3 h	3.8 h	6 h	24 h	34.6 h	72 h	0.1 K	0.144 K	0.3 K
WMO	Global NWP	5 km	15 km	250 km	3 h	24 h	120 h	3 h	24 h	120 h	0.3 K	0.5 K	1 K
WMO	Nowcasting	5 km	10.8 km	50 km	1 h	1.8 h	6 h	1 h	1.3 h	2 h	0.5 K	0.794 K	2 K
WMO	Regional NWP	25 km	31.5 km	50 km	1 h	2.3 h	12 h	1 h	2.9 h	24 h	0.5 K	0.63 K	1 K
WMO	S & I A	50 km	85.5 km	250 km	3 h	4.8 h	12 h	3 h	6 h	24 h	0.1 K	0.171 K	0.5 K
WMO	Synoptic Meteorology	5 km	10.8 km	50 km	3 h	6 h	24 h	1 h	2.9 h	24 h	0.5 K	0.794 K	2 K

Table 3. Requirements on horizontal resolution, observing cycle, timeliness and accuracy of SST data for different user categories, as documented in the WMO Database of Observational Requirements (http://www.wmo.int/pages/prog/sat/Databases.html). T/H: the "threshold" is the minimum requirement to be met to ensure that data are useful. Goal: the "goal" is an ideal requirement above which further improvements are not necessary. B/T: the "breakthrough" is an intermediate level between "threshold" and "goal" which, if achieved, would result in a significant improvement for the targeted application.

3. REQUIREMENTS FROM REFERENCE DOCUMENTS

3.1 Introduction

A variety of documents has been published by organisations such as GCOS that discuss the generation and provision of climate data. Although the SST_cci project is not concerned with making measurements, many of the principles described in these documents do apply. Similarly, there have been many projects in the past that aimed to generate data for climate applications. Some of the lessons learned in those projects can be translated into user requirements that are relevant to the SST_cci project. Part of the user requirements gathering exercise was to obtain and read these documents and extract requirements. These are detailed in the following sections.

3.2 Requirements from documents about generation and provision of climate data

Documents that are relevant to the generation of climate data records and to the SST_cci project were identified and requirements were extracted from them. In some cases, for example where the documents referred specifically to observations, the requirements were rephrased or adapted to apply to the CCI products. The requirements are listed below; each has three columns of information associated with them. In the first column a unique identifier for each requirement is specified. The requirement itself is in the second column. In the third column are any additional comments and references to the documents that informed the requirements (in square brackets). This format is used throughout this document.

SST_CCI-UR-REF-1	There is a continuing need for a timely flow of climate quality data to climate monitoring and analysis centres.	See SST_CCI-UR-QUF-44 for a definition of timely; the continuing need for data can be addressed by ensuring that the data record is extendable in the future when new instrumentation is available. [RD-10, RD-14, RD-15]
SST_CCI-UR-REF-2	Global coverage is required.	See also SST_CCI-UR-QUF-42. [RD-14, RD-15]
SST_CCI-UR-REF-3	There is a requirement for products that cover at least 30 years.	For example to aid study of climate change and variability. [RD-10]
SST_CCI-UR-REF-4	Uncertainties need to be characterised fully.	This should include the full error budget of the translation from the input data to the products. [RD-3, RD-15]
SST_CCI-UR-REF-5	Uncertainties need to accompany the products.	[RD-16]
SST_CCI-UR-REF-6	Confidence in uncertainty estimates needs to be stated.	[RD-16]

SST_CCI-UR-REF-7	Uncertainty characteristics should be verified by comparison against independent observations.	[RD-3]
SST_CCI-UR-REF-8	Conversion of the system from research to operational use needs to be promoted.	For example by converging climate requirements with operational requirements. [RD-2, RD-7]
SST_CCI-UR-REF-9	Feedback is required to producers of data used by the project to inform them of any issues that have been discovered with their data.	[RD-3, RD-7]
SST_CCI-UR-REF-10	The requirements of users with access to the least developed computing infrastructures need to be addressed.	[RD-10]
SST_CCI-UR-REF-11	All steps taken during product development should be published.	Including algorithm selection and statements about accuracy, resolution and homogeneity. [RD-14]
SST_CCI-UR-REF-12	Data need to be easily accessible.	[RD-10]
SST_CCI-UR-REF-13	Data need to be free.	[RD-10]
SST_CCI-UR-REF-14	Data need to be unrestricted in their availability.	[RD-10]
SST_CCI-UR-REF-15	Standards should be followed for data storage and information sharing.	For example, in order to reduce operating costs. [RD-2]
SST_CCI-UR-REF-16	Standards and procedures for storage of metadata should be developed.	[RD-10]
SST_CCI-UR-REF-17	Full information about input data and any processing applied needs to be archived.	To allow future reprocessing. [RD-3]
SST_CCI-UR-REF-18	There is a requirement to publish information about data and algorithm maturity.	For example which parts have undergone peer-review. [RD-14]
SST_CCI-UR-REF-19	A statement saying point by point which GCOS guidelines have been followed should be published.	[RD-14]

SST_CCI-UR-REF-20	Access to data, products and documentation needs to be provided.	[RD-14]
SST_CCI-UR-REF-21	Version control should be instigated.	[RD-14]
SST_CCI-UR-REF-22	Appropriate user groups need to be consulted systematically.	To establish requirements and to inspire global participation in use of data. [RD-2]
SST_CCI-UR-REF-23	A mechanism for feedback from users needs to be provided.	[RD-14]

3.3 Requirements from lessons learned from other projects

Lessons learned documents were sought from other projects that aimed to produce climate data records. If these did not exist, projects were asked to comment on aspects of the project that worked, did not work, and what they would have done differently. Four replies were received during the survey period. Requirements that have been identified from these replies are listed below. These will be updated in future if more comments are received.

SST_CCI-UR-LLP-24	It is beneficial to users to reduce as much as possible any barriers to obtaining and using data.	
SST_CCI-UR-LLP-25	Requests from users for support need to be dealt with quickly and thoroughly.	
SST_CCI-UR-LLP-26	It is important to foster good communication between the project, users and other interested parties.	
SST_CCI-UR-LLP-27	Users need to be kept informed of developments.	By publishing results throughout the lifetime of the project.
SST_CCI-UR-LLP-28	The project should be made to feel open and inclusive to users and other scientists.	By making meeting reports, presentations and minutes available.
SST_CCI-UR-LLP-29	Users should have easy access to information, documents, products and contacts through a high quality website.	

4. QUESTIONNAIRE

4.1 Introduction

Current and future users of SST data were invited to enter their requirements into an online questionnaire. The questions that were asked in the questionnaire are included as an annex to this document. Invites were sent to more than 800 email addresses. Two methodologies were applied to generate this list of email addresses:

First, lists of peer-reviewed publications that cite published references for various SST datasets were downloaded from Web of Science (http://apps.isiknowledge.com) on 30th July 2010. The datasets used are given below; full details of the publications are in Table 4:

- Hadley Centre Sea Ice and Sea Surface Temperature (HadISST; Rayner et al, 2003);
- International Comprehensive Ocean-Atmosphere Data Set (ICOADS; Worley et al, 2005);
- National Oceanographic and Atmospheric Administration (NOAA) Optimal Interpolation (OI) v2 (Reynolds et al, 2002);
- Advanced Very High Resolution Radiometer (AVHRR) Pathfinder v5 (Kilpatrick et al, 2001).

Some editing of the citation lists was carried out to remove articles that clearly weren't concerned with SSTs. Email addresses and names were mined from the remaining data.

Second, a list of climate research applications was developed. Contacts for each of these research areas were sought through searches using the internet and by taking advantage of existing contacts of the SST_cci Climate Research Group.

Complete responses were received from 108 scientists from around the world; at least as many people again started to fill out the questionnaire but didn't complete it. The results and user requirements presented here are based on the complete responses. However, results from the incomplete responses were checked for consistency with the complete responses.

The number of complete responses, divided by continent, is shown in Figure 1. Approximately half the responses were from Europe. The location of responses is further broken down to the country level in Figure 2. This plot demonstrates that the most responses from a single country was from the UK.

The questionnaire was divided into two sections. In the first part, users were asked for their opinions about current SST data. In the second part, their requirements for SST data five years from now were gathered.

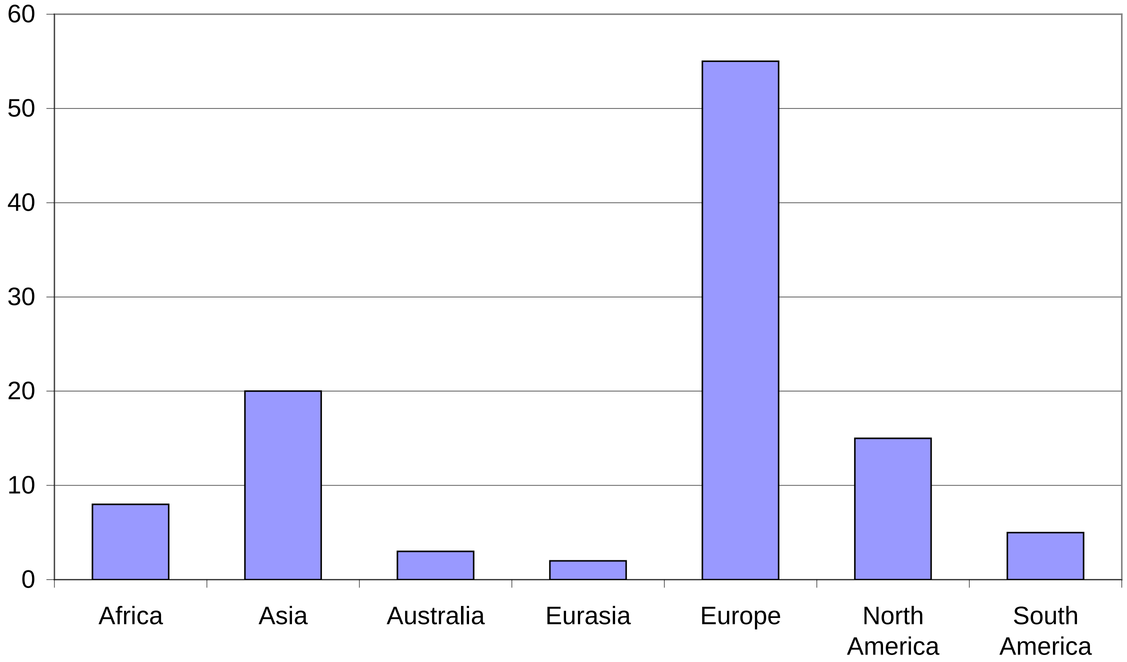


Figure 1. Number of respondents to the survey by continent. The Eurasia column contains countries partly in Europe and partly in Asia.

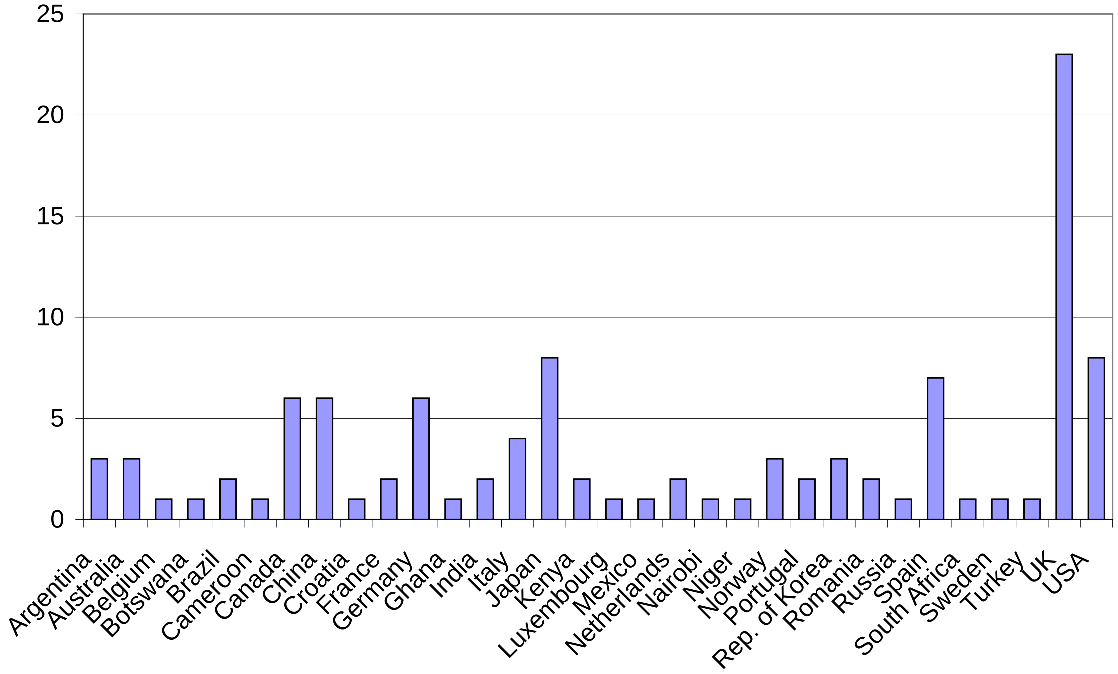


Figure 2. Number of respondents to the survey by country.

4.2 Currently available SST data

4.2.1 Introduction

There is a variety of SST datasets currently available to users, some of which are based on satellite data, some on in situ data sources, and some that are combinations of the two. Some sources of information about the currently available data are in Table 4. Respondents were asked to identify the strengths and weaknesses of the data that they use or have knowledge of. They were also asked to identify characteristics of the data that would become weaknesses as use of SST data advances in the future. The aim was to determine which aspects are limiting use of SST data now and in the future, and to identify combinations of datasets that might overcome the weaknesses.

Data name	Reference/website for further information
ATSR series	http://earth.esa.int/object/index.cfm?fobjectid=4006; http://envisat.esa.int/earth/www/object/index.cfm?fobjectid=3773
AVHRR Pathfinder v5	Kilpatrick, K.A., Podesta, G.P., Evans., R., 2001, Overview of the NOAA/NASA Advanced Very High Resolution Radiometer Pathfinder algorithm for sea surface temperature and associated matchup database, Journal of Geophysical Research-Oceans, 106 (C5): 9179-9197 May 15 2001; http://www.nodc.noaa.gov/SatelliteData/pathfinder4km
Other AVHRR	http://noaasis.noaa.gov/NOAASIS/ml/avhrr.html
SEVIRI	http://www.esa.int/msg/pag4.html
AMSR-E	http://aqua.nasa.gov/about/instrument_amsr.php
TMI	http://trmm.gsfc.nasa.gov/overview_dir/tmi.html
HadSST2	Rayner, N.A., Brohan, P., Parker, D.E., Folland, C.K., Kennedy, J.J., Vanicek, M., Ansell, T., Tett, S.F.B., 2006, Improved analyses of changes and uncertainties in sea surface temperature measured in situ since the mid-nineteenth century: the HadSST2 data set, Journal of Climate. 19(3) pp. 446-469; http://www.metoffice.gov.uk/hadobs/hadsst2
ICOADS	http://icoads.noaa.gov/
HadISST1	Rayner, N. A., Parker, D. E., Horton, E. B., Folland, C. K., Alexander, L. V., Rowell, D. P., Kent, E. C., Kaplan, A., 2003, Global analyses of sea surface temperature, sea ice, and night marine air temperature since the late nineteenth century J. Geophys. Res.Vol. 108, No. D14, 4407 10.1029/2002JD002670; http://www.metoffice.gov.uk/hadobs/hadisst
Reynolds et al daily OI (2007)	Reynolds, R.W., Smith, T.M., Liu, C., Chelton, D.B., Casey, K.S., Schlax, M.G., 2007, Daily High-Resolution-Blended Analyses for Sea Surface Temperature. J. Climate, 20, 5473–5496. doi: 10.1175/2007JCLI1824.1; http://www.emc.ncep.noaa.gov/research/cmb/sst_analysis/
Reynolds et al OI v2 (2002)	Reynolds, R. W., Rayner, N.A., Smith, T.M., Stokes D.C., Wang, W., 2002, An improved in situ and satellite SST analysis for climate. J. Climate, 15, 1609-1625; http://www.emc.ncep.noaa.gov/research/cmb/sst_analysis/
RSS MWOI merged analysis (9 km)	http://www.ssmi.com/sst/microwave_oi_sst_browse.html
Kaplan et al (1998)	Kaplan, A., Cane, M.A., Kushnir, Y., Clement, A.C., Blumenthal, M.B., Rajagopalan, B., Analyses of global sea surface temperature 1856-1991, Journal of Geophysical Research-Oceans, 103, C9, 18567-18539, 1998
ERSST v3	http://www.ncdc.noaa.gov/oa/climate/research/sst/ersstv3.php
COBE	Ishii, M., Shouji, A., Sugimoto, S., Matsumoto, T., 2005, Objective Analyses of Sea-Surface Temperature and Marine Meteorological Variables for the 20th Century using ICOADS and the KOBE Collection. Int. J. Climatol., 25, 865-879.

Data name	Reference/website for further information
OSTIA	Stark, J.D., Donlon, C.J., Martin, M.J., McCulloch, M.E., 2007, OSTIA : An operational, high resolution, real time, global sea surface temperature analysis system., Oceans '07 IEEE Aberdeen, conference proceedings. Marine challenges: coastline to deep sea. Aberdeen, Scotland.IEEE; http://ghrsst-pp.metoffice.com/pages/latest_analysis/ostia.html
NOCS daily OI	Berry, D. I., Kent, E.C., 2009, A New Air–Sea Interaction Gridded Dataset from ICOADS With Uncertainty Estimates. Bull. Amer. Meteor. Soc., 90, 645–656; http://www.noc.soton.ac.uk/ooc/CLIMATOLOGY/noc2.php
RTG SST	http://polar.ncep.noaa.gov/sst/
FNMOC 10 km high res analysis	http://sos.noaa.gov/datasets/Ocean/fnmoc_sst_anomaly.html
RAMSSA 9 km	Beggs, H., A high-resolution blended sea surface temperature analysis over the Australian region, 2007, BMRC Research Report No. 130 (http://www.bom.gov.au/bmrc/pubs/researchreports/RR130.pdf); http://www.bom.gov.au/marine/sst.shtml
Odyssea	http://www.mersea.eu.org/html/information/catalog/products/CERSAT-GLOB-ODYSSEA-SST-NRT-OBS.html
Medspiration	http://www.medspiration.org/products/

Table 4. References and information sources for currently available SST data.

The respondents were given the option of describing up to three climate applications for which they currently use SST data and were able to enter strengths and weaknesses for each. They were first asked to classify these applications by selecting one or more categories from a list. They then chose a primary category from those selected. Figure 3 shows the distribution of responses. The 'Other' category includes: diurnal cycle, paleoclimate (3 responses), correlations between environment and species distributions, atmospheric general circulation model (AGCM) boundary condition, biogeography of marine organisms, operational numerical weather prediction (NWP), weather forecasting, proxy calibration and validation, sea level, medium range-monthly forecasts, coral proxy validation, fire activity prediction, climate processes, air-sea interaction, technique development, fisheries and process studies related to fronts.

The respondents' applications included all the predefined categories from which they were able to choose. However, there were no responses where the primary category was 'high latitude modelling' or 'aerosol'.

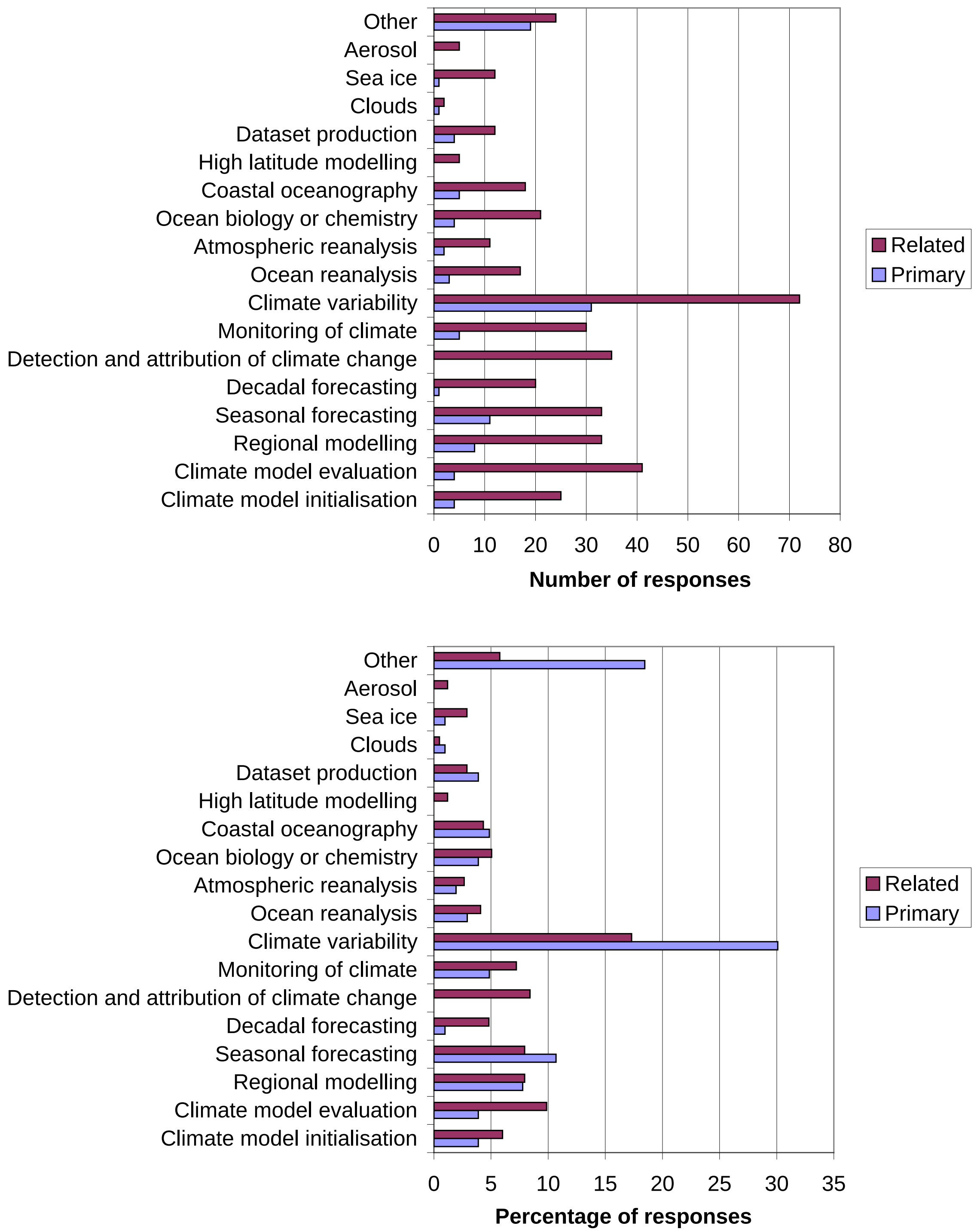


Figure 3. Distribution of responses in each application category in terms of actual numbers (top) and percentage of the total numbers (bottom). Red bars show the number/percentage of respondents indicating that their current SST application related to the categories listed on the left hand side; blue bars show the number/percentage where this was their primary category.

4.2.2 Overall results for currently available SST data

The results are illustrated graphically in Figure 4 - Figure 6. These plots summarise all the responses gathered. They are organised with a dataset or analysis in each column, and characteristics of the data that might be viewed as a strength or weakness in the rows. Each row is further split with strengths and weaknesses of the data for present day applications at the top, and strengths and weaknesses for future needs (five years from now) at the bottom. Note that respondents weren't specifically asked for future strengths of the data; strengths were assumed to continue in the future unless they were selected to be a future weakness. The actual number of responses for each are given (strengths : weaknesses). Where the boxes are coloured green a characteristic is viewed as a strength (ratio of strength to weakness greater than 2 : 1); red shows characteristics that come through as a weakness (ratio less than 1 : 2). Boxes are grey if they are between the two, or white if there were no answers for the dataset/characteristic.

Figure 4 shows the results for SST data on their original grid/swath/positions and data averaged onto a grid (level 2 and level 3 data respectively). The results for each dataset are discussed below.

The Along Track Scanning Radiometer (ATSR) series of instruments has many characteristics that are viewed as strengths, including its spatial resolution, its bias characteristics and its stability. Weaknesses were identified as being the spatial sampling, frequency of observations and the length of the data record. In the future the grid that the data are on and characterisation of uncertainties are no longer exclusively viewed as strengths.

The Advanced Very High Resolution Radiometer (AVHRR) Pathfinder v5 data similarly has many characteristics that are viewed as strengths. In contrast to the ATSR series, the bias characteristics are not a clear strength but neither is spatial sampling a clear weakness; although the number of respondents identifying the latter as a weakness is greater than those selecting it as a strength. However, the frequency of observations is identified as a clear strength of the data. The bias characteristics, characterisation of uncertainties and the depth that the SST refers to all have mixed responses. Other versions of the AVHRR data have similar responses, except users view bias characteristics and characterisation of uncertainties as clear weaknesses.

The Spinning Enhanced Visible and Infrared Imager (SEVIRI) has fewer responses than the previous datasets. Frequency of observations is the clearest characteristic to be identified as a strength, and the length of the data record the clearest to be seen as a weakness.

The length of the data record is also seen as a weakness for the Advanced Microwave Scanning Radiometer – Earth Observing System (AMSR-E). Its bias characteristics and characterisation of uncertainties are also characterised as weaknesses. Its apparent strengths include its spatial sampling, the frequency of observations and the format of the data files. There was mixed results for the spatial sampling and the depth that the SSTs correspond to. The precision and stability of the data were found to currently be strengths, but in the future some respondents felt that they would be weaknesses.

The results for the Topical Rainfall Measuring Mission Microwave Imager (TMI) identified frequency of observations as the main strength and length of the data record as the principal weakness. As with AMSR-E, the spatial resolution was identified as a strength by some respondents but a weakness by others.

All responses

	ATSR series	AVHRR Pathfinder V5	Other AVHRR	SEVIRI	AMSR-E	TMI	HadSST2	ICOADS	Other
Spatial resolution	9 : 0	17 : 2	14 : 0	1 : 0	6 : 5	5 : 3	13 : 16	4 : 11	3 : 2
	9 : 0	**16 : 3**	**14 : 0**	**1 : 0**	**5 : 6**	**5 : 5**	**10 : 22**	**3 : 13**	**3 : 2**
Spatial sampling	2 : 7	5 : 7	4 : 6	0 : 0	5 : 0	0 : 0	3 : 8	3 : 14	1 : 0
	2 : 7	**5 : 8**	**4 : 7**	**0 : 0**	**5 : 0**	**0 : 0**	**2 : 9**	**2 : 15**	**1 : 1**
Grid	2 : 0	10 : 0	6 : 0	0 : 0	3 : 0	4 : 1	19 : 3	6 : 0	4 : 0
	2 : 1	**10 : 1**	**6 : 1**	**0 : 1**	**3 : 1**	**4 : 2**	**18 : 6**	**5 : 2**	**4 : 0**
Frequency of observations	2 : 7	11 : 3	7 : 1	3 : 0	10 : 2	6 : 0	13 : 7	5 : 10	1 : 0
	2 : 8	**11 : 5**	**6 : 3**	**3 : 1**	**9 : 3**	**6 : 2**	**10 : 12**	**3 : 10**	**1 : 0**
Bias characteristics	7 : 0	3 : 3	0 : 4	0 : 0	2 : 5	0 : 1	3 : 4	0 : 5	0 : 1
	7 : 1	**3 : 4**	**0 : 5**	**0 : 0**	**2 : 6**	**0 : 1**	**3 : 4**	**0 : 5**	**0 : 1**
Precision of the data	9 : 0	6 : 0	5 : 1	1 : 0	3 : 1	3 : 0	6 : 6	2 : 1	0 : 0
	9 : 0	**5 : 2**	**5 : 2**	**1 : 0**	**3 : 2**	**3 : 1**	**6 : 7**	**2 : 2**	**0 : 1**
Stability of the data	4 : 0	5 : 1	3 : 1	0 : 0	3 : 0	0 : 0	13 : 2	4 : 3	1 : 0
	4 : 0	**5 : 2**	**3 : 2**	**0 : 1**	**3 : 2**	**0 : 2**	**12 : 3**	**4 : 3**	**1 : 0**
Well characterised uncertainties	2 : 0	3 : 4	1 : 4	0 : 0	1 : 3	1 : 2	6 : 7	1 : 4	0 : 2
	2 : 1	**3 : 5**	**1 : 5**	**0 : 0**	**1 : 4**	**1 : 2**	**5 : 9**	**0 : 5**	**0 : 3**
Depth that the SST corresponds to	4 : 1	3 : 2	4 : 1	0 : 1	3 : 2	1 : 1	2 : 5	2 : 2	0 : 0
	4 : 1	**3 : 3**	**4 : 1**	**0 : 1**	**3 : 2**	**1 : 1**	**2 : 5**	**2 : 2**	**0 : 0**
Format of the data files	5 : 0	5 : 2	5 : 1	2 : 0	8 : 0	4 : 0	21 : 4	10 : 1	2 : 1
	5 : 1	**5 : 3**	**5 : 2**	**2 : 1**	**8 : 1**	**4 : 1**	**20 : 6**	**10 : 1**	**2 : 1**
Timeliness of data delivery	5 : 0	7 : 2	6 : 1	1 : 0	7 : 0	3 : 0	10 : 3	1 : 0	2 : 0
	5 : 0	**7 : 2**	**6 : 1**	**1 : 0**	**7 : 0**	**3 : 0**	**9 : 4**	**1 : 1**	**2 : 0**
Reliability of the data delivery	4 : 1	4 : 1	4 : 1	1 : 1	3 : 1	2 : 1	8 : 1	4 : 1	1 : 0
	4 : 1	**4 : 1**	**4 : 1**	**1 : 1**	**3 : 1**	**2 : 1**	**8 : 2**	**4 : 2**	**1 : 0**
Length of the data record	1 : 5	12 : 5	6 : 3	0 : 2	1 : 5	0 : 5	35 : 2	23 : 2	1 : 1
	1 : 5	**12 : 6**	**6 : 3**	**0 : 3**	**1 : 5**	**0 : 6**	**35 : 2**	**23 : 2**	**1 : 1**
Reputation of the data	4 : 0	14 : 0	4 : 0	0 : 0	5 : 0	2 : 1	27 : 0	13 : 1	1 : 0
	4 : 0	**14 : 0**	**4 : 0**	**0 : 0**	**5 : 0**	**2 : 1**	**27 : 1**	**13 : 1**	**1 : 0**
Other	0 : 2	0 : 0	0 : 0	1 : 0	1 : 0	2 : 1	1 : 0	1 : 0	1 : 0
	0 : 2	**0 : 2**	**0 : 2**	**1 : 0**	**1 : 0**	**2 : 1**	**1 : 1**	**1 : 1**	**1 : 0**

Figure 4. Strengths and weaknesses for SST data on their original grid/swath/positions and averaged onto a grid (level 2 and level 3 data). Each column contains the responses for an individual dataset. Each row is for different aspects of the data that might be regarded as a strength or weakness. Each row is split into two: the top numbers and colours show strengths and weaknesses as viewed in the present day; the bottom numbers (in bold) and colours are how the strengths and weaknesses will be viewed in the future. The numbers give the number of times each aspect was selected (strengths : weaknesses). A box is coloured green if the ratio is greater than 2 : 1, red if it is less than 1 : 2, grey if it is between those numbers, and white if there were no responses for that dataset/category.

The final two datasets in this category, Hadley Centre SST (HadSST2) and the International Comprehensive Ocean-Atmosphere Data set (ICOADS), are based on in situ data. Similar strengths were found for both and included their grid, format of the data files and the length of the datasets. The stability of HadSST2 was found to be a strength, but not so for ICOADS. There were mixed responses about bias characteristics for HadSST2 but this was found to be a clear weakness of ICOADS, while the reverse was true for the depth that the SSTs correspond to. Spatial sampling was seen as a weakness in both. In the future spatial resolution and frequency of observations will become weaker features of these datasets.

Looking now at the different aspects of the data, spatial resolution is identified as a strength of the infrared instruments (ATSR, AVHRR and SEVIRI) but a weakness of in situ datasets. Where it is a weakness, this is generally because the resolution is too low (rather than it being too high for an application to use). The spatial sampling of ATSR and the in situ data are criticised, but it is seen as a strength of AMSR-E, while AVHRR gets mixed responses. Respondents are generally happy with the grids used for the data, with AVHRR Pathfinder and HadSST2 on the most popular grids. Only ATSR and the in situ data are weak in the frequency of observations section, while ATSR is the only dataset for which the bias characteristics are seen as a strength. Respondents seem generally happy with the satellite data precision and stability, although there are concerns about the latter in the future for AVHRR other than Pathfinder and AMSR-E.

The characterisation of uncertainties is generally not chosen as a strength of current datasets and so is an area where improvements should be sought. Respondents seem broadly happy with data file format, and timeliness and reliability of data delivery. The length of the data record is also an area where respondents were generally not happy. ATSR, SEVIRI, AMSR-E and TMI were all assessed as weak in this category. Here, responses for AVHRR were more positive and strongly positive for the in situ data. This suggests that for many applications the shorter satellite records are inadequate. Finally, most of the datasets enjoy very positive reputations, with AVHRR Pathfinder v5, HadSST2 and ICOADS obtaining particularly strong results.

Figure 5 and Figure 6 show overall results for analyses of SST data (level 4). An error in the questionnaire meant that only current views are available for the data in Figure 6.

HadISST1 received mixed responses to the question about spatial resolution, with the results becoming more negative when thinking about future use of SST. Respondents were, however, generally happy that the grid used is suitable for their application. Analysis frequency is set to become too low in the future. Negative opinions outweigh positives for bias characteristics and data precision while the opposite is true for stability. Opinions of all these characteristics will become more negative in future. Characterisation of uncertainties and depth that the SSTs correspond to are both seen as weaknesses. The remaining characteristics are viewed as strengths, with data file format, data record length and reputation particularly positive.

The two Reynolds et al analyses received similar responses to each other, and also resemble the HadISST1 results. However, analysis frequency, the bias characteristics, precision, stability, characterisation of uncertainties and the depth that the SST corresponds to received more favourable results than HadISST1. The length of the data record was seen in a more negative light than HadISST1.

In contrast to the previous analyses, spatial resolution was found to be a strength of the RSS MWOI merged analysis. This points to a requirement for high spatial resolution. The Kaplan et al analysis was identified as having a number of weaknesses: its spatial resolution, analysis frequency, bias characteristics, precision, uncertainty characterisation and depth that the SSTs correspond to. Data file format and data delivery reliability were found to be strengths. The ERSST v3 analysis had similar responses to Kaplan et al, although the results for the spatial resolution question were more mixed.

Spatial resolution was also a weakness for COBE, but was viewed as a strength of OSTIA. The characterisation of uncertainties and length of the dataset were found to be weak for OSTIA and in the future analysis frequency will be an issue for some respondents. The remaining analyses all had few responses.

All responses

	HadISST1	Reynolds et al Daily OI (2007)	Reynolds et al OI v2 (2002)	RSS MWOI merged analysis (9 km)	Kaplan et al (1998)	ERSST v3	COBE	OSTIA
Spatial resolution	17 : 13	12 : 6	10 : 8	3 : 0	1 : 6	7 : 5	0 : 2	6 : 1
	14 : 17	11 : 9	10 : 10	3 : 0	1 : 7	6 : 11	0 : 4	6 : 2
On a suitable grid for this application	11 : 2	6 : 0	6 : 0	2 : 0	3 : 3	3 : 1	1 : 0	2 : 0
	10 : 3	6 : 1	6 : 1	0 : 0	3 : 3	3 : 3	1 : 0	2 : 1
Analysis frequency	3 : 5	13 : 0	10 : 2	2 : 0	0 : 2	2 : 2	1 : 0	3 : 0
	3 : 8	11 : 3	10 : 3	0 : 1	0 : 4	1 : 5	1 : 2	3 : 3
The bias characteristics	3 : 4	7 : 1	3 : 0	1 : 0	0 : 2	1 : 3	1 : 1	3 : 1
	3 : 6	7 : 1	3 : 0	0 : 0	0 : 3	1 : 4	1 : 2	3 : 1
The precision of the data	3 : 6	4 : 2	3 : 0	1 : 1	0 : 4	0 : 4	1 : 2	3 : 0
	3 : 7	4 : 3	3 : 2	0 : 1	0 : 4	0 : 5	1 : 2	3 : 0
The stability of the data	6 : 2	8 : 0	7 : 0	2 : 1	3 : 2	3 : 2	0 : 1	3 : 1
	6 : 3	8 : 0	7 : 0	0 : 1	3 : 2	3 : 2	0 : 1	3 : 1
Well characterised uncertainties	2 : 6	6 : 4	4 : 2	0 : 2	0 : 4	3 : 8	0 : 1	0 : 4
	2 : 8	6 : 4	3 : 3	0 : 2	0 : 4	2 : 9	0 : 1	0 : 4
Depth that the SST corresponds to	0 : 1	2 : 3	1 : 2	1 : 2	0 : 1	0 : 1	0 : 0	2 : 0
	0 : 3	2 : 4	1 : 2	0 : 2	0 : 2	0 : 2	0 : 0	2 : 1
The format of the data files	17 : 1	14 : 1	13 : 0	2 : 0	6 : 0	12 : 0	1 : 0	3 : 0
	17 : 3	14 : 2	13 : 1	0 : 1	6 : 1	12 : 1	1 : 1	2 : 2
Timeliness of data delivery	6 : 2	3 : 1	9 : 1	1 : 0	1 : 1	7 : 1	0 : 1	5 : 0
	6 : 2	3 : 1	9 : 1	0 : 0	1 : 1	7 : 2	0 : 1	4 : 2
Reliability of the data delivery	8 : 0	6 : 0	9 : 0	1 : 0	2 : 0	7 : 0	0 : 0	5 : 0
	8 : 1	6 : 0	9 : 0	0 : 0	2 : 0	7 : 0	0 : 0	4 : 1
The length of the data record	33 : 3	11 : 7	11 : 6	1 : 2	8 : 4	17 : 1	7 : 0	0 : 7
	32 : 3	11 : 8	11 : 6	0 : 2	7 : 4	16 : 2	7 : 0	0 : 8
The reputation of the data	21 : 1	7 : 0	10 : 0	0 : 0	2 : 1	7 : 0	1 : 0	0 : 0
	21 : 1	7 : 0	10 : 0	0 : 0	2 : 1	7 : 0	1 : 0	0 : 0
Other	0 : 0	0 : 1	0 : 1	0 : 0	0 : 0	0 : 0	0 : 0	1 : 0
	0 : 0	0 : 1	0 : 1	0 : 0	0 : 0	0 : 0	0 : 0	1 : 0

Figure 5. As Figure 4 except showing strengths and weaknesses for analysed (level 4) SST data.

The responses to these questions point to a requirement from users of higher spatial resolution than is provided by some of the current analyses. Analyses with grids of 5-10 km received positive reviews, while the 1° grid spacing of HadISST1 had a mixed response. However, it should be noted that there is potential for confusion in these results, in that grid spacing is not necessarily equivalent to the resolution at which meaningful information is present. In general, respondents were happy that the grids used were suitable for their applications.

The results for analysis frequency show a requirement for more frequent analyses in the future. Daily analyses received positive responses, but there is a suggestion that more frequent analyses will become desirable in the future. The bias characteristics, data precision, stability, characterisation of uncertainties and depth that the SST corresponds to were not generally seen as strengths of these data. However, OSTIA and the Reynolds analyses got positive responses to some of these.

All responses

	NOCS daily OI	RTG SST	FNMOC 10 km high res analysis	RAMSSA 9 km	Odyssea	Medspiration	Other
Spatial resolution	2 : 0	3 : 0	1 : 0	2 : 0	2 : 0	1 : 0	1 : 1
On a suitable grid for this application	2 : 0	1 : 0	0 : 0	1 : 0	1 : 0	1 : 0	0 : 0
Analysis frequency	1 : 0	1 : 1	1 : 0	1 : 1	1 : 1	1 : 0	1 : 0
The bias characteristics	0 : 0	0 : 1	0 : 1	0 : 1	1 : 1	0 : 0	0 : 0
The precision of the data	0 : 0	1 : 0	0 : 0	1 : 0	1 : 0	0 : 0	0 : 0
The stability of the data	0 : 0	1 : 0	0 : 0	1 : 0	0 : 1	0 : 0	0 : 1
Well characterised uncertainties	1 : 0	0 : 1	0 : 1	0 : 1	0 : 2	0 : 1	0 : 1
Depth that the SST corresponds to	0 : 0	0 : 2	0 : 1	1 : 1	1 : 1	0 : 0	0 : 0
The format of the data files	2 : 0	0 : 0	0 : 0	1 : 0	1 : 0	0 : 0	0 : 0
Timeliness of data delivery	0 : 0	1 : 0	1 : 0	2 : 0	0 : 0	0 : 1	1 : 0
Reliability of the data delivery	0 : 0	1 : 0	1 : 0	2 : 0	0 : 1	0 : 0	1 : 0
The length of the data record	2 : 0	1 : 4	0 : 1	0 : 1	0 : 2	0 : 2	0 : 1
The reputation of the data	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Other	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0

Figure 6. As Figure 5; an error in the questionnaire meant that future strengths and weaknesses were not available.

Format of the data files, timeliness and reliability of data delivery were generally seen as strengths of the data. Length of the data record was a weakness for some, including OSTIA, and a positive for only HadISST1, Kaplan et al, COBE (greater than 100 years in each case) and NOCS daily OI (almost 40 years).

4.2.3 Results for currently available SST data divided by application area

Plots showing results divided by application category are provided in Appendix A.

4.2.4 Summary

Respondents were asked for their opinions on the strengths and weaknesses of current SST datasets and analyses for their specific application of the data. This exercise has demonstrated that all the current datasets and analyses have aspects that are regarded as weaknesses. Some of these, such as bias characteristics, might be improved for a particular data record. However some, such as length of data record, are fundamental weaknesses and can only be overcome by combining with other data. Characterisation of uncertainties was found to be a weakness across many of the data records and hence is an area where effort should be focussed. The results for the SST analyses pointed to a need for high spatial and temporal frequency.

SST_CCI-UR-QUE-30	Data should be combined where this will allow weaknesses in individual datasets to be overcome.	For those users who are happy with a multi-sensor SST record.
SST_CCI-UR-QUE-31	Characterisation of uncertainties needs to be improved relative to current datasets.	
SST_CCI-UR-QUE-32	Analyses with 10 km or finer spatial resolution and daily or more frequent temporal resolution are required for the number of respondents considering these characteristics as strengths of the data to strongly outweigh those viewing them as negatives.	See also SST_CCI-UR-QUF-36.

4.3 Results of requirements gathering for future use of SST data

4.3.1 Introduction

Respondents were asked to think ahead up to 5 years in the future about their requirements for SST data in their particular applications. These may be applications that are currently only being planned and so some level of speculation is involved in the responses. For many of the questions respondents were asked for three levels of requirement. These were aimed at understanding the range of performance levels that would be useful to the users. The levels were:

Threshold: the limit at which the observation becomes ineffectual and is no use for the application.

Breakthrough: the level at which a significant improvement in this application would be achieved.

Objective: the maximum performance limit for the observation, beyond which no significant improvement in the application would be achieved.

As in the section about current SST data, responses related to all categories of climate research applications (Figure 7). However, ‘sea ice’ and ‘aerosol’ were not chosen as the primary category by any respondents.

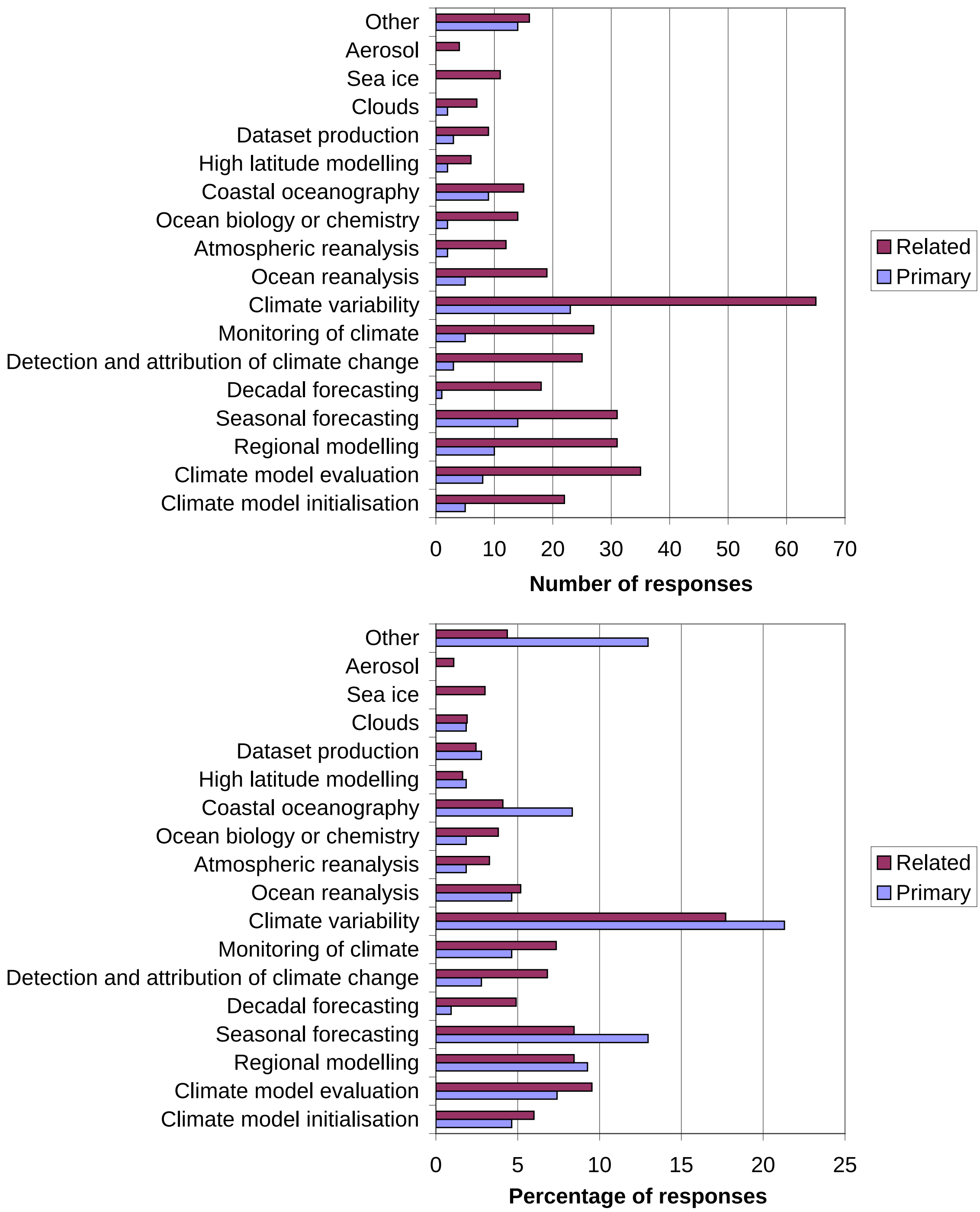


Figure 7. Distribution of responses in each application category in terms of actual numbers (top) and percentage of the total numbers (bottom). Red bars show the number/percentage of respondents indicating that their future SST application related to the categories listed on the left hand side; blue bars show the number/percentage where this was their primary category.

In the following, each question from the questionnaire is discussed in turn. Figures showing the responses are shown for each of the questions. There were 108 full responses in total. In many of the plots the responses have been broken down by primary application category. The size of the bars show the overall number of responses, and the colour coding shows which primary application categories they were from. The key to the colours is shown in Figure 8. If a separate key is shown with a plot or if only a single colour has been used, the key in Figure 8 does not apply.

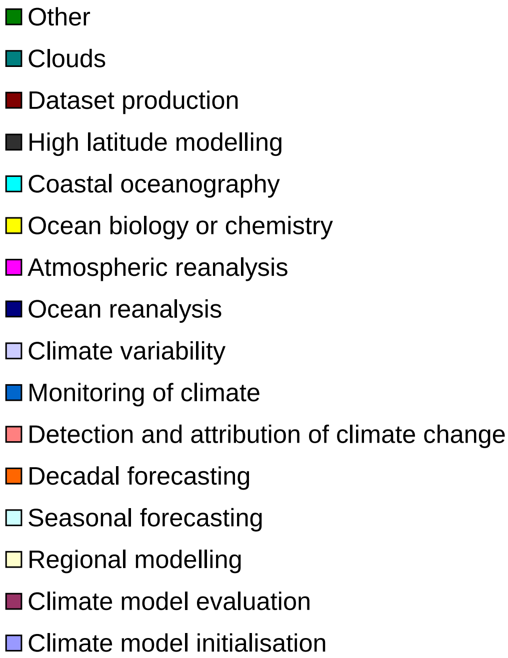


Figure 8. Colours used for each application category; these are used in the majority of plots between Figure 9 and Figure 43.

4.3.2 Responses to each question

The following questions were application specific, i.e. for each response the category of application (such as climate model initialisation) was also recorded. The aim was to make it possible to see if particular types of application have different requirements to others.

4.3.2.1 Data level required

Respondents were asked whether their application required data on the original grid/swath of the instrument (level 2), gridded data (level 3) or analysed data (level 4). Results are shown in Figure 9. These show that level 4 data is the most commonly required, followed by level 3 and then level 2.

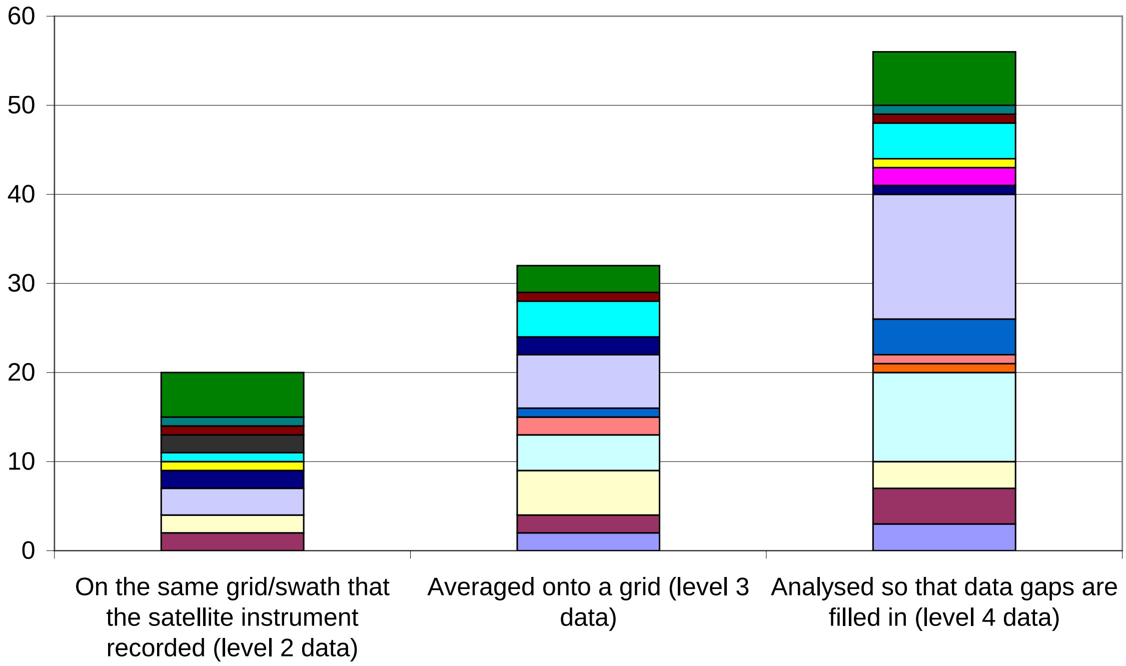


Figure 9. Data level required by the future applications.

Within application categories there was often no agreement on the data level. For example in the climate model evaluation category there were 2 responses for level 2 data, 2 for level 3 and 4 for level 4. Level 2 data received no responses for a number of the application categories. However, the two responses in the high latitude category required level 2 data. Therefore, there are specific requirements for a particular data level in some of the application categories, but generally responses were mixed.

SST_CCI-UR-QUF-33	The most common requirement is for level 4 data (52%). However, some respondents require level 2 (19%) and 3 data (32%).

4.3.2.2 Definition of grid

If respondents chose either level 3 or level 4 data in the previous question they were also asked about the grid they would like the data on.

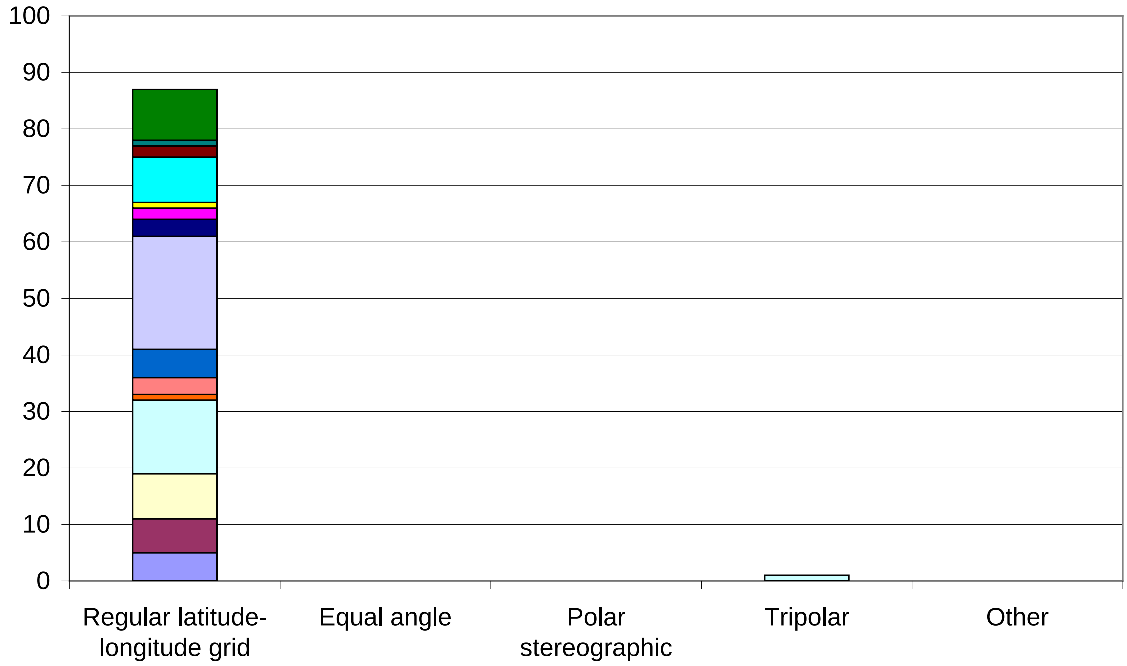


Figure 10. Grid to use for level 3 or level 4 data.

As shown in Figure 10, there was a strong preference shown for a regular latitude-longitude grid. A few users favoured alternatives such as a tripolar grid.

SST_CCI-UR-QUF-34	Respondents have a clear preference that level *3* and level 4 data should be provided on a regular latitude-longitude grid.

4.3.2.3 Combining data

Respondents were asked for their opinion about whether it was acceptable to combine data from multiple similar instruments (for example the ATSR series) or from many different sensor types (such as ATSR and AVHRR together). Results are in Figure 11.

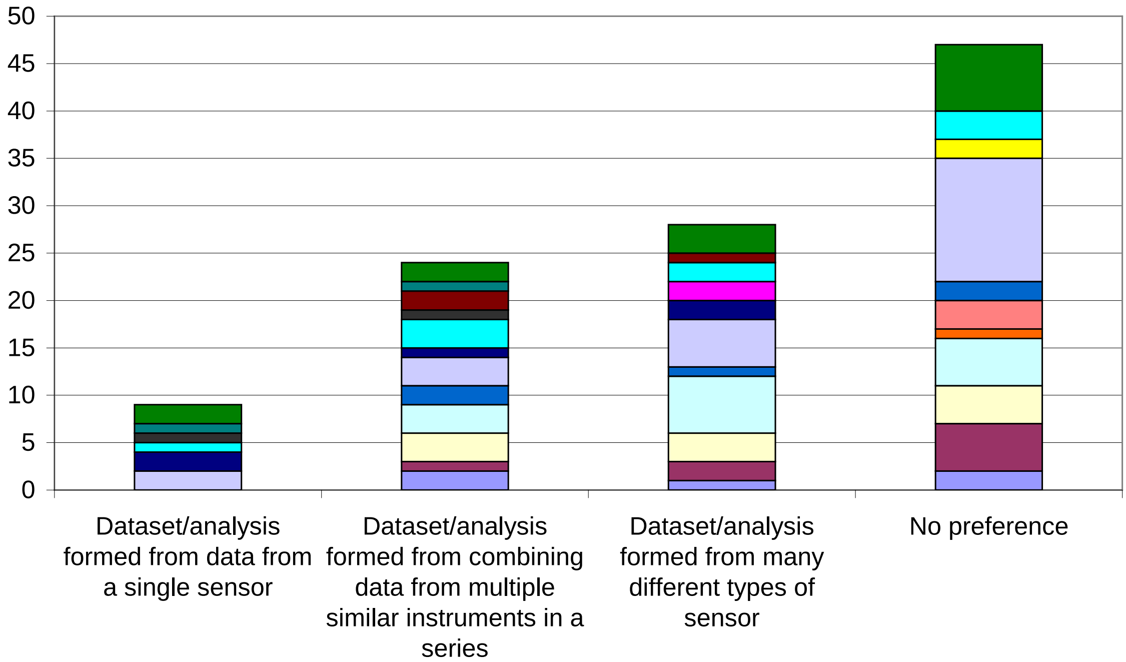


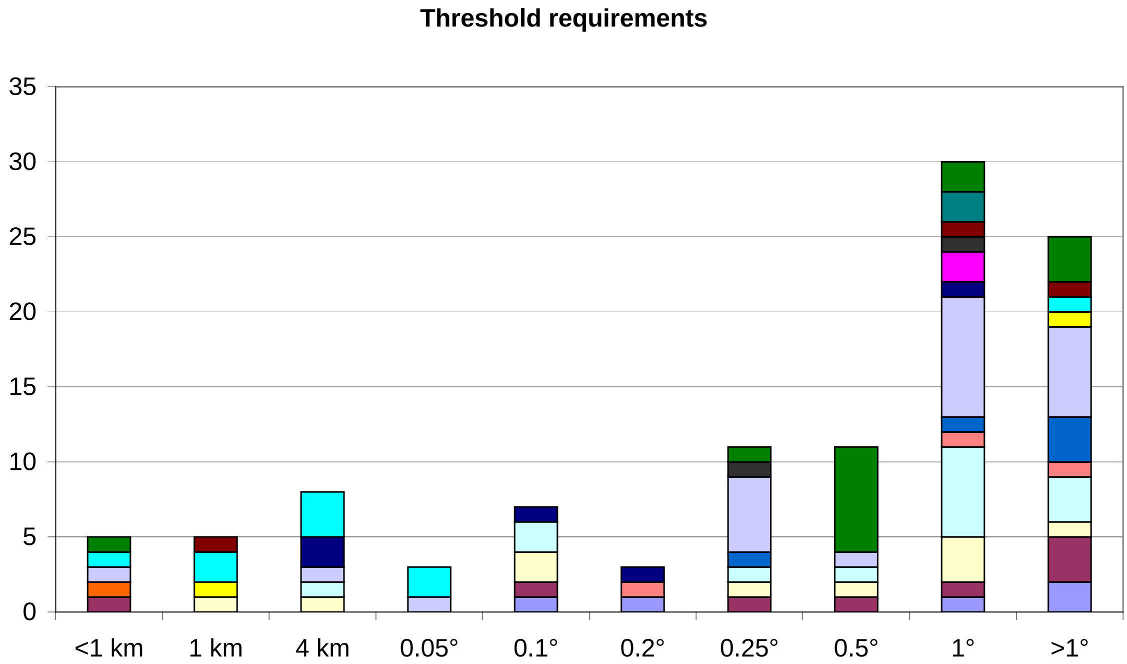
Figure 11. Is it acceptable to combine together different data for this application?

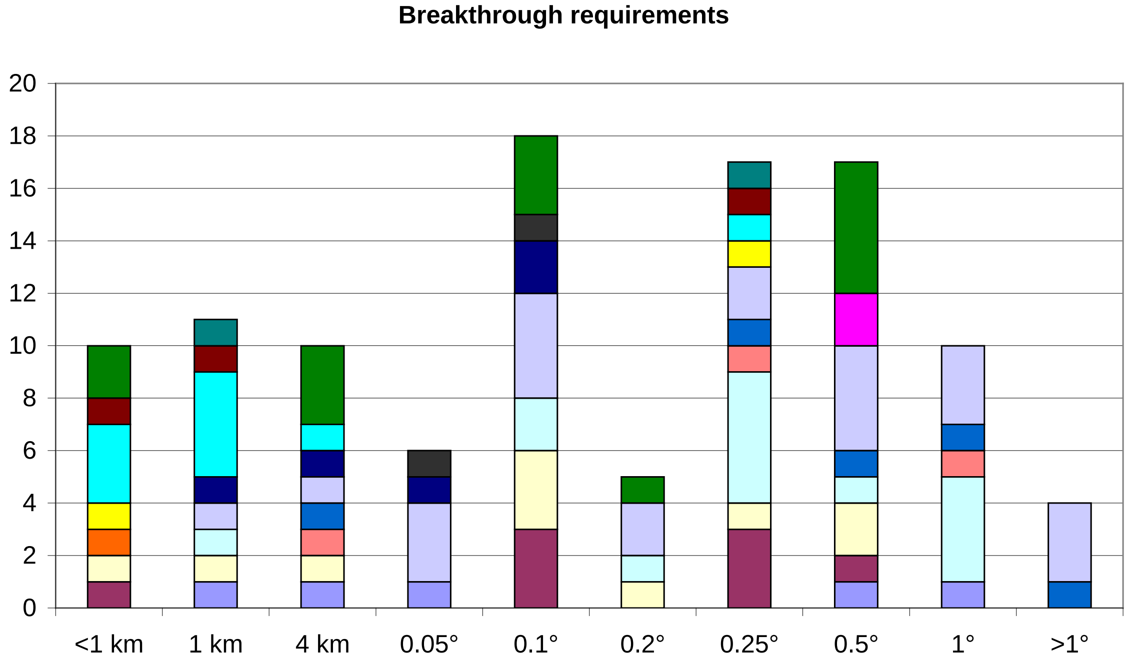
The most common response to this question was 'no preference'. Of those expressing an opinion there were approximately equal numbers for the two options for combining data. The responses asking for no combination of data were in the high latitude, coastal oceanography, ocean reanalysis and climate variability categories. However there were also other responses in these categories for the other options.

SST_CCI-UR-QUF-35	The needs of different users can be met by making available single-sensor records, sensor-series datasets, and multiple-sensor analyses.

4.3.2.4 Spatial resolution

Respondents were asked the spatial resolution they require for their applications. They were asked to specify these in terms of breakthrough, threshold and objective requirements. The results are shown in Figure 12.


Threshold requirements
35
30
25
20
15
10
5
0
<1 km
1 km
4 km
0.05°
0.1°
0.2°
0.25°
0.5°
1°
>1°


Breakthrough requirements
20
18
16
14
12
10
8
6
4
2
0
<1 km
1 km
4 km
0.05°
0.1°
0.2°
0.25°
0.5°
1°
>1°

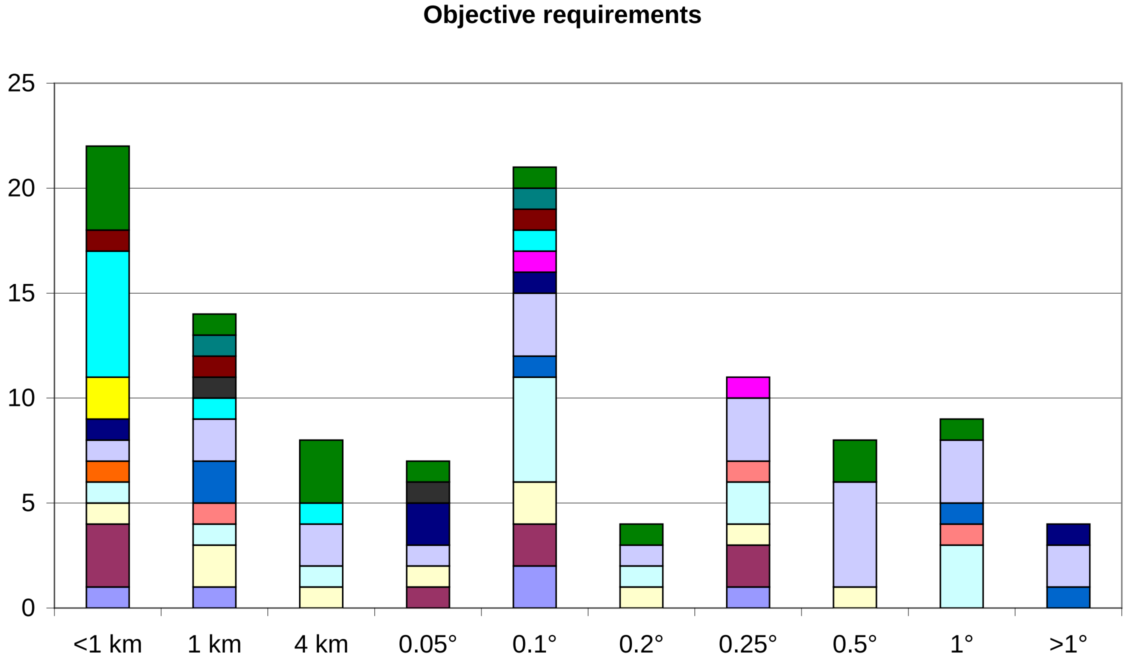


Figure 12. The spatial resolution required for future applications.

Even at the threshold level of requirements, respondents chose the full range of options presented to them. Particularly high resolution is required in the coastal oceanography and decadal forecasting category. Responses in other categories were quite mixed. Overall the mode of the responses was a threshold requirement for a resolution of 1°.

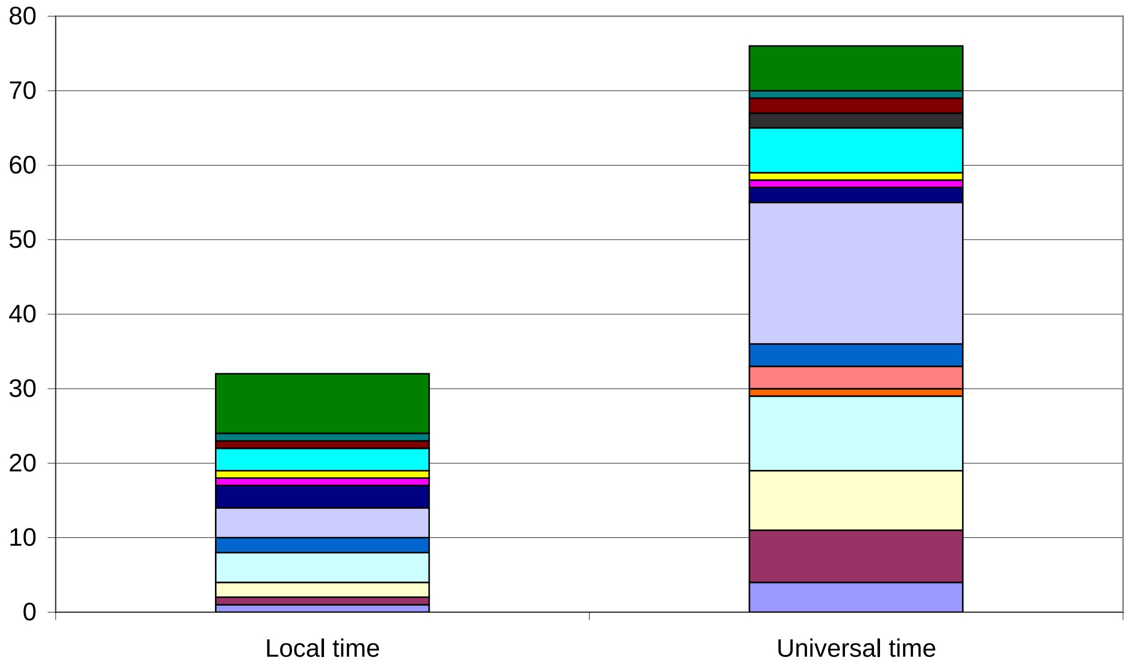
At the breakthrough requirement level, the distribution of responses was quite broad. 0.1, 0.25 and 0.5° all received a high number of responses. Again, responses within categories were generally mixed but with coastal oceanography and decadal forecasting requiring higher resolution.

At the objective requirement level there were two peaks to the distribution of responses at <1 km and 0.1° resolution. However, responses were received across the whole range of options, and there was still a broad range of responses in many of the application categories.

SST_CCI-UR-QUF-36	Overall, the most common responses for spatial resolution were 1° (threshold), 0.1° (breakthrough) and <1 km (objective).

4.3.2.5 Local or universal time

Respondents were asked if they prefer data where all SSTs are at the same local time (such as provided by a polar orbiting satellite) or at the same universal time (as from a geostationary satellite). Results are in Figure 13.



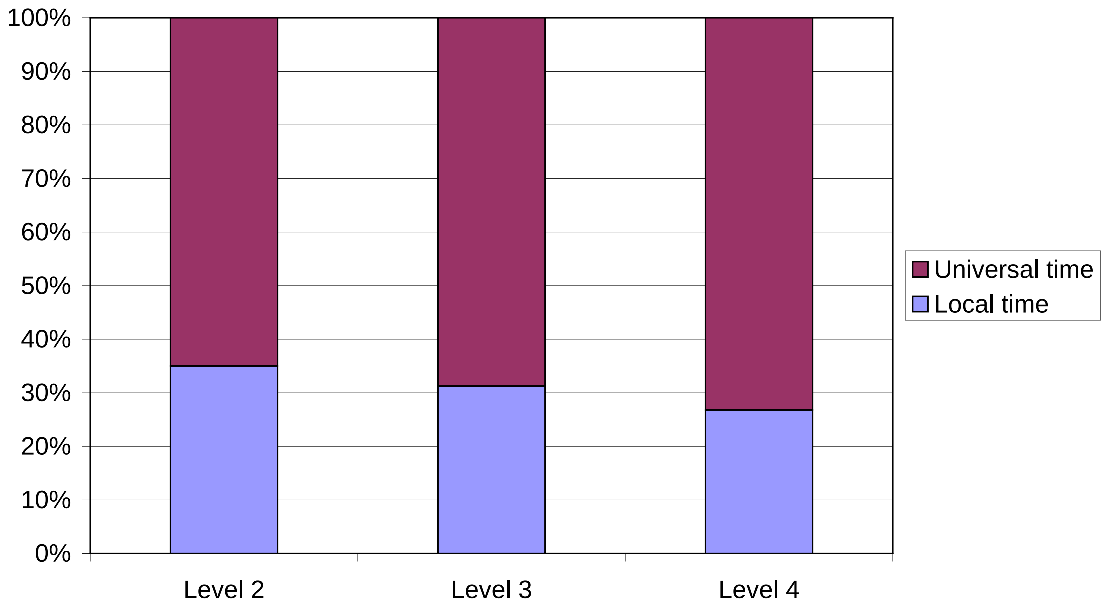


Figure 13. SSTs to be at the same local or universal time? Top – results with colours indicating the application categories; bottom – percentage of respondents choosing local or universal time if they also selected that they require level 2, level 3 or level 4 data.

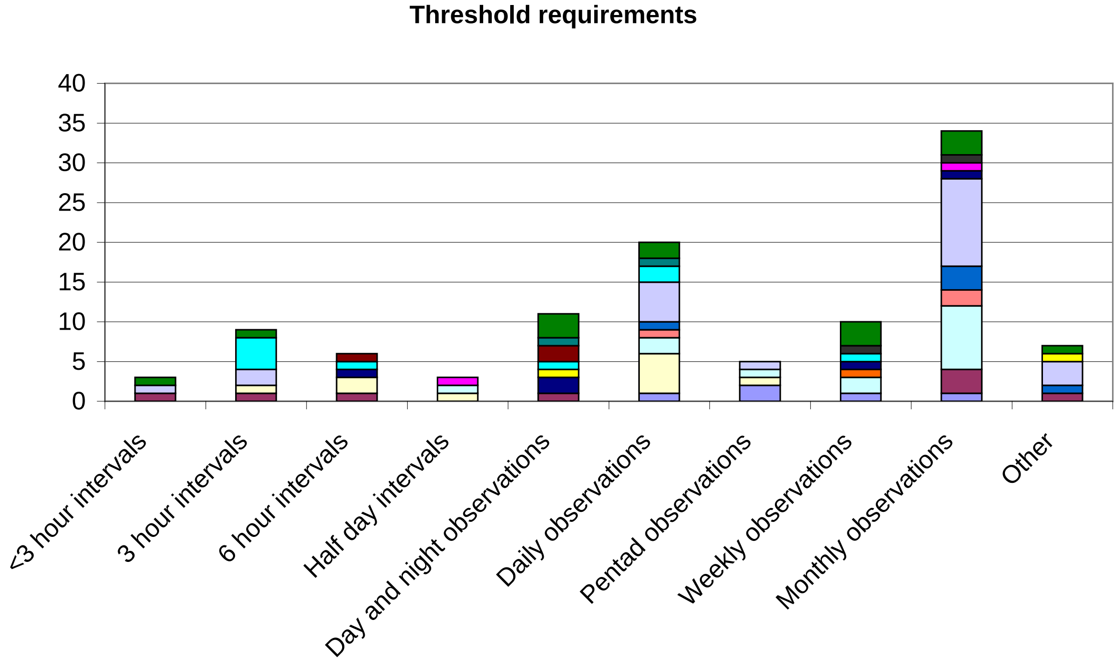
The preferred option was for SSTs at the same universal time, although there were also many responses for the alternative. This result was consistent across most of the different application categories. There was little difference in the proportions for the two options between the groups of respondents who require level 2, level 3 or level 4 data.

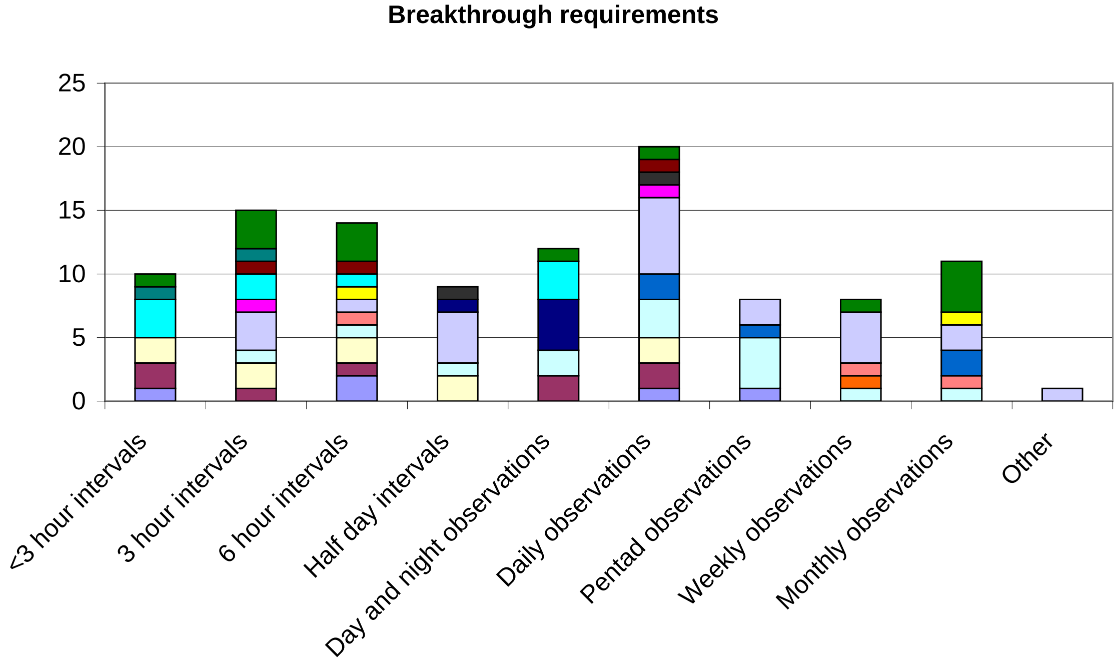
SST_CCI-UR-QUF-37	SST data corresponding to the same universal time is

preferred to SSTs at the same local time by the majority of potential users of the SST_cci products.

4.3.2.6 Data frequency

Respondents were asked how frequently they required SST data at a location; results are shown in Figure 14.





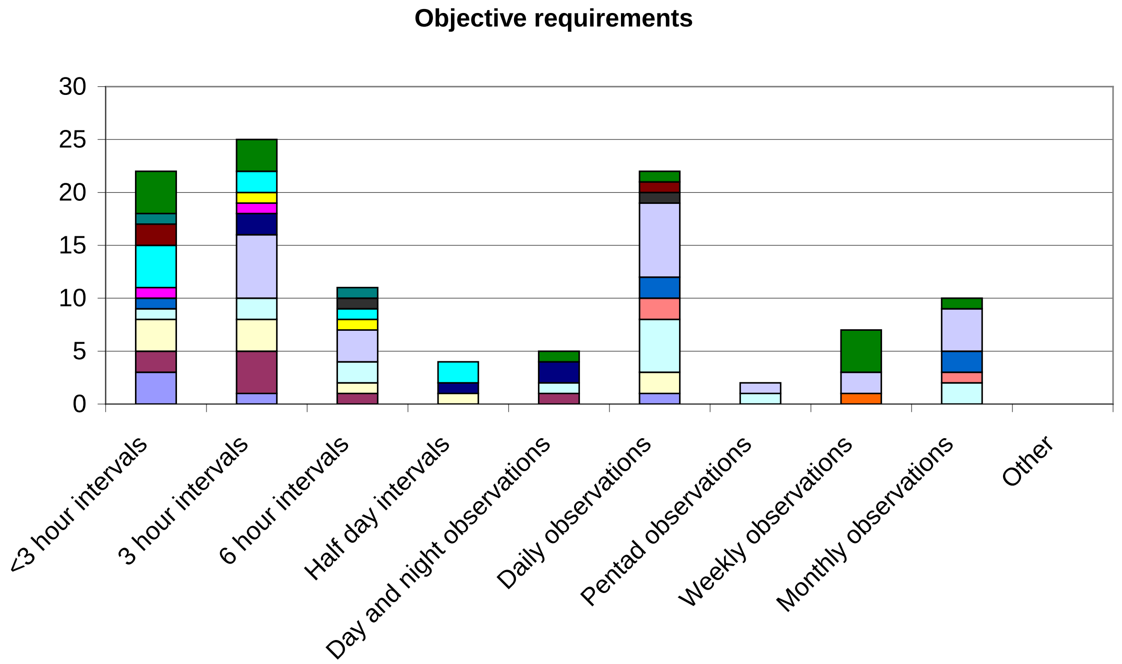


Figure 14. Requirements for frequency of SSTs at a location.

The threshold requirement responses peak at monthly data, with a second peak at daily. As with spatial resolution the responses cover a wide range of possible answers, both in the overall results and within the application categories.

At the breakthrough level, the peak in response is at daily frequency. At the objective level it is at 3 hourly frequency, although the distribution of responses still has a peak at daily frequency.

SST_CCI-UR-QUF-38	The most common requirements for data frequency at a location are monthly (threshold), daily (breakthrough) and 3 hourly (objective).	There were also significant numbers of users who had more stringent requirements. For example over a third of respondents selected 6 hourly or more frequent at the breakthrough requirement level.

4.3.2.7 Data gaps

Following on from the question about data frequency, respondents were asked if data gaps were acceptable. For example, is it critical if there are no data at some locations at a particular time if cloud obscured the view of the surface from the satellite?

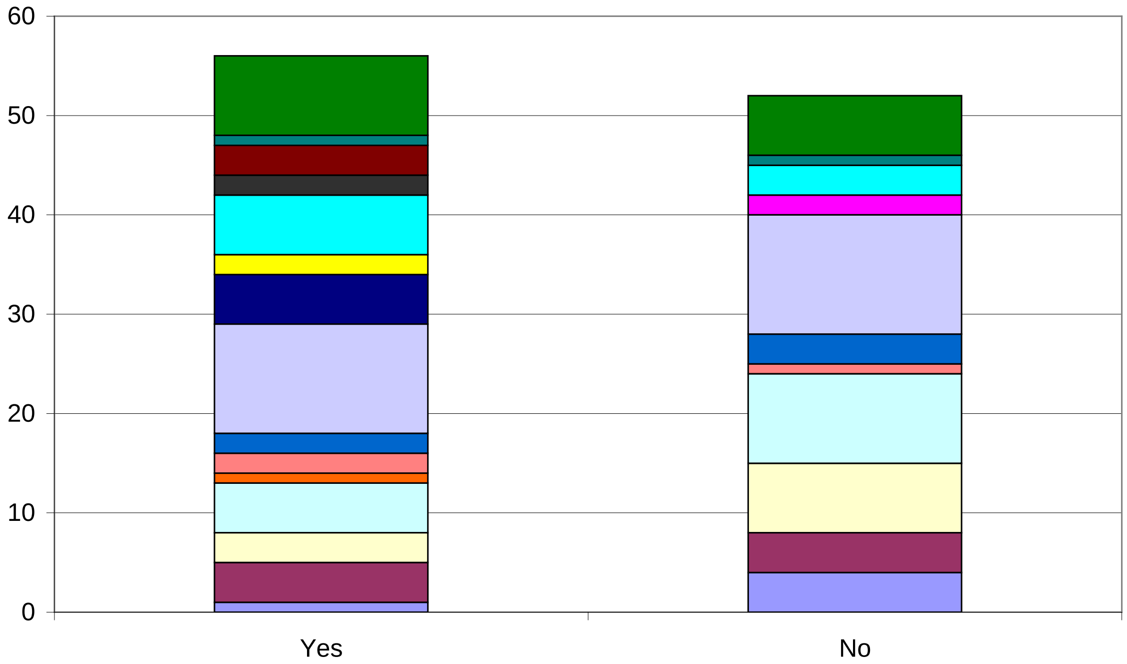


Figure 15. Are data gaps acceptable, for example as may occur due to cloud.

Results were very mixed for this question (Figure 15), with 'yes, data gaps are acceptable' receiving a marginally greater number of responses. All respondents in the ocean reanalysis, ocean biology or chemistry, high latitude modelling and dataset production categories were happy with data gaps; in the atmospheric reanalysis category all responses were for no data gaps.

Figure 16 shows the data level specified by respondents (see Section 4.3.2.1) broken down by the answer to the question about data gaps. For those respondents who find data gaps acceptable there is a roughly equal split between data level. However, in the group that find data gaps unacceptable there is a clear preference for level 4 data, i.e. an analysis of SST data where gaps have been filled in.

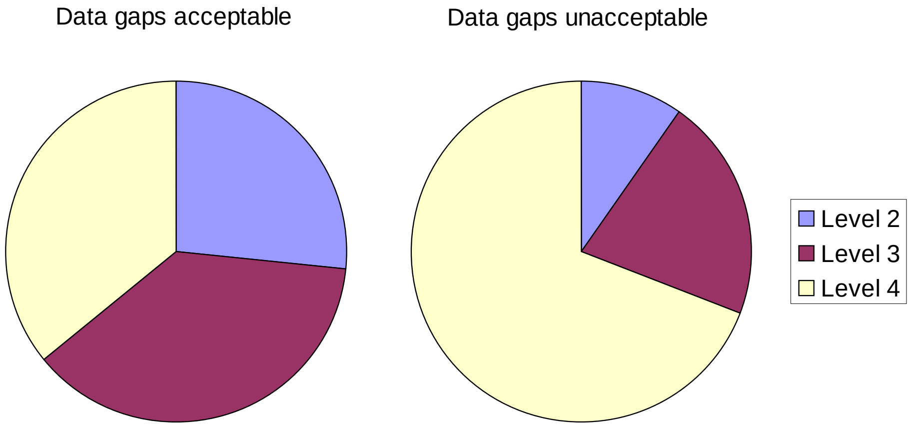


Figure 16. Data level preferred by respondents who specified that data gaps are acceptable (left) and unacceptable (right).

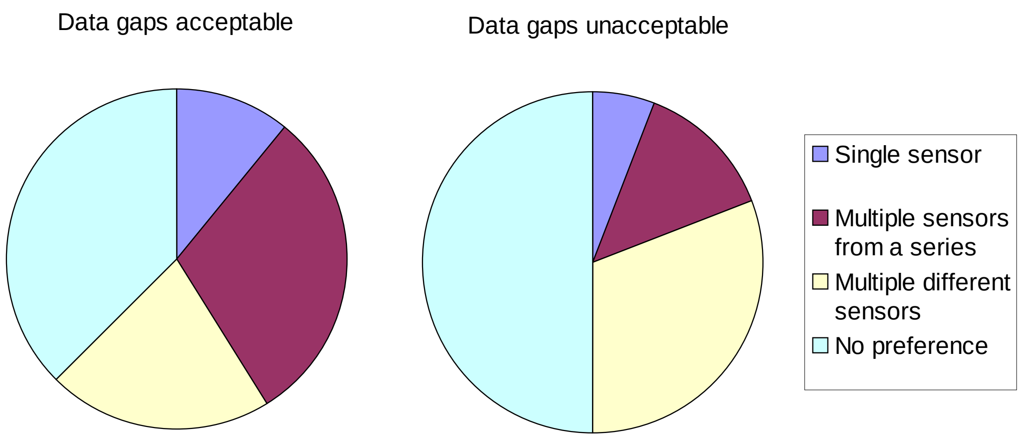


Figure 17. Preferences for what data should be combined to make the SST products required by respondents who specified that data gaps are acceptable (left) and unacceptable (right).

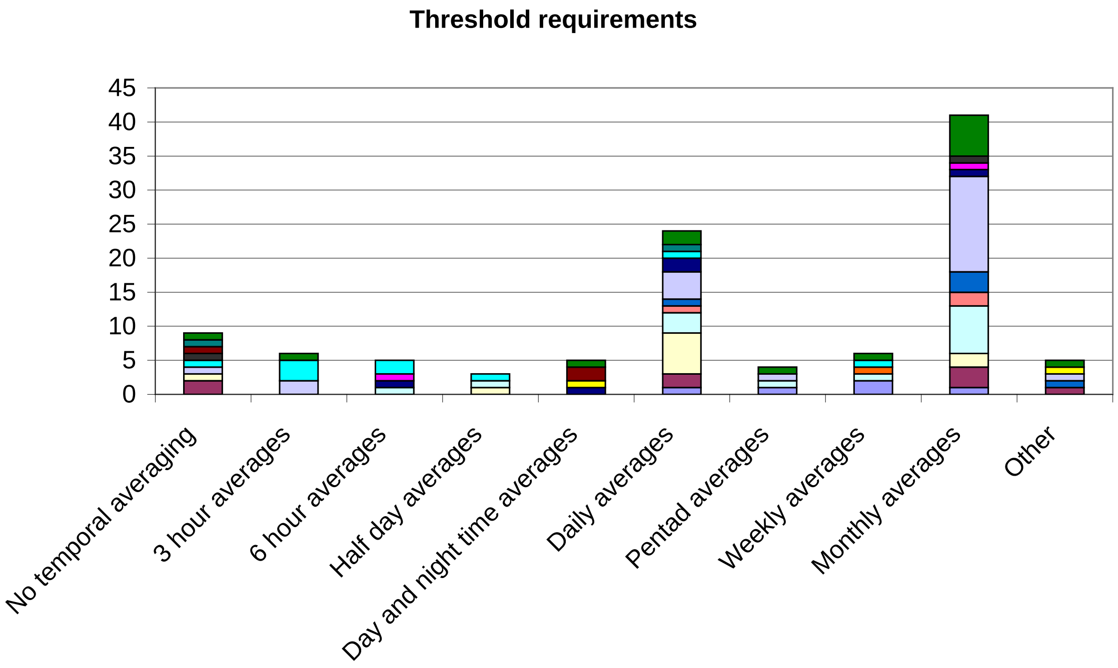
Similarly, Figure 17 shows what data respondents would like combined to make the product they require (see Section 4.3.2.3) if data gaps are acceptable (left) or unacceptable (right). A difference is again found between the two groups. Of those who find data gaps unacceptable, a greater proportion specified that data from multiple different sensors could be combined together or that they had no preference for what data are used than those in the group for which data gaps are acceptable.

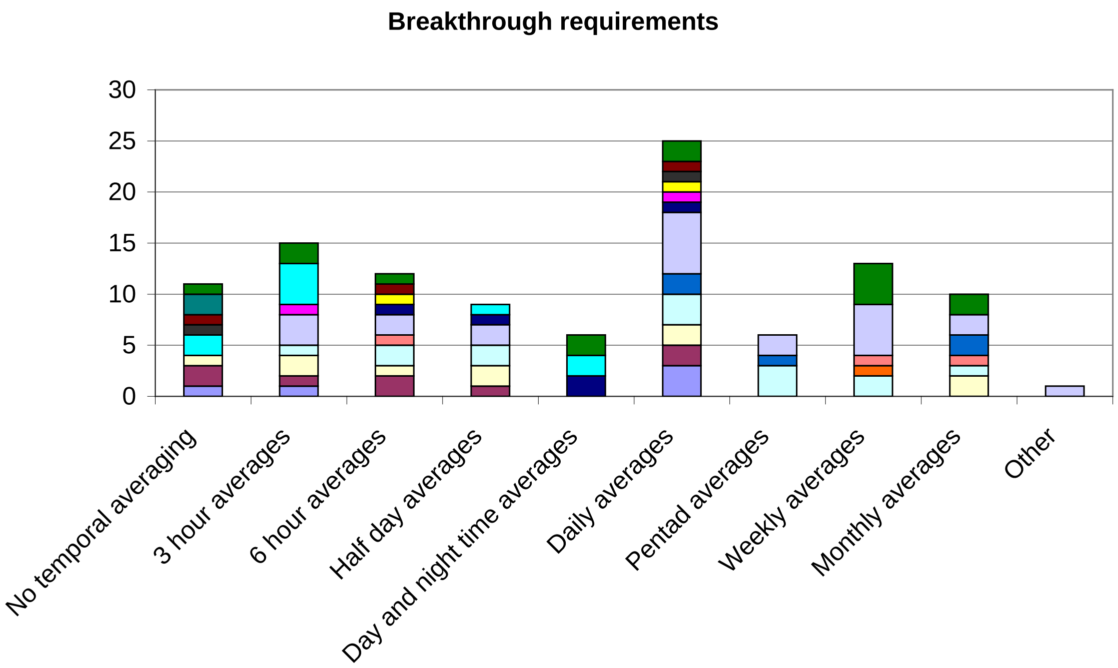
The results in Figure 16 and Figure 17 explore two different ways of achieving an SST product without data gaps; first, analysis techniques can be employed to fill areas where there are no data; second, data from multiple sensors (including, for example, data from both infrared and microwave instruments) could be combined. These results indicate that the group of users who require data without gaps are generally happy with either technique.

SST_CCI-UR-QUF-39	Versions of the data with gaps (if they exist) and versions without gaps are required.	A version without gaps could be achieved either as a result of combining data from multiple sensors or infilling using analysis techniques. There was no evidence in the results to suggest that either method was unacceptable.

4.3.2.8 Temporal averaging

Respondents were asked the level of temporal averaging that would be acceptable to achieve the requirement in the previous question. The results are in Figure 18.


Threshold requirements
45
40
35
30
25
20
15
10
5
0
No temporal averaging
3 hour averages
6 hour averages
Half day averages
Day and night time averages
Daily averages
Pentad averages
Weekly averages
Monthly averages
Other


Breakthrough requirements
30
25
20
15
10
5
0
No temporal averaging
3 hour averages
6 hour averages
Half day averages
Day and night time averages
Daily averages
Pentad averages
Weekly averages
Monthly averages
Other

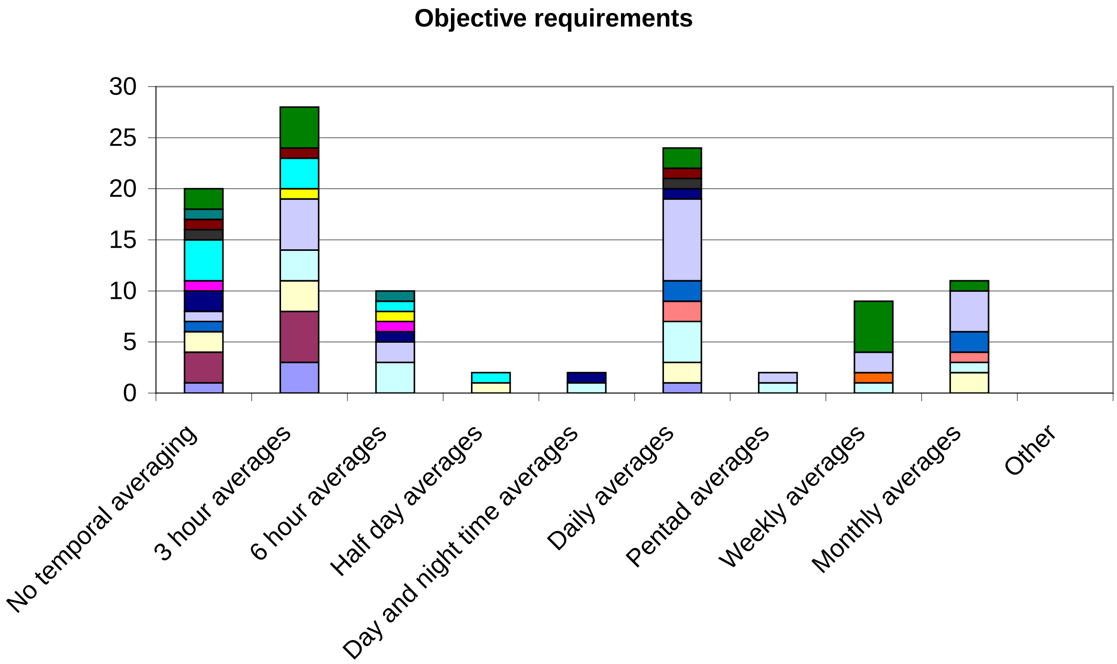


Figure 18. Requirements for temporal averaging of data.

Results closely mirror those of the question about data frequency. These results imply that the respondents are generally happy with temporal averaging, rather than requiring a snapshot of SSTs at a particular time. However, a significant minority (8%, 10%, 19% at the threshold, breakthrough and objective levels respectively) of respondents chose the 'no temporal averaging option'.

SST_CCI-UR-QUF-40	For the majority of respondents it is acceptable to use temporal averaging when building datasets.	However, it is not acceptable for a significant minority of respondents.

4.3.2.9 Data times

Respondents were asked which times of the day they required SSTs for. They were able to select times throughout the day at half hour intervals.

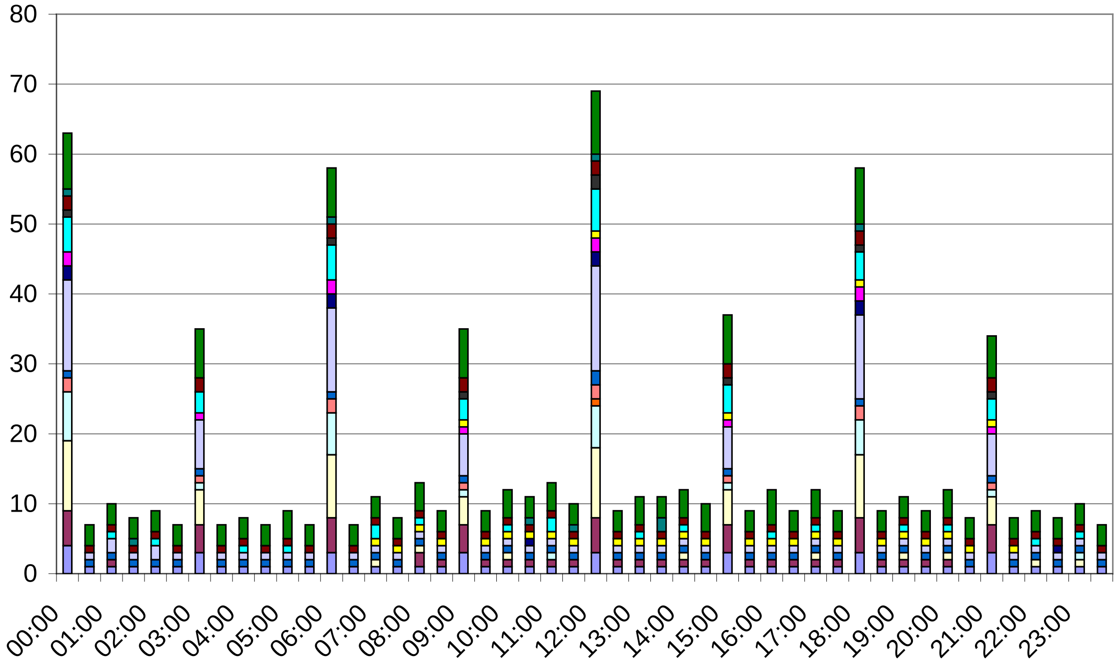


Figure 19. Times of the day when SSTs are required.

All times available for selection were chosen by at least seven respondents (Figure 19). Overall, SST data is most required at midnight, 6 am, midday and 6 pm. SSTs midway between these times were also chosen by many respondents.

Within the application categories, there were differences between when SSTs were required. For example, in some categories, such as climate model initialisation and climate variability, all times of day were selected. For ocean biology and chemistry, the two respondents only chose times between 7 am and 9.30 pm.

SST_CCI-UR-QUF-41	SSTs are most commonly required at midnight, 6 am, midday and 6pm; additional data at midpoints between those times are required by many, and SSTs at half hour spacing would be used for some applications.

4.3.2.10 Spatial coverage

This question asked about the coverage (global or regional) that is required.

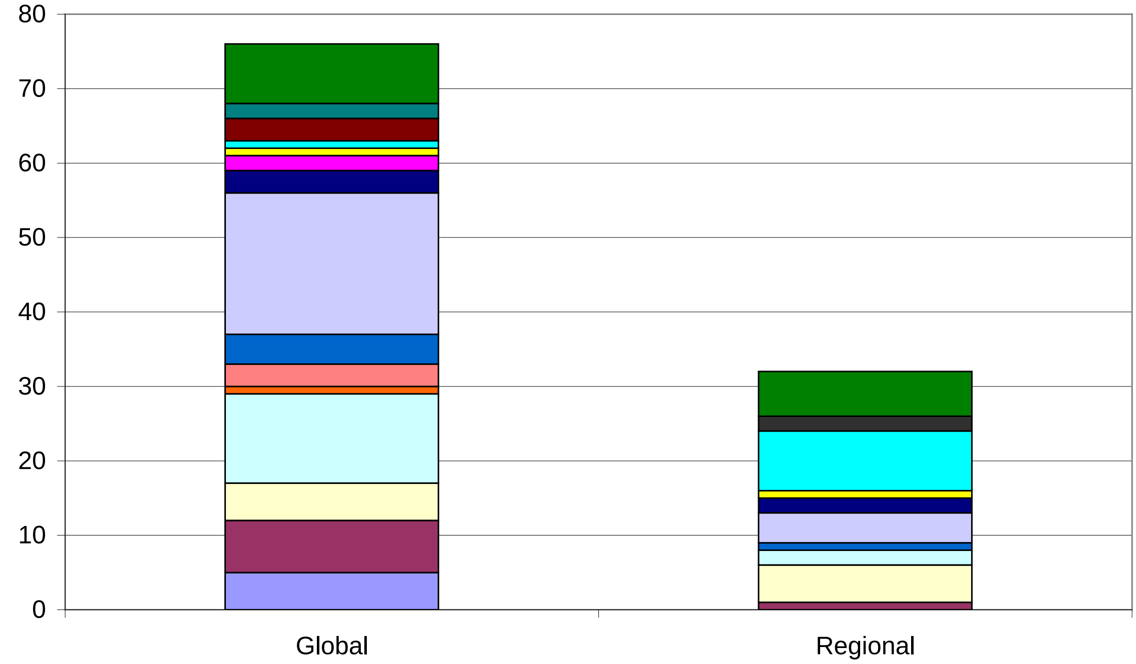


Figure 20. Spatial coverage required.

The majority of respondents require global coverage (Figure 20). However, some applications are regional. Individual regions specified by potential users covered a wide range of locations and spatial scales. These are listed below:

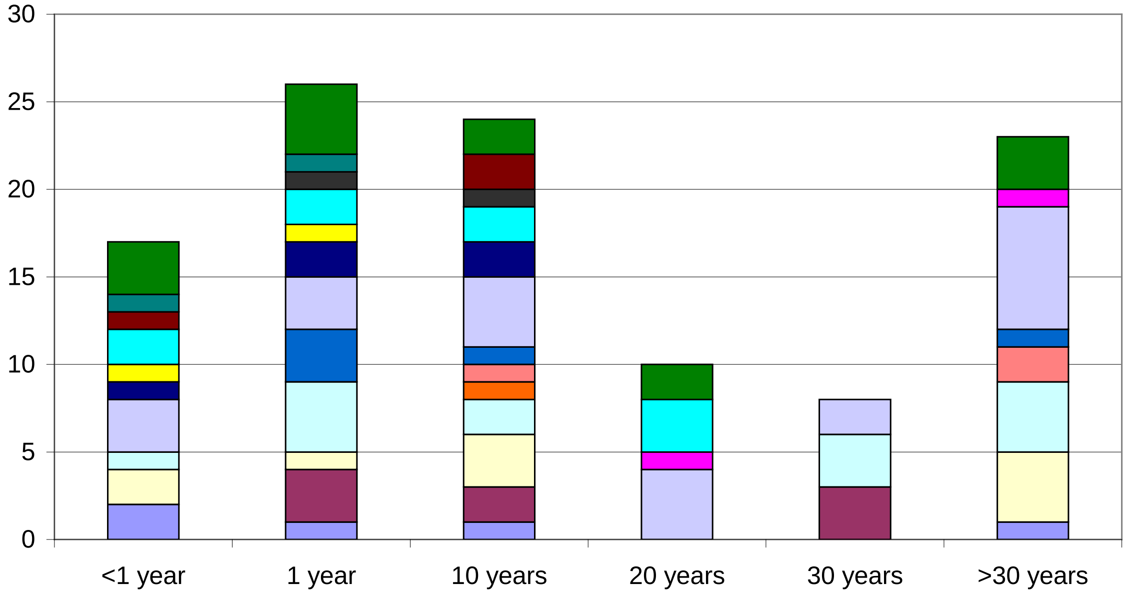
Pacific and Atlantic oceans; Northern Hemisphere; Arctic; Arctic & sub-Arctic (some Antarctic); North Atlantic (specified by three potential users); Northwest Atlantic; Coastal Greenland; Northeast Atlantic; North Atlantic/Europe, Mediterranean (two potential users); North Atlantic north of 30°N, Nordic Seas, Arctic; Nordic Seas, Barents Sea, Arctic; Eastern North Atlantic from 10°N to 45°N; Mediterranean, North Sea, North Atlantic; Mediterranean; Western Mediterranean; Caspian Sea; UK coastal; West Africa; Canadian Eastern Shelf; Pacific warm pool; Tropics; Tropical oceans; South of Equator; Western Indian Ocean and Eastern Atlantic; South Atlantic Ocean; 0-25°S, 40-90°E; Australia; 100-30°W, 60-5°S; 120-20°W, 0-90°S.

SST_CCI-UR-QUF-42	Global coverage is required.	See also SST_CCI-UR-REF-2.

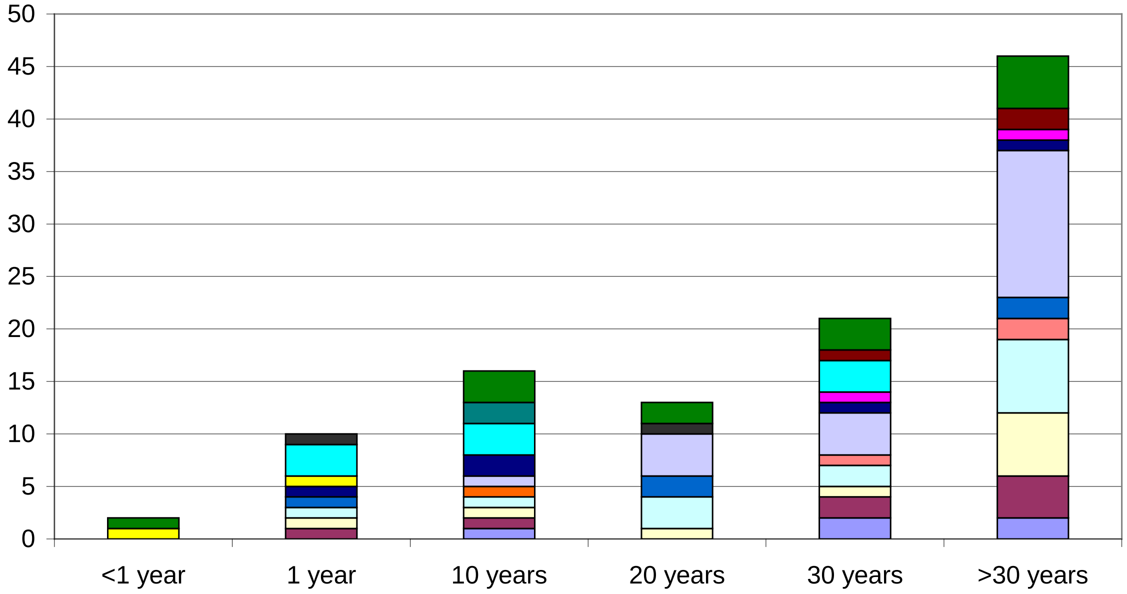
4.3.2.11 Temporal coverage

Users were asked what length of time series they require. Results are illustrated in Figure 21.

Threshold requirements



Breakthrough requirements



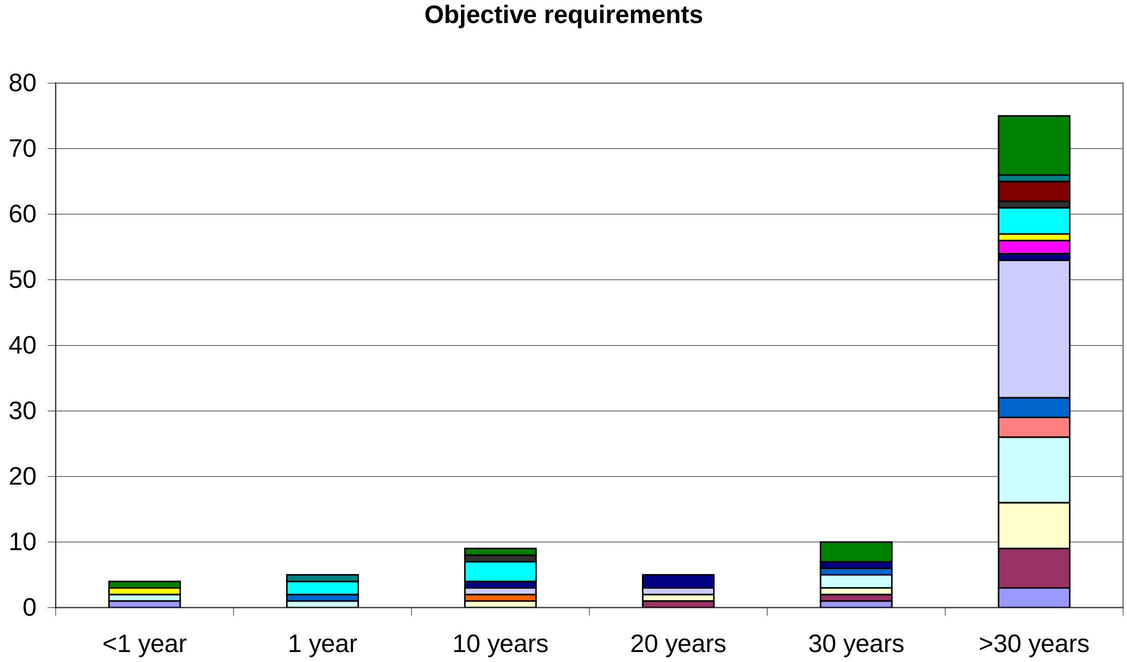


Figure 21. Requirements for temporal coverage.

Responses covered the full range of possible answers at threshold, breakthrough and objective levels of requirements. At the threshold level, the distribution of responses peaks at 1 year, although there is also a peak at >30 years. This is driven by applications such as the analysis of climate variability. At the breakthrough level, there is a clear indication that respondents want long >30 year data records, and this comes out even stronger in the objective requirements.

Temporal coverage (years)	Start year (assuming end in Dec 2014)	Comment on sensor availability based on information in Table 3 of [RD-16].
1	2014	Temporal coverage of this length could be achieved with data from ATSR, AVHRR, TMI, AMSR-E and SEVIRI if they are still available.
10	2005	ATSR, AVHRR, TMI, AMSR-E and SEVIRI could potentially all provide this temporal coverage, assuming their data records continue.
20	1995	Assuming continuation of their data records, both AVHRR and ATSR series of sensors are available for the full time period (the ATSR data record starts in 1991).
30	1985	Only the AVHRR series of instruments can provide data for the full period, assuming that they continue in the future.
>30	Prior to 1985	AVHRR data are available back to 1981.

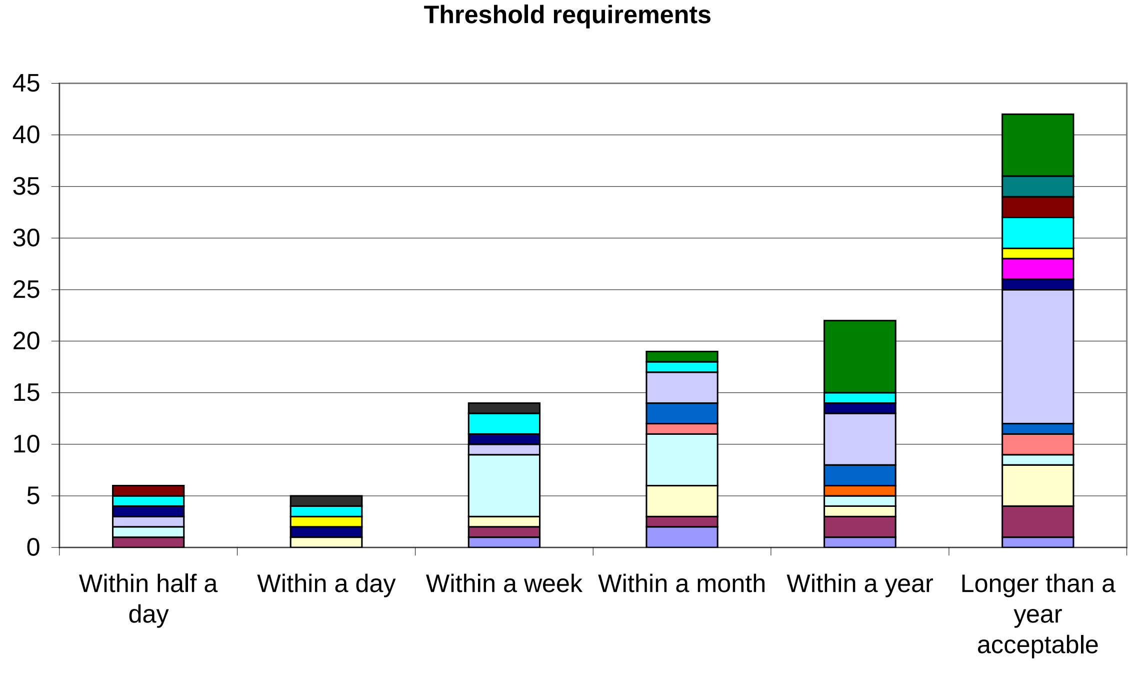
Table 5. Illustration of how user requirements translate to start year for a data product, assuming that the requirements are to be met five years in the future. The final column indicates which satellite sensors could potentially be used.

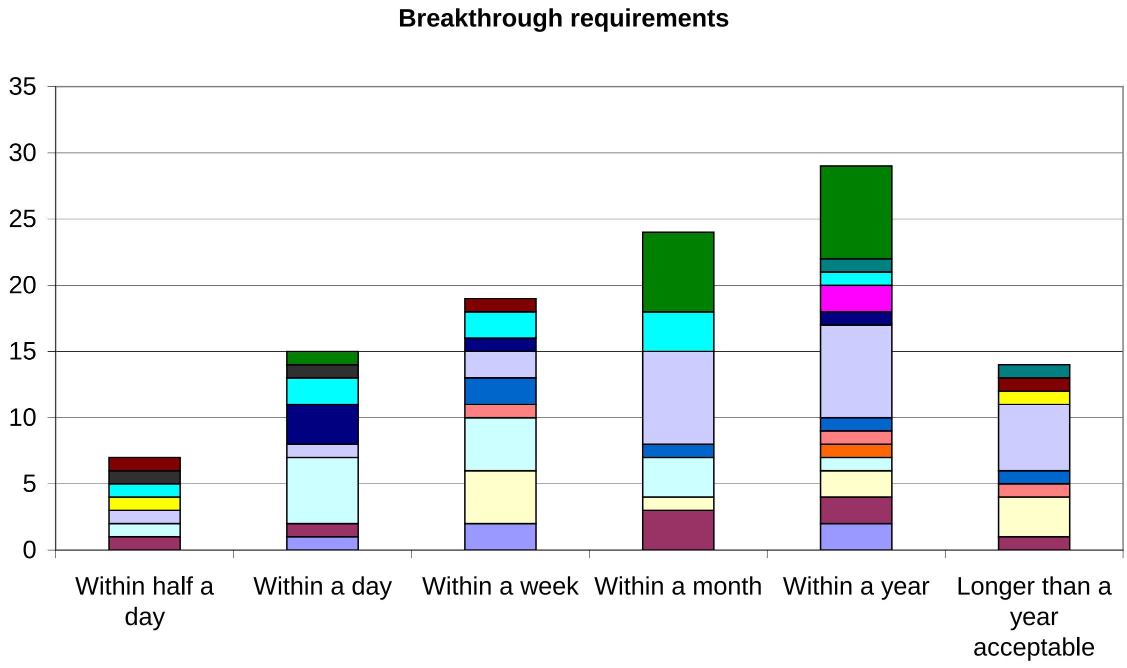
An illustration of how these requirements translate to start year for a data product, assuming it ends in December 2014, is shown in Table 3. The end date approximately corresponds to five years in the future, i.e. the date that respondents were asked to think ahead to when entering requirements. A continuous 30 year record is only available from the AVHRR series of sensors. For the mode of the threshold requirements (1 year) ATSR, AVHRR, TMI, AMSR-E and SEVIRI could all potentially be used. These conclusions assume that data records from current sensors will continue.

SST_CCI-UR-QUF-43	The most common response at the threshold requirement level is for temporal coverage of one year (24% of responses). However, temporal coverage of 10 years and >30 years received almost as many responses (22% and 21% respectively). At the breakthrough and objective requirements levels there is a clear requirement for data records longer than 30 years.

4.3.2.12 Speed of data delivery

In this question, respondents were asked the acceptable time between data being recorded and when they received them.





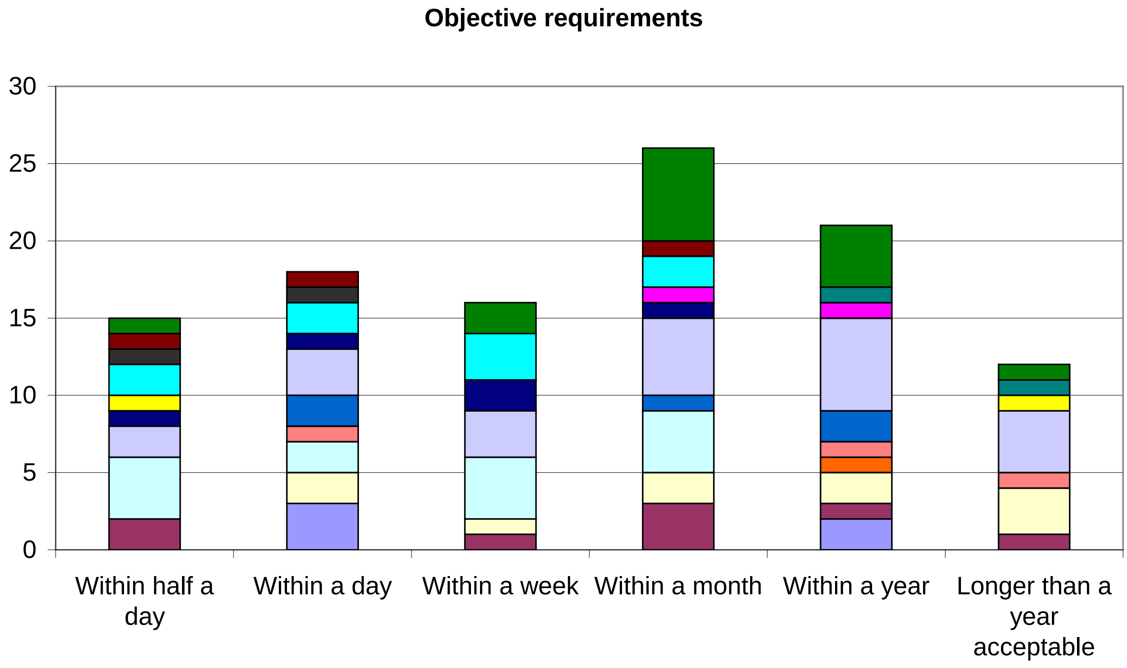


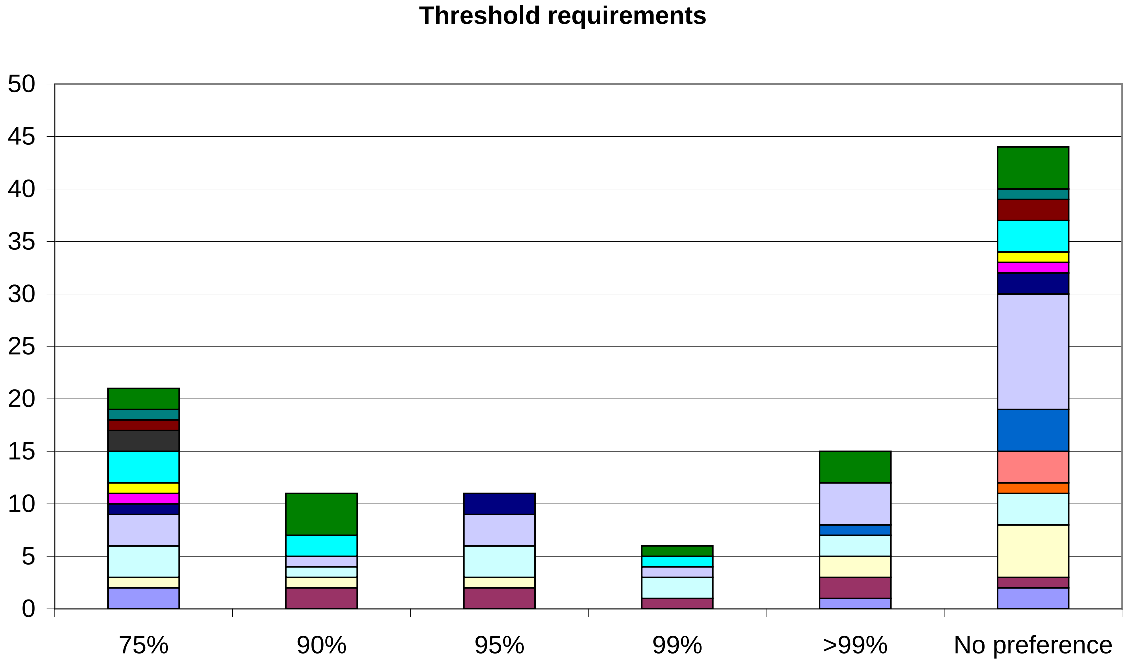
Figure 22. Acceptable delay between data being recorded and delivery.

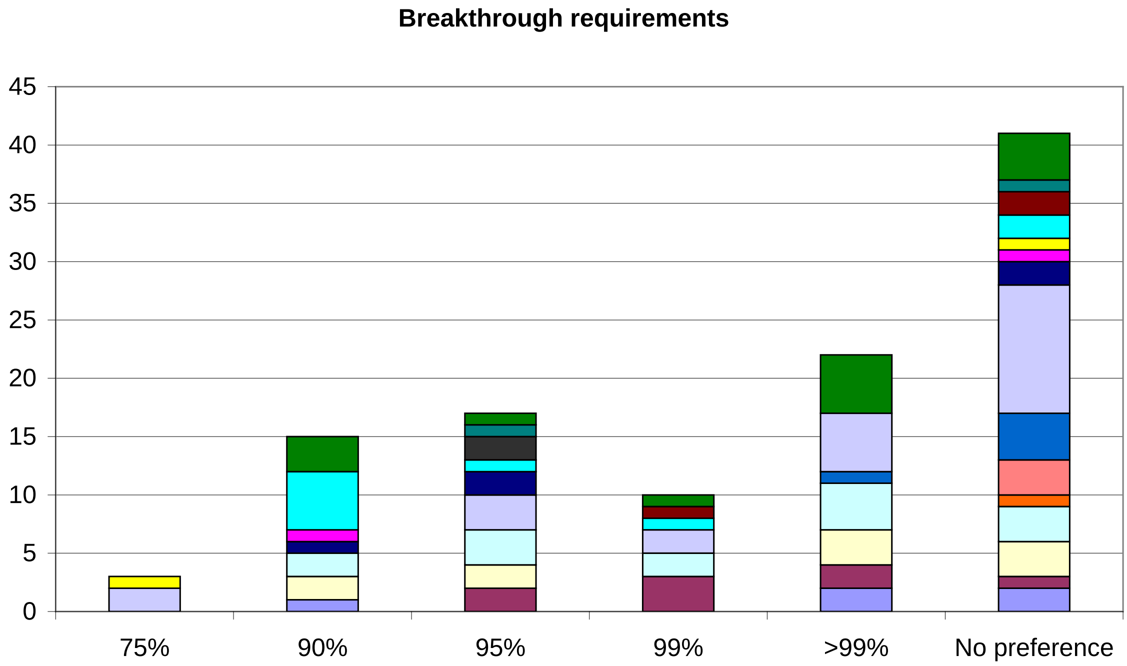
The results, shown in Figure 22, show that the threshold requirements for many applications do not have tight data delivery requirements. At the breakthrough level the distribution of responses peaks at delivery within a year, and at within a month for the objective level. Again, there was a wide range of responses. High latitude modelling has the tightest requirements for data delivery (delivery within a week, even at the threshold level), while applications in the cloud category have the loosest requirements (delivery within a year).

SST_CCI-UR-QUF-44	The most common requirements for timeliness of data delivery were "longer than a year acceptable" (threshold), "within a year" (breakthrough) and "within a month" (objective).	However, some users have much tighter requirements and need data as quickly as within half a day.

4.3.2.13 Reliability of data delivery

Respondents were asked how reliable the delivery of data needs to be.





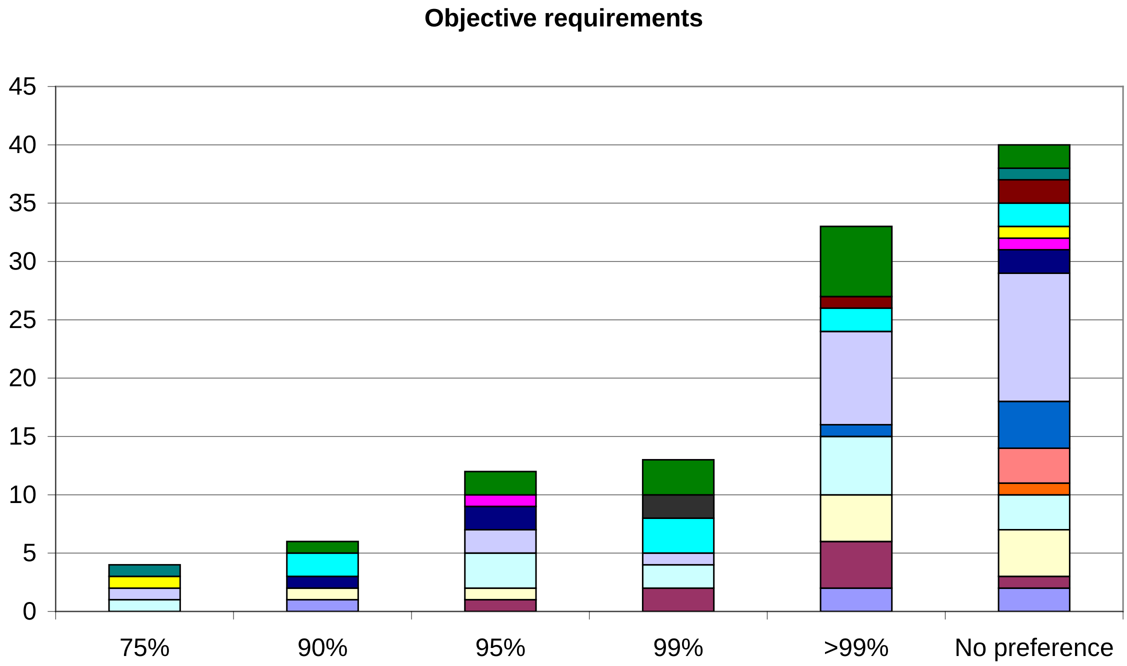


Figure 23. Requirements for reliability of data delivery.

Many users expressed no preference (Figure 23). Of those who did have a preference a range of responses were received. At the threshold level the most common response was for 75% data delivery reliability (the lowest reliability option that was provided) and at the breakthrough and objective levels it was for >99% reliability.

SST_CCI-UR-QUF-45	Where a preference was specified, the most common requirements for reliability of data delivery were 75% (threshold) and >99% (breakthrough and objective).

4.3.2.14 Depth that SSTs should correspond to

Users were queried about what depth the SST_cci products should correspond to. This question was motivated by the fact that there are a number of different definitions of SST. One of these is SSTfnd, which is defined as the SST free of diurnal variability i.e. the temperature at the first time of day when heat gained from solar absorption exceeds the surface heat loss. Users were first asked if this concept was relevant to their applications. The 'yes' answer received slightly more responses than 'no' (Figure 24). When answers were divided by application category the answers were also split, with only the high latitude modelling category giving a clear 'yes' and clouds 'no'. It is also notable that this interest in SSTfnd is, with this definition, somewhat contradicted by the preference of many respondents for SSTs on universal rather than local times.

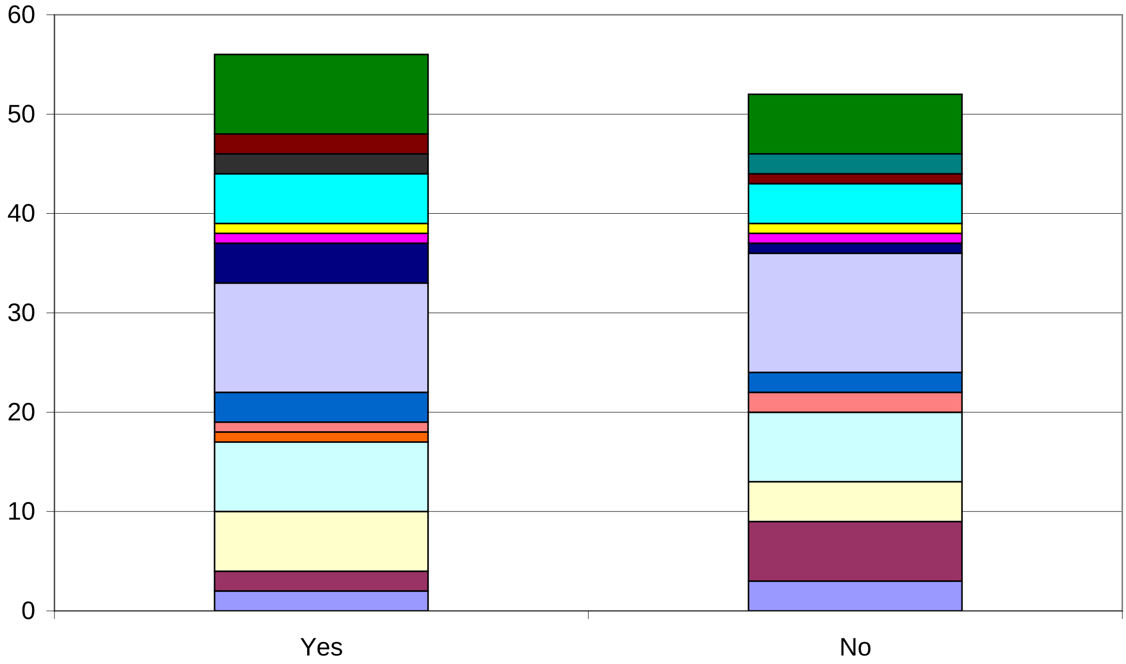


Figure 24. Responses to the question: is SSTfnd relevant to you application?

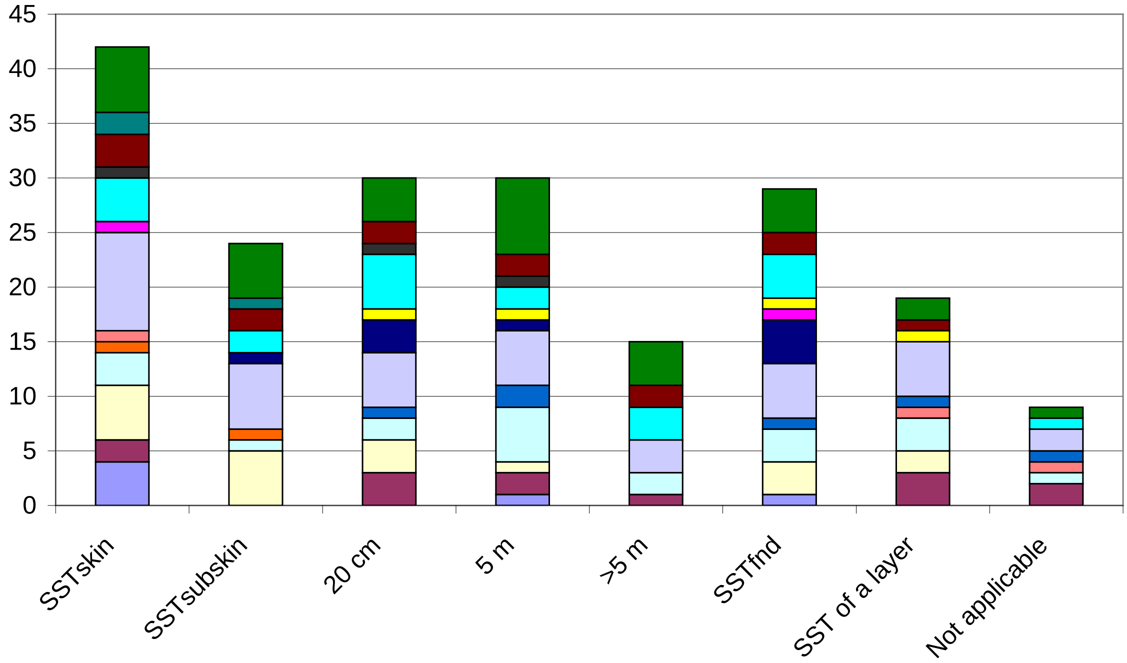


Figure 25. Depths that SSTs should correspond to.

Respondents were then queried about the depth of SST that was most useful for their applications. A range of responses were received, as shown in Figure 25. Even within application categories there were no clear preferences. Overall, SSTskin, which is the depth sensed by infrared satellite instruments, had the most responses.

SST_CCI-UR-QUF-46	SSTskin is the depth most commonly required by respondents, followed by SSTs at depths roughly corresponding to the range of traditional in situ observations (20 cm and 5 m).

4.3.2.15 Information provided in locations partially covered by sea ice

Respondents were asked what should be reported in locations where there is sea ice partly or completely covering the ocean. Responses are shown in Figure 26.

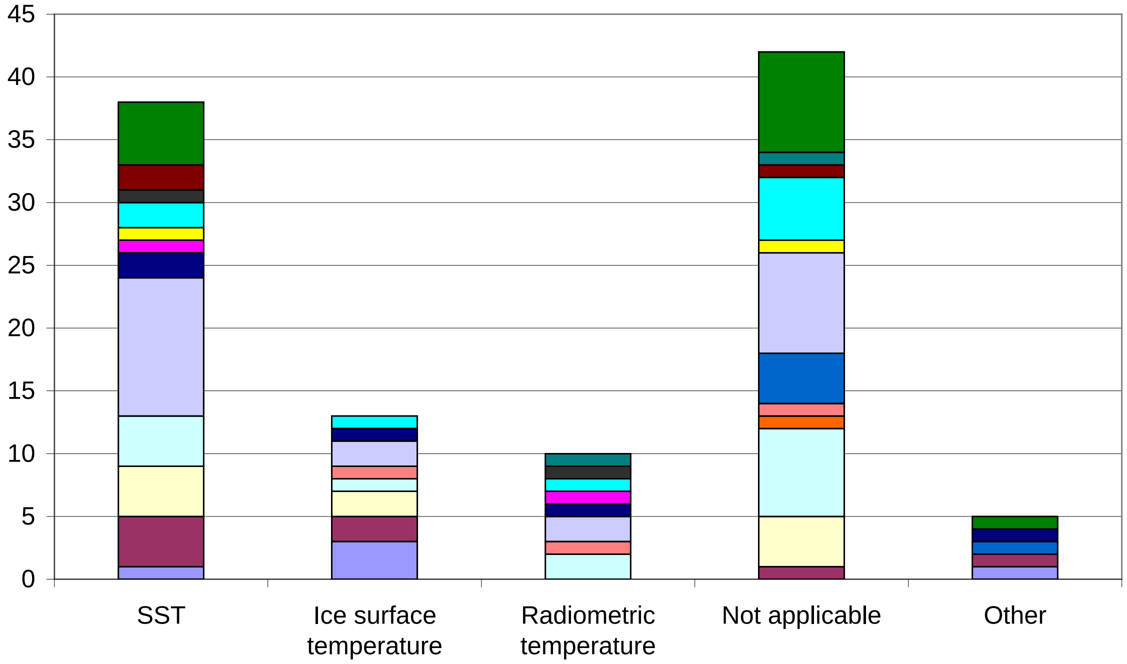


Figure 26. Responses to question about sea ice affected locations.

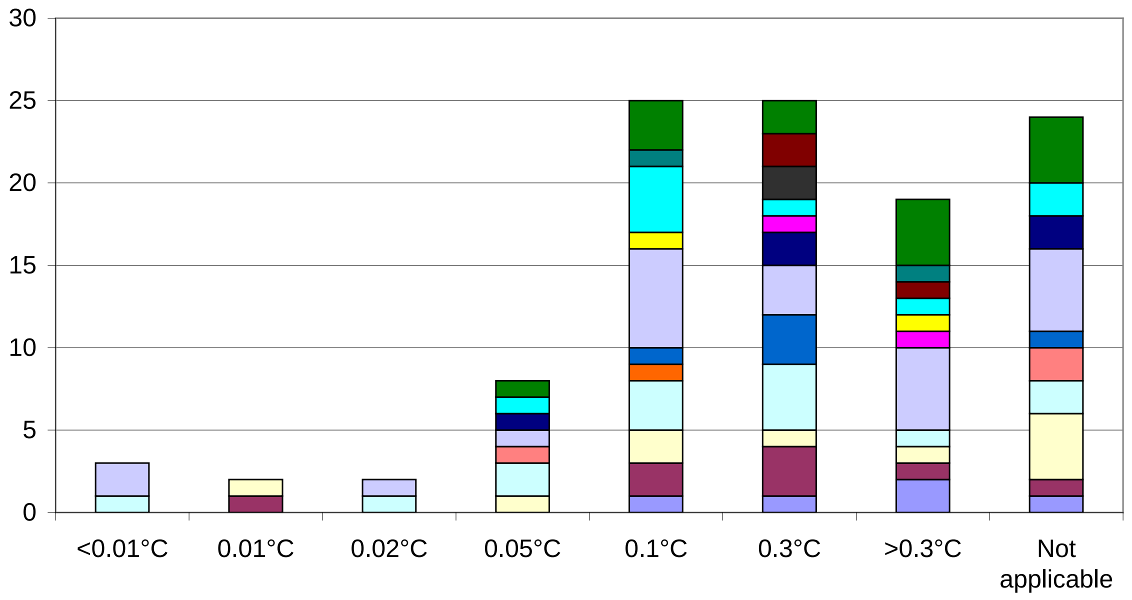
The most common response was 'not applicable'; of those expressing an opinion SST was the preferred choice. Suggestions under 'Other' were air temperature above the ice, ice fraction and providing all options.

SST_CCI-UR-QUF-47	Reporting of SST is most commonly required for sea-ice affected areas.	However, 38% of respondents expressing a requirement favoured either ice surface or radiometric temperature.

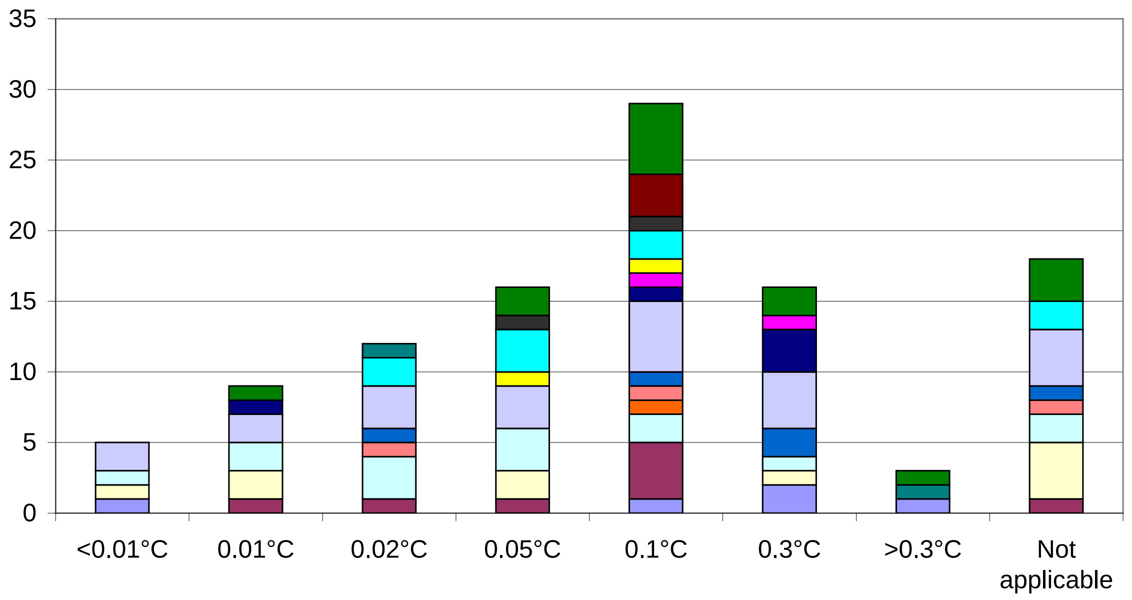
4.3.2.16 Acceptable levels of bias

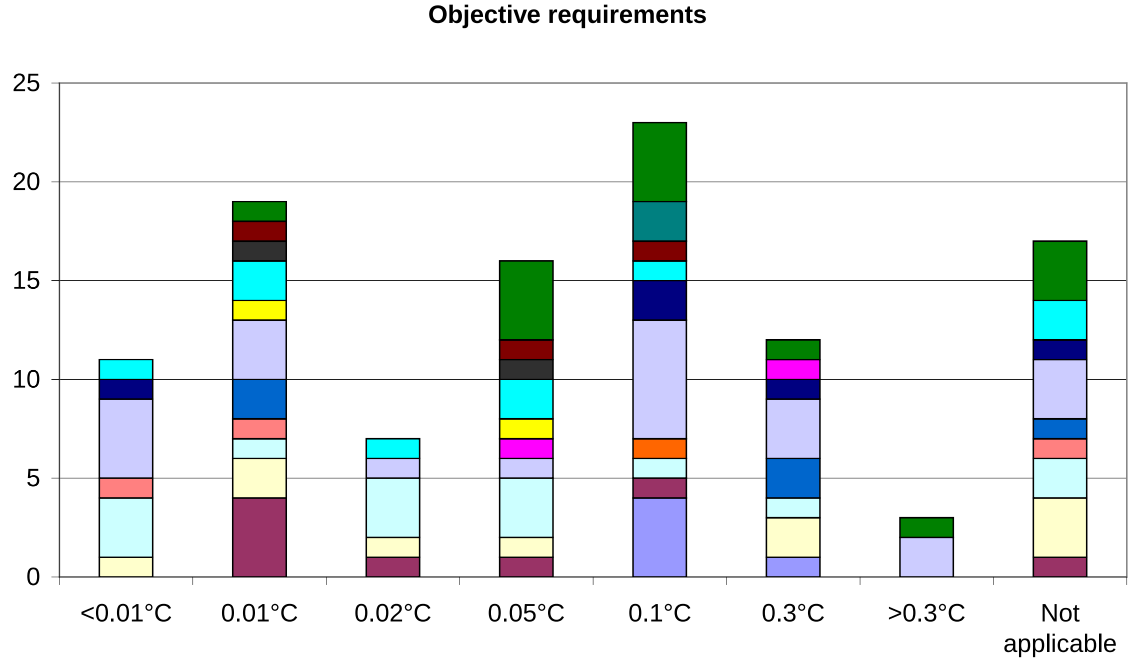
The respondents were asked for their requirements for the amount of bias (systematic errors) in the data that would be acceptable. As well as selecting a value for the bias, they were also asked to specify the spatial scale for which the achievement of this level of performance should be demonstrated. Results are shown in Figure 27.

Threshold requirements



Breakthrough requirements





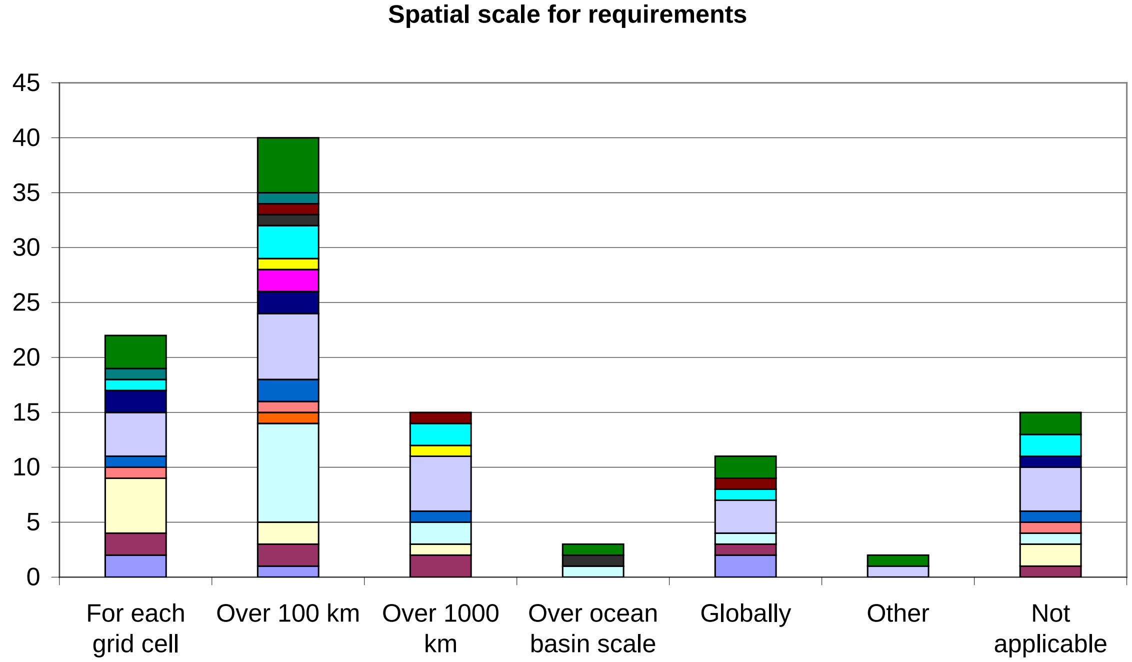


Figure 27. Requirements for amount of bias that is acceptable.

At the threshold level, requirements for acceptable bias were largely 0.1°C or greater. At breakthrough level, the peak response was 0.1°C. This was also the case at the objective level, but with a secondary peak at 0.01°C. The peak response for the spatial scale over which to demonstrate the achievement of this level of performance was 100 km. It is noted that availability of high quality in situ data will determine whether it is possible to demonstrate this at all times and locations.

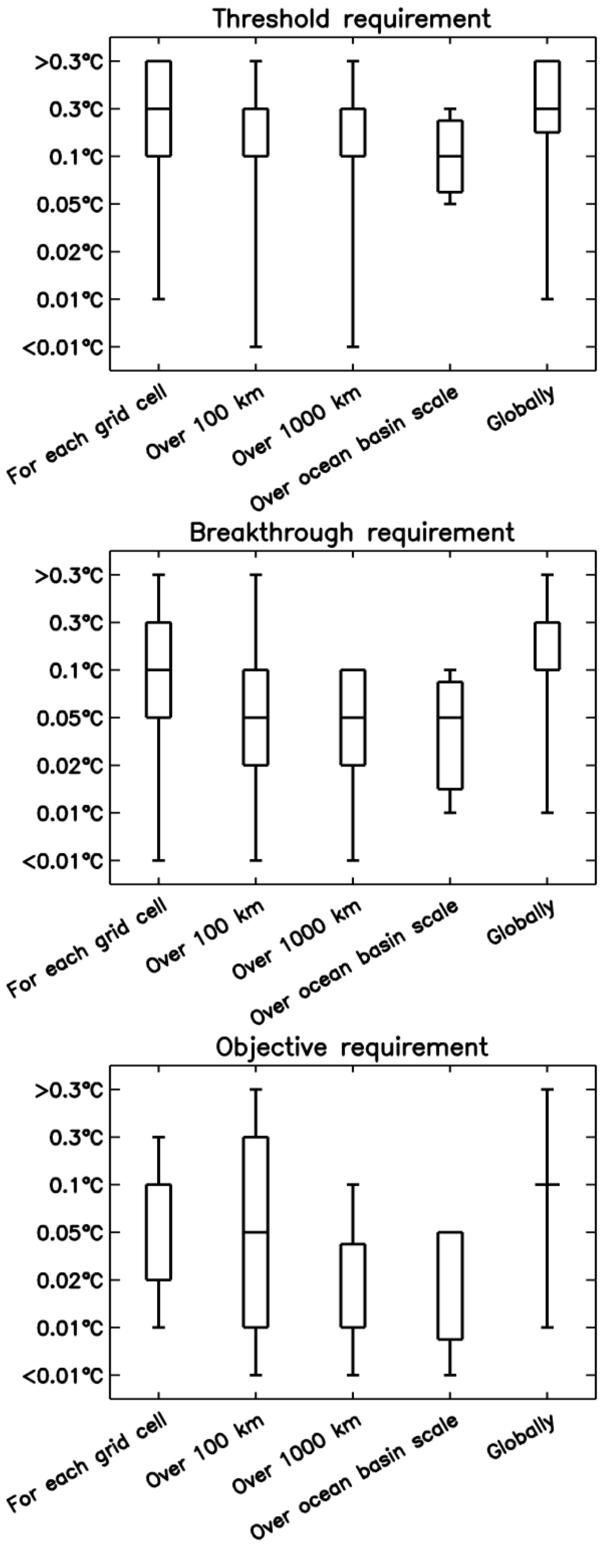


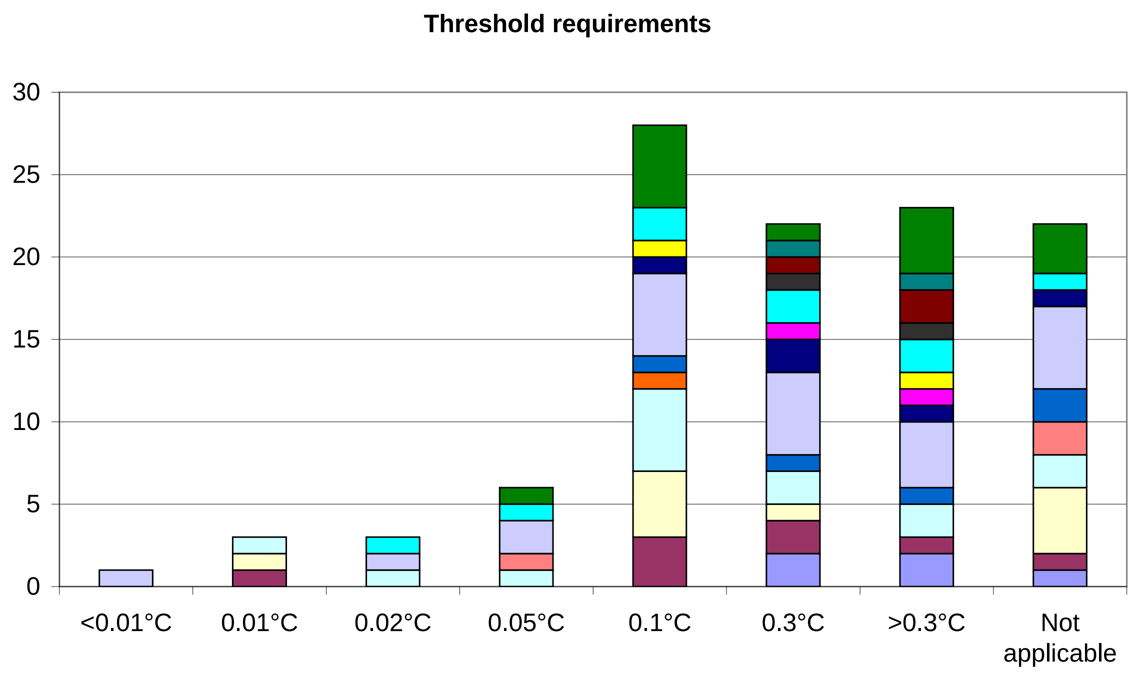
Figure 28. Plots showing the distribution of responses to the question about acceptable levels of bias, divided by the spatial scale over which this should be demonstrated. The boxes and the lines through the boxes show the 25th, 50th and 75th percentiles; the whiskers show the range of responses. Responses of 'Not applicable' or 'Other' are not shown.

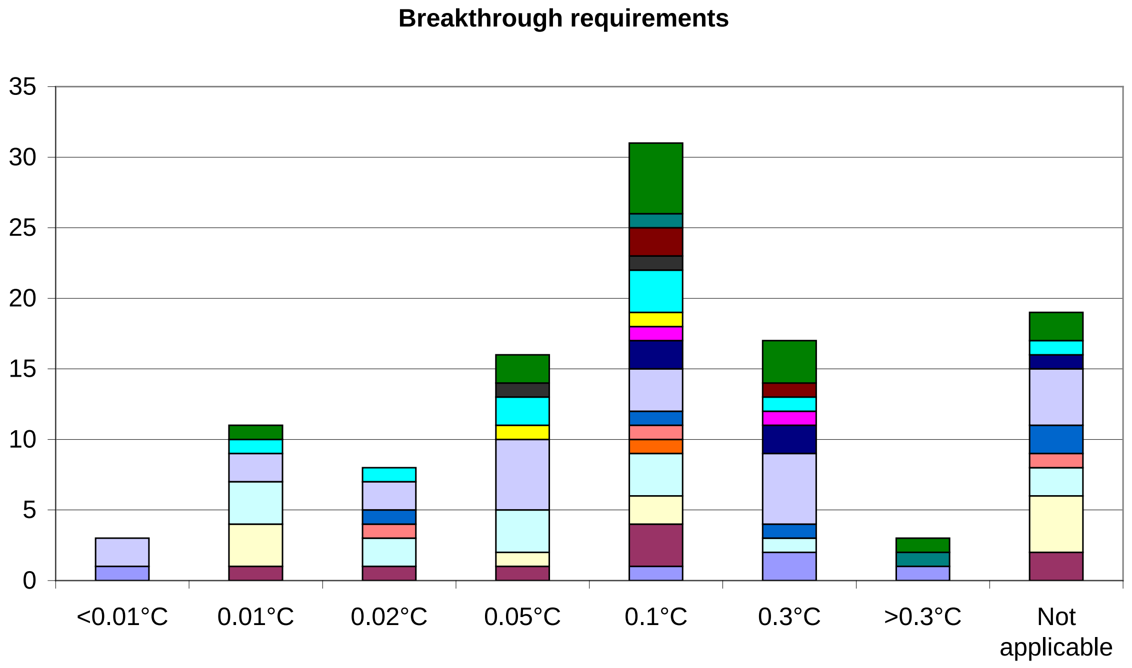
The relationship between the acceptable level of bias and the spatial scale selected by respondents is shown in Figure 28. There is an indication of more stringent requirements at larger spatial scales.

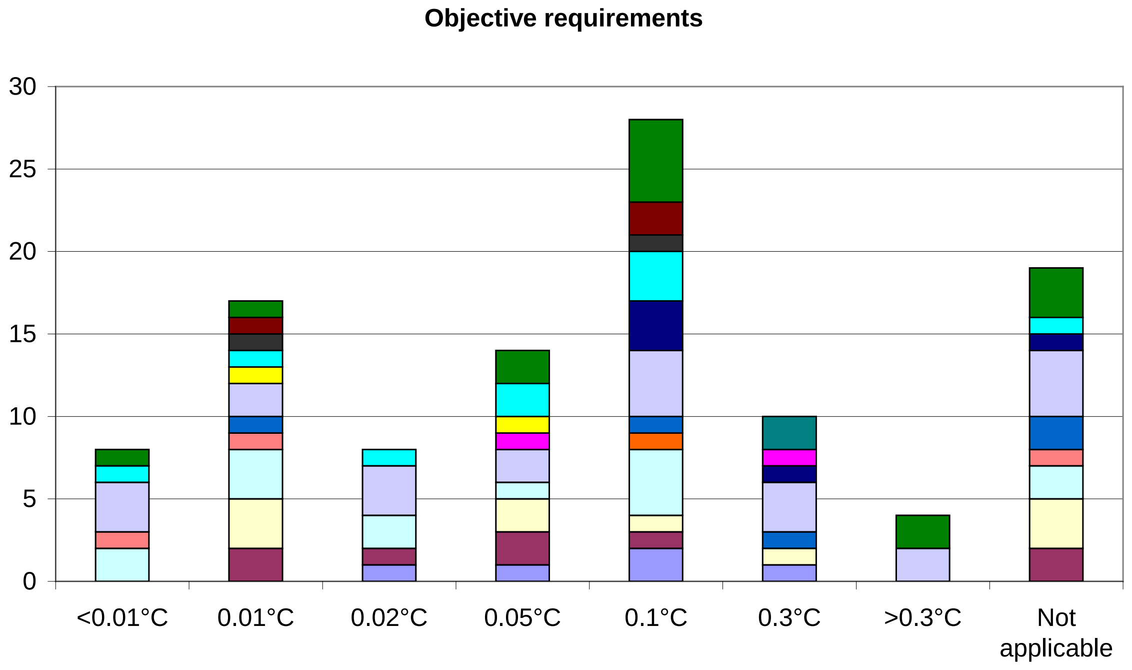
SST_CCI-UR-QUF-48	The most common acceptable levels of bias were 0.1 and 0.3°C (threshold), and 0.1°C (breakthrough and objective). The most common response was that the achievement of this should be demonstrated over a spatial scale of 100 km.

4.3.2.17 Required precision

Respondents were asked about the precision (the dispersion of random error) that is required for their application.




Breakthrough requirements
35
30
25
20
15
10
5
0
<0.01°C
0.01°C
0.02°C
0.05°C
0.1°C
0.3°C
>0.3°C
Not applicable


Objective requirements
30
25
20
15
10
5
0
<0.01°C
0.01°C
0.02°C
0.05°C
0.1°C
0.3°C
>0.3°C
Not applicable

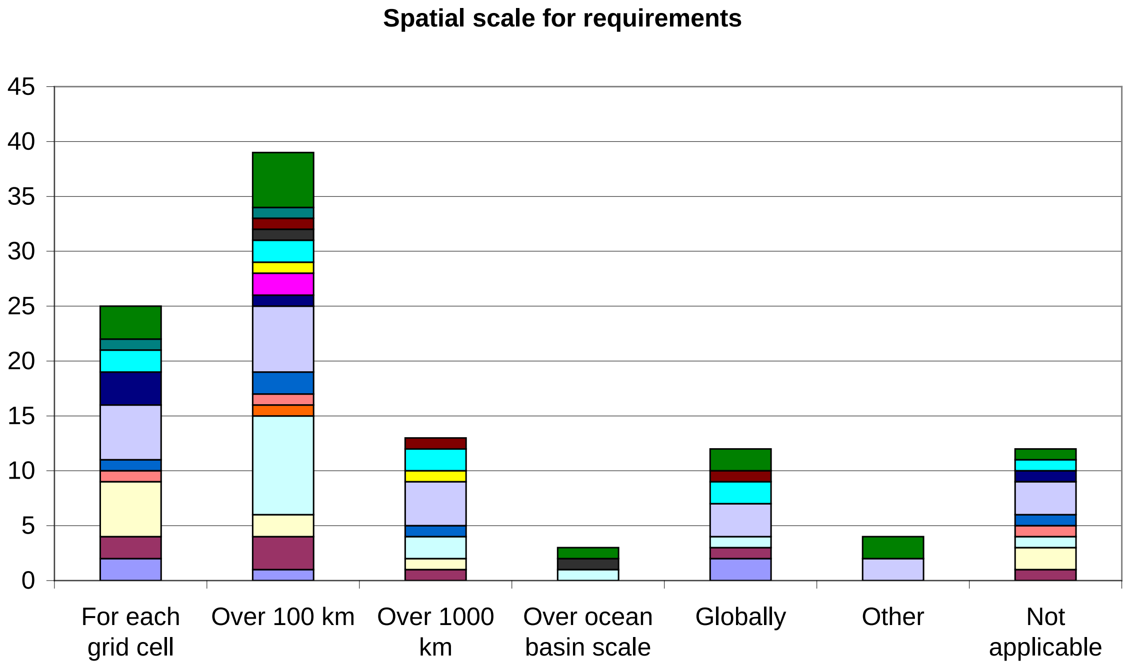


Figure 29. Requirements for precision.

The answers received (Figure 29) were very similar to those for bias and hence the conclusions are also similar. The relationship between the required precision and the spatial scale selected by respondents is shown in Figure 30. There is an indication of more stringent requirement with increasing spatial scale at the breakthrough level of requirement. At threshold and objective levels a relationship between the two is less clear.

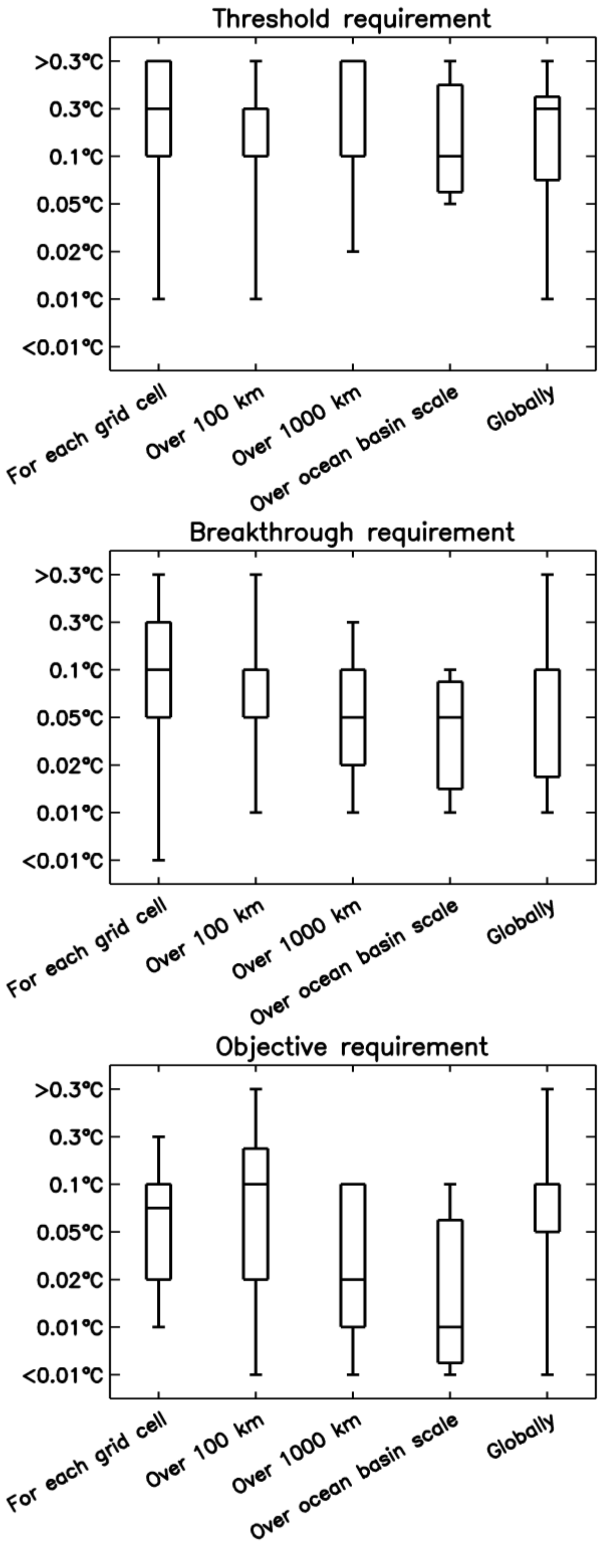
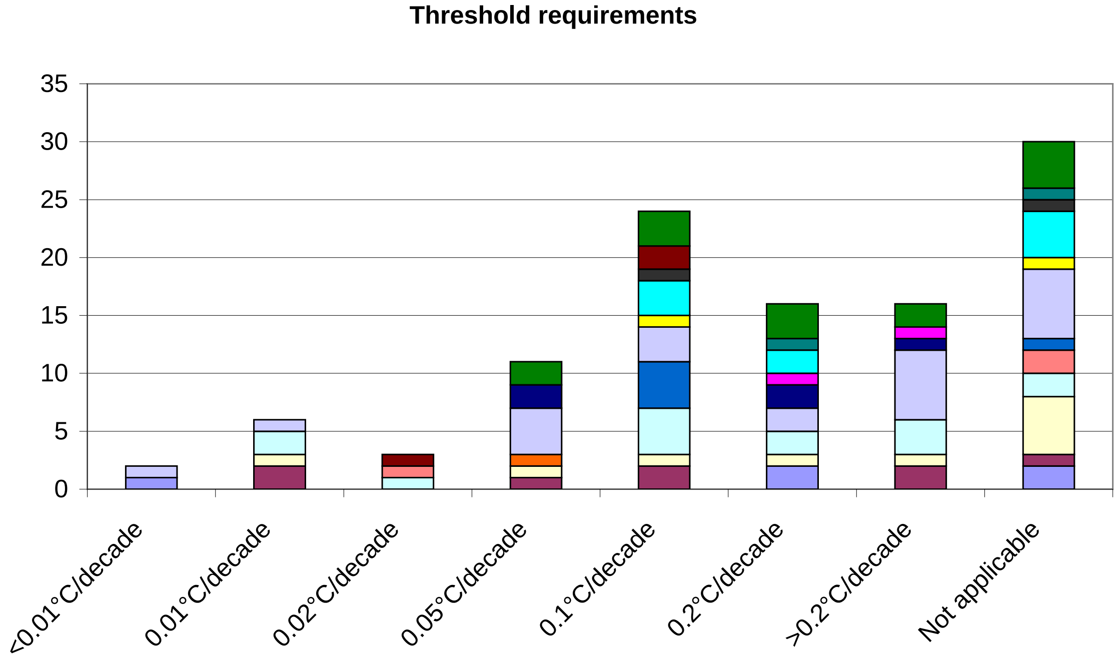


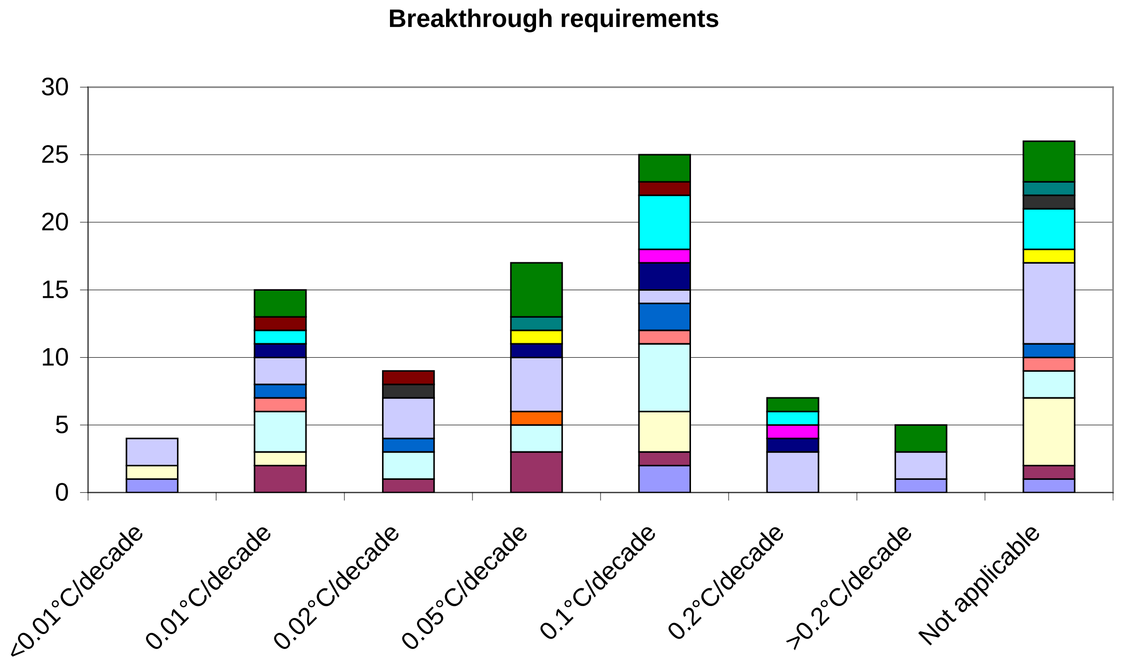
Figure 30. As Figure 28 but showing the distribution of responses to the question about required precision.

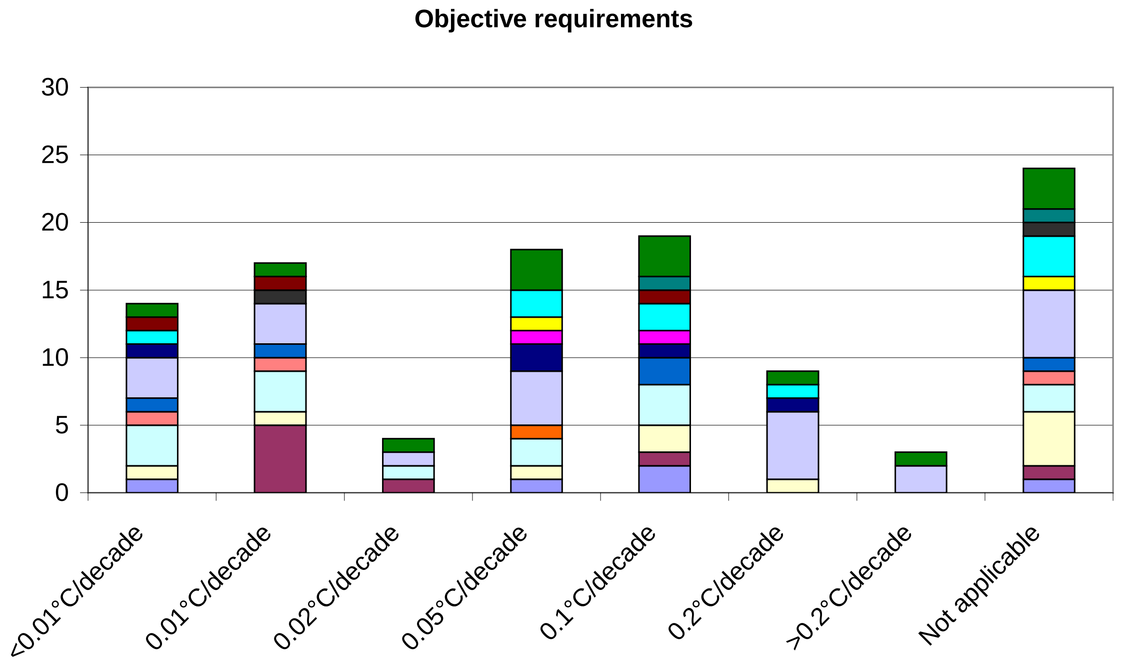
SST_CCI-UR-QUF-49	The most common response was that 0.1°C is the required precision and that the achievement of this should be demonstrated over a spatial scale of 100 km.

4.3.2.18 Acceptable levels of drift

This question asked for requirements for the acceptable amount of drift (change in bias over time) in the data. Results are in Figure 31.




Breakthrough requirements
30
25
20
15
10
5
0
<0.01°C/decade
0.01°C/decade
0.02°C/decade
0.05°C/decade
0.1°C/decade
0.2°C/decade
>0.2°C/decade
Not applicable


Objective requirements
30
25
20
15
10
5
0
<0.01°C/decade
0.01°C/decade
0.02°C/decade
0.05°C/decade
0.1°C/decade
0.2°C/decade
>0.2°C/decade
Not applicable

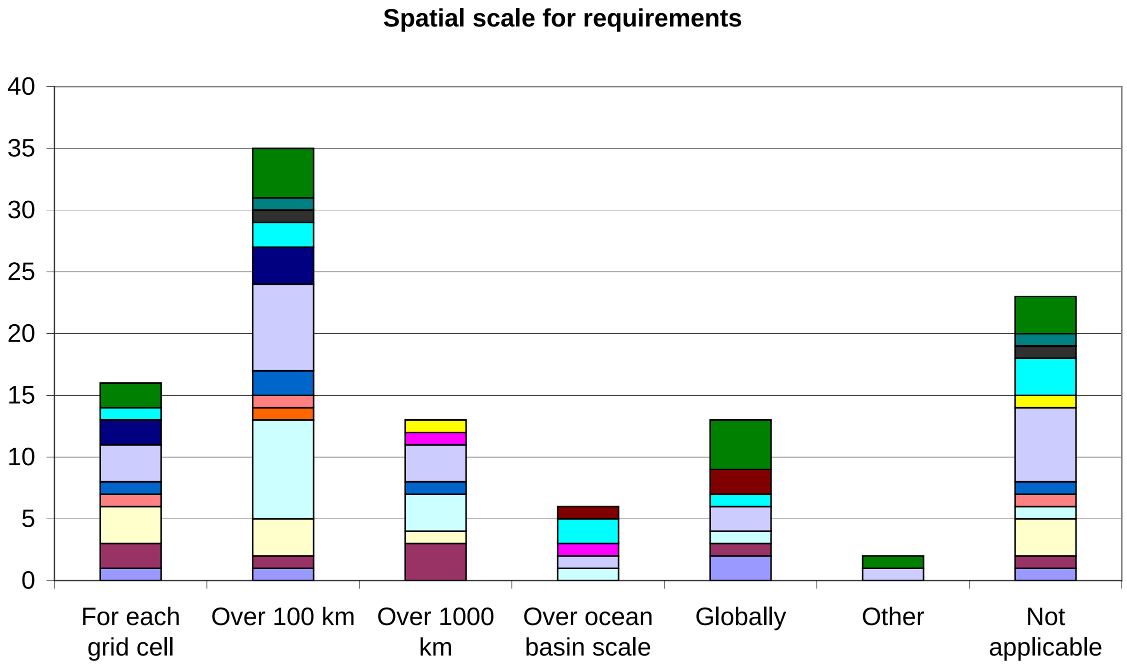


Figure 31. Requirements for the acceptable level of drift in the data.

Of those specifying a preference, at the threshold, breakthrough, and objective level, the most common requirement was for a drift of no more than 0.1°C per decade. However, there were some respondents who require very high stability of <0.01°C per decade. Again, the most common response was that the achievement of this should be demonstrated over a spatial scale of 100 km. As with the requirements for bias and precision, the demonstration of this will depend on the availability of high quality in situ data.

The relationship between acceptable level of drift and the spatial scale selected by respondents is shown in Figure 32. At threshold, breakthrough and objective requirement levels there is an indication that the lowest acceptable levels of drift have tended to be selected by respondents who chose 1000 km as the spatial scale.

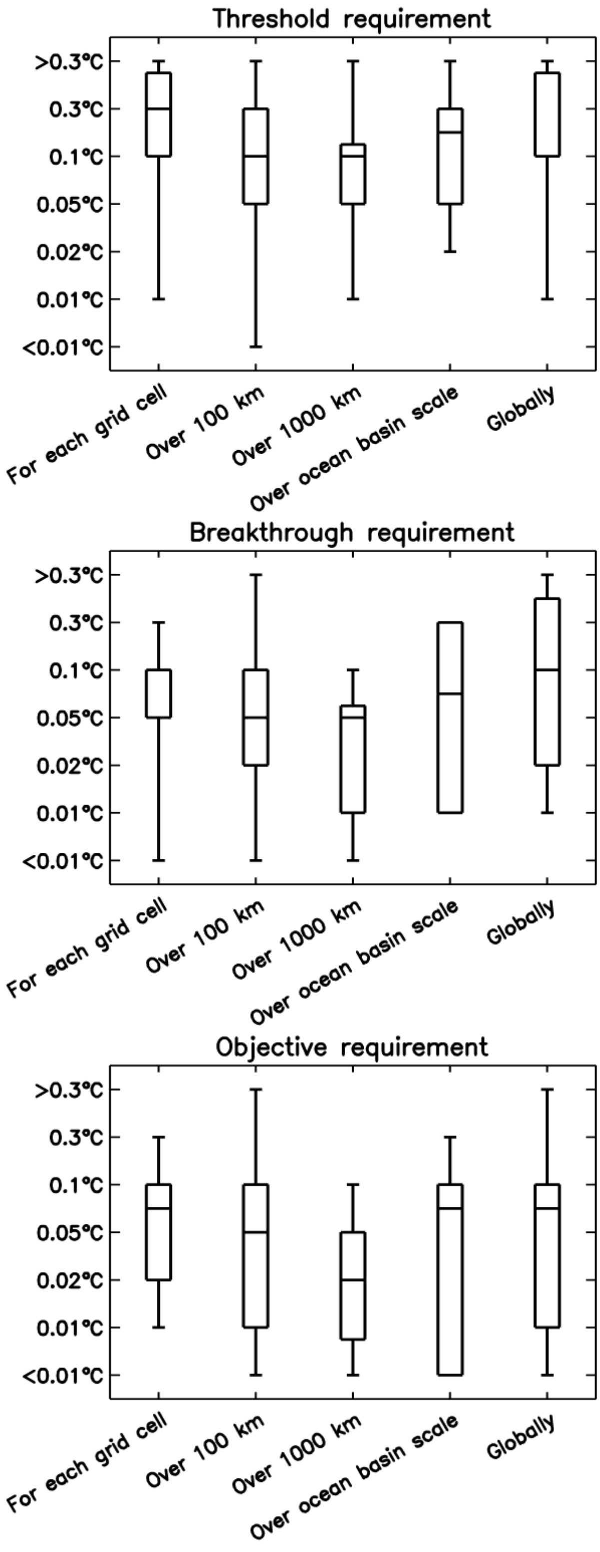


Figure 32. As Figure 28 but showing the distribution of responses to the question about acceptable level of drift.

SST_CCI-UR-QUF-50	At the threshold, breakthrough, and objective requirement levels, 0.1°C per decade was the most common response for the acceptable level of drift. The most common response for the spatial scale that the achievement of this should be demonstrated over was 100 km.	However, a significant number of users have stricter requirements, particularly at the breakthrough and objective levels.

4.3.2.19 Presentation of pseudo-random errors

This question enquired whether pseudo-random errors (errors that are correlated within synoptic scales and uncorrelated beyond) are an issue for the user's applications.

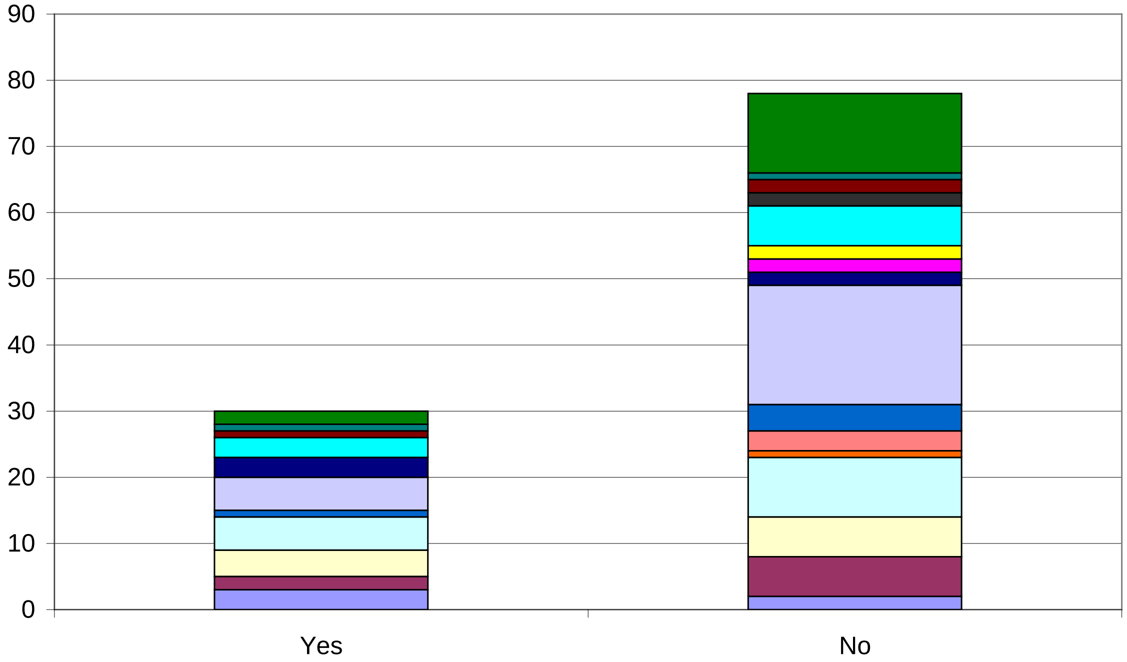


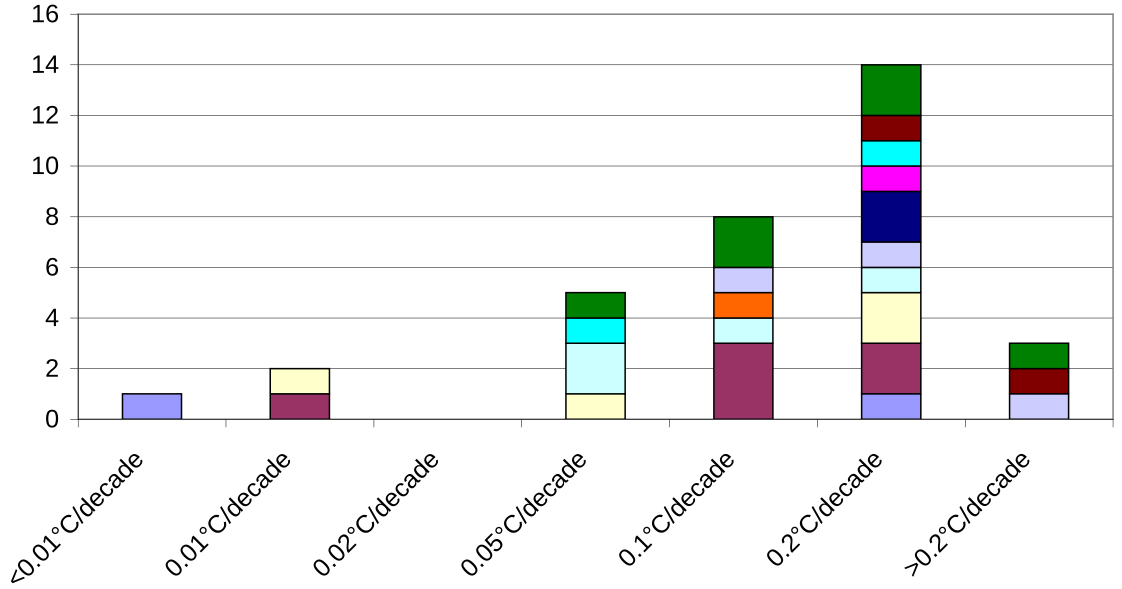
Figure 33. Result of question asking whether pseudo-random errors are an issue.

As shown in Figure 33, the most common response to this was 'no'. There were no application categories where pseudo-random errors were clearly an issue, as where there was a 'yes' response in a category, other responses were 'no'.

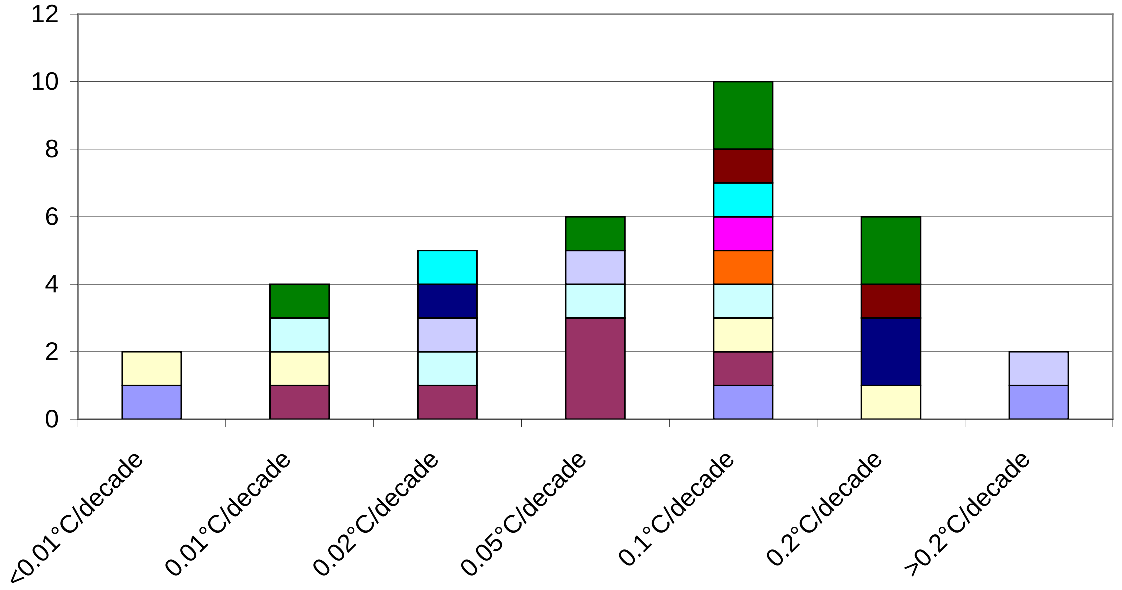
4.3.2.20 Acceptable change in bias between day and night SSTs

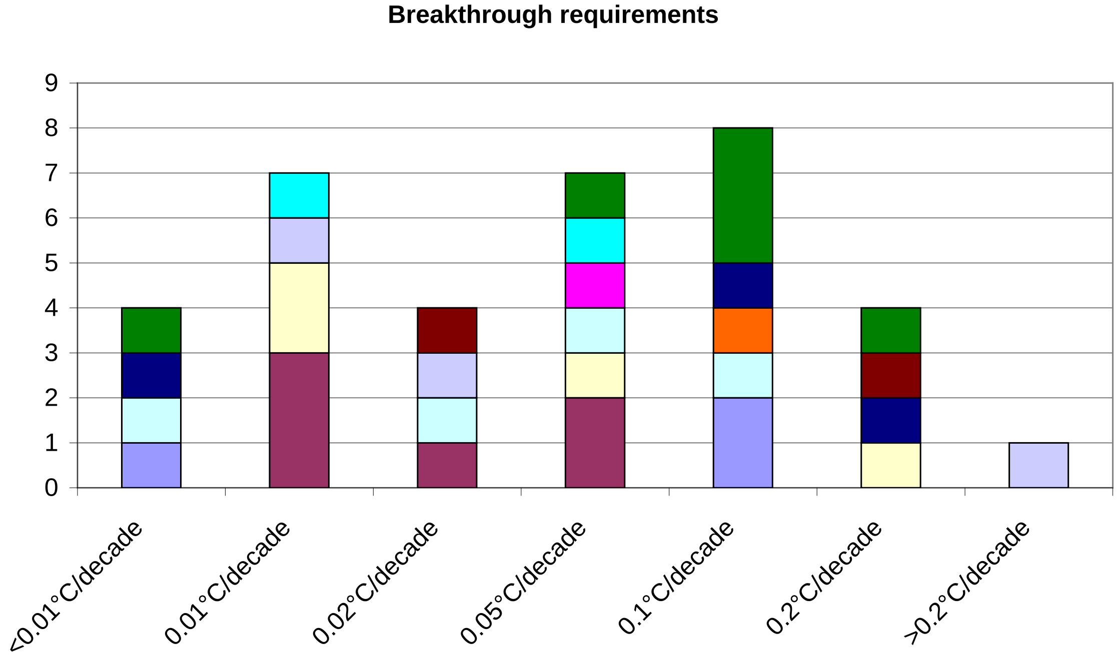
Respondents could optionally provide requirements for an acceptable change in relative bias between day and night SSTs. Figure 34 shows the results from those who entered requirements.

Threshold requirements



Breakthrough requirements





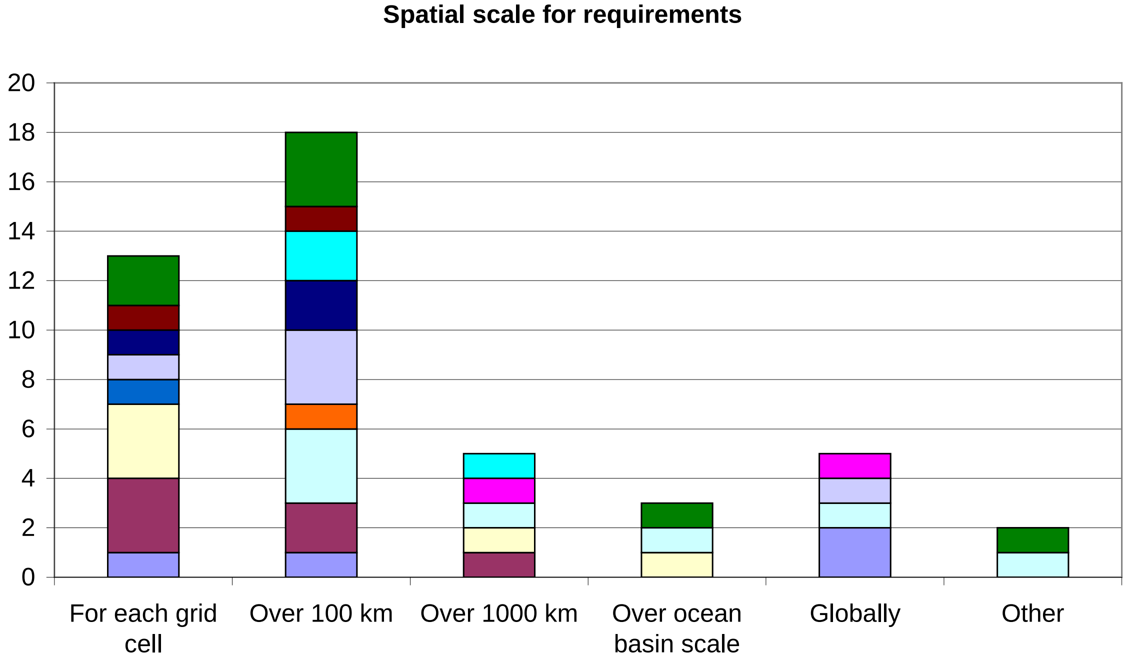


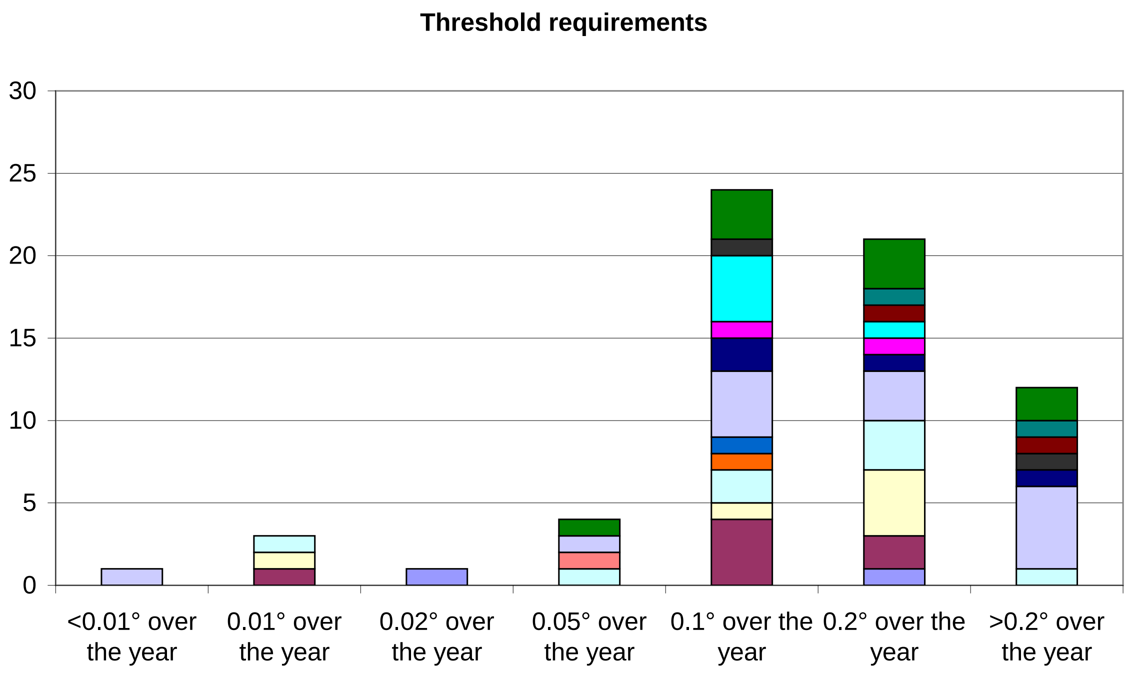
Figure 34. Requirements for drift in day-night differences.

At the threshold level, the peak response was for 0.2°C per decade. At the breakthrough and objective level the most responses were for 0.1°C per decade. However, some respondents have more stringent requirements, with some needing changes of less than 0.01°C per decade. The most common requirement was for the achievement of this to be demonstrated over a spatial scale of 100 km. As with the previous similar questions, demonstration of this will depend on availability of high quality data to compare to.

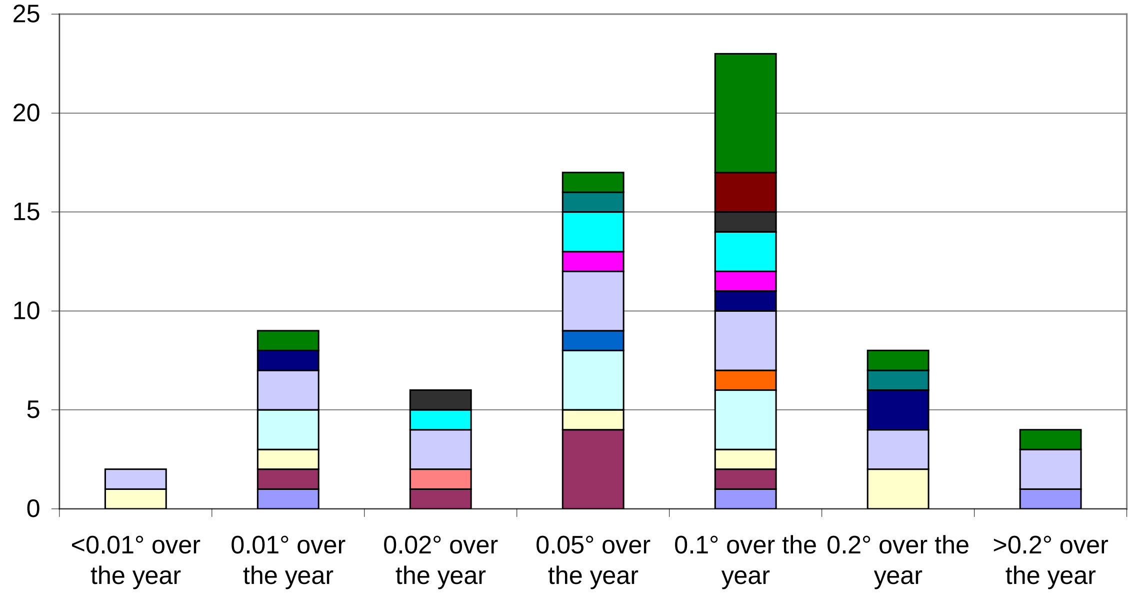
SST_CCI-UR-QUF-51	At the threshold, breakthrough and objective requirement levels, the most common response for the acceptable drift in relative bias between day and night SSTs was 0.1°C per decade. The most common requirement was that the achievement of this should be demonstrated over a spatial scale of 100 km.	However, many users have stricter requirements.

4.3.2.21 Acceptable change in bias over the annual cycle

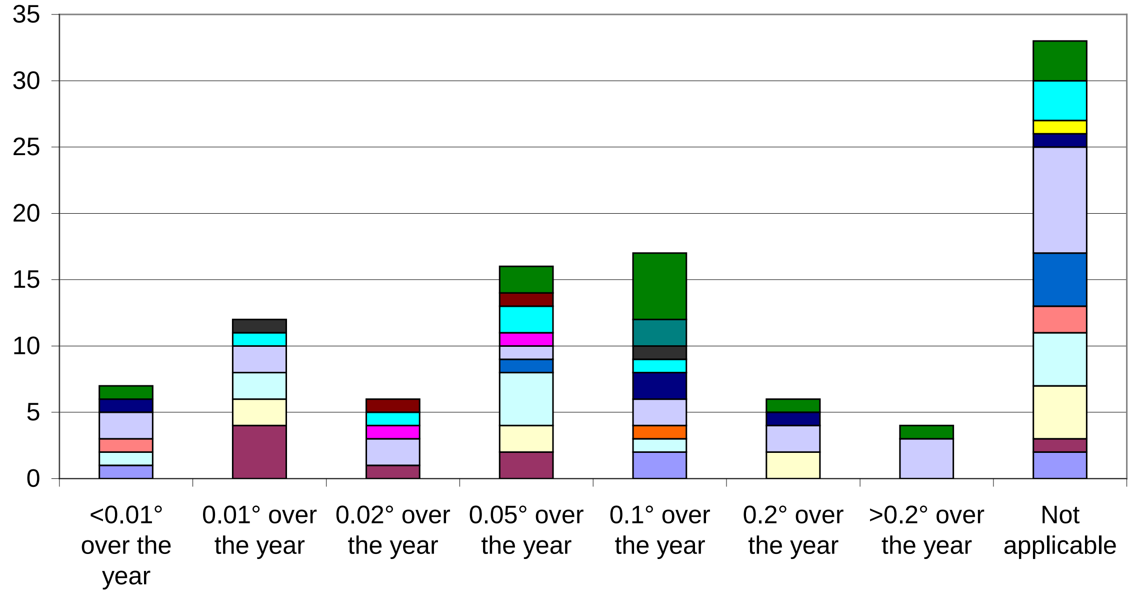
Respondents could also optionally provide requirements for an acceptable change in bias level over the annual cycle. Figure 35 shows the results from those who entered requirements.



Breakthrough requirements



Objective requirements



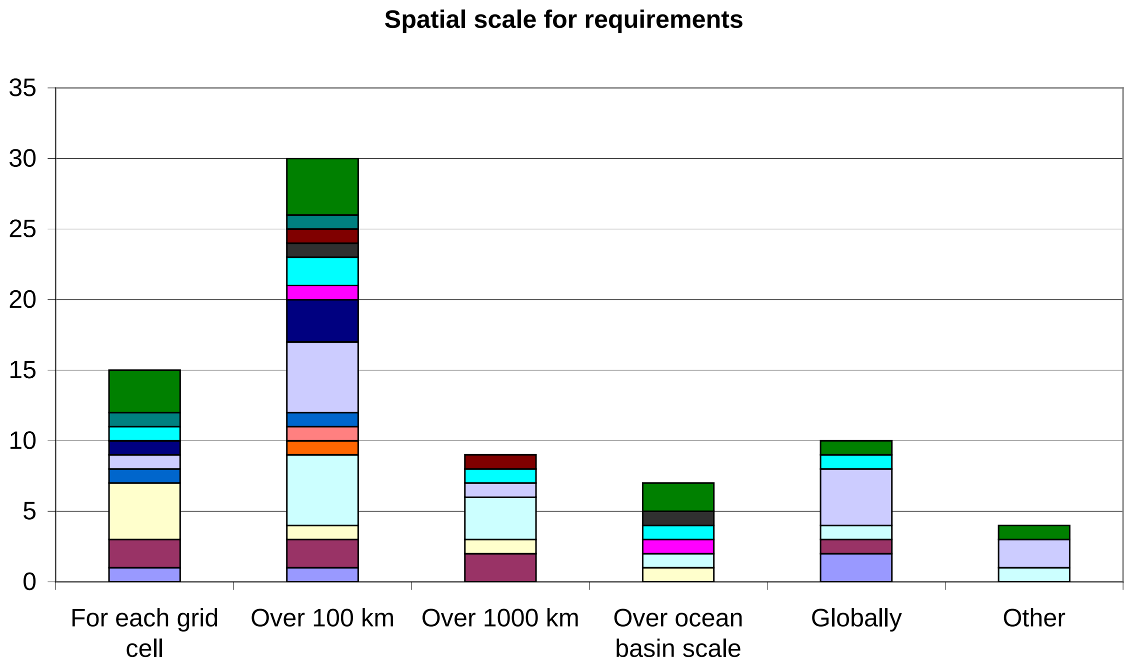


Figure 35. Requirements for an acceptable change in bias over the annual cycle.

Again, the most responses were for 0.1°C per decade and for the achievement of this to be demonstrated over a spatial scale of 100 km. It is noted again that demonstration of this will depend on availability of comparison data.

SST_CCI-UR-QUF-52	At all requirement levels, the most common response was that 0.1°C per decade is the acceptable change in bias over the annual cycle. The most common requirement was that the achievement of this should be demonstrated over a spatial scale of 100 km.

4.3.2.22 Uncertainty information

Figure 36 shows the responses to a question about how uncertainty information should be communicated.

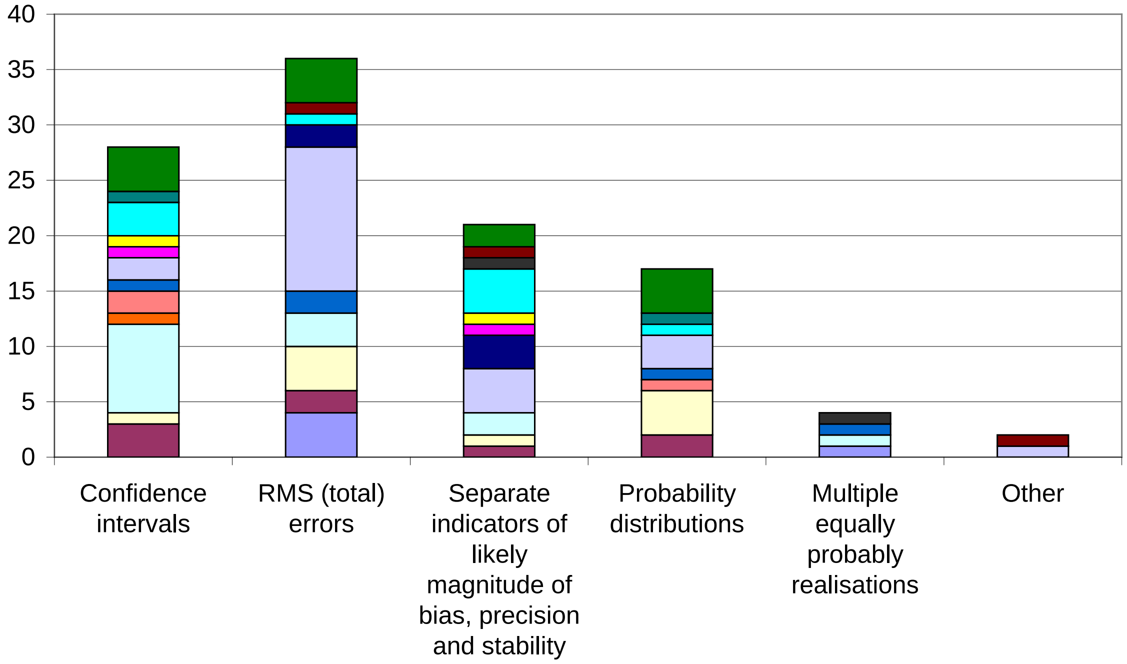


Figure 36. Preferences for how uncertainty information should be communicated.

Confidence intervals and root mean square (RMS) errors (i.e. total uncertainty) achieved the most responses, with the latter getting the most (33% compare to 26%). Separate indicators of likely magnitude of bias, precision and stability, and probability distributions (histograms showing the range and probability of SSTs) both also received a significant number of responses. There was little consistency in responses within application categories, indicating that even in a single research area there is no one way of communicating uncertainties that will suit everyone.

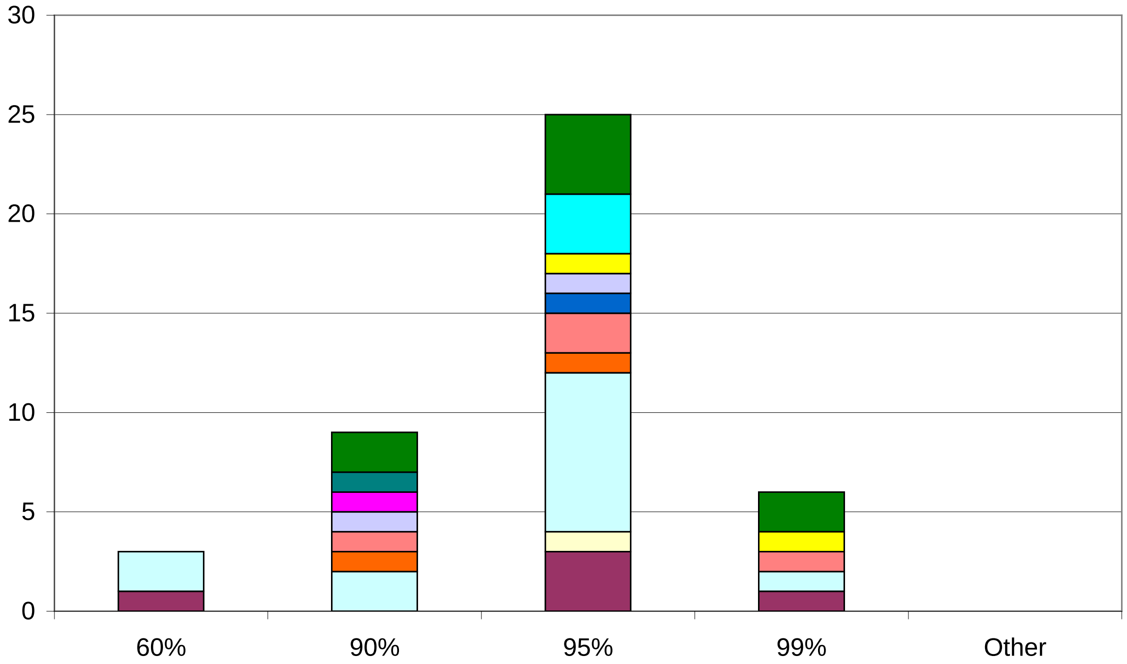


Figure 37. Confidence intervals that should be provided.

Where respondents chose confidence intervals they were also asked the size of confidence intervals to provide. As shown in Figure 37, there was a clear preference for 95% confidence interval.

Figure 38 shows responses to the question 'Would information about the correlation structure of uncertainties be useful for your application?'.

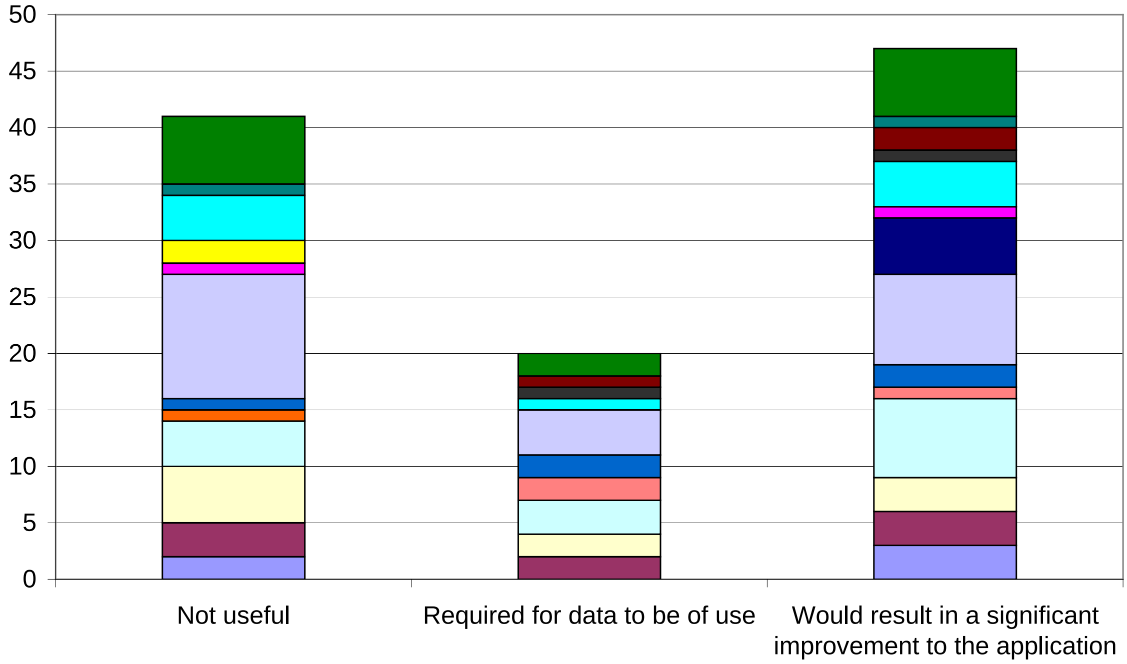


Figure 38. How information about correlation structure would impact on use of products in applications.

The majority of responses were that these would either result in a significant improvement to the application or are required for the data to be of use. Again, there was generally a variety of responses even within an application area.

SST_CCI-UR-QUF-53	An estimate of total uncertainty (root mean square of the total error distribution) is most commonly required by respondents.	Chosen by 33% of respondents.
SST_CCI-UR-QUF-54	Confidence intervals were also required by a significant number of respondents. Where confidence intervals are provided, there is a clear preference for the 95% confidence interval.	Confidence intervals were chosen of 26%.
SST_CCI-UR-QUF-55	Separate indicators of likely magnitude of bias, precision and stability are required by many respondents.	Chosen by 19%.

SST_CCI-UR-QUF-56	Uncertainty information in the form of probability distributions are required by many.	16% of respondents chose this option.
SST_CCI-UR-QUF-57	Information about the correlation structure of errors is essential or desirable for most respondents.	

4.3.2.23 Use of in situ data to verify the SST_cci data

This question was aimed at determining if there were any sources of in situ data that should not be used to verify the SST_cci products. The results are shown in Figure 39. This plot shows only overall responses; full results separated by application category are also available but not shown here. The vast majority of responses were to either use each of the in situ datasets or that there was no preference.

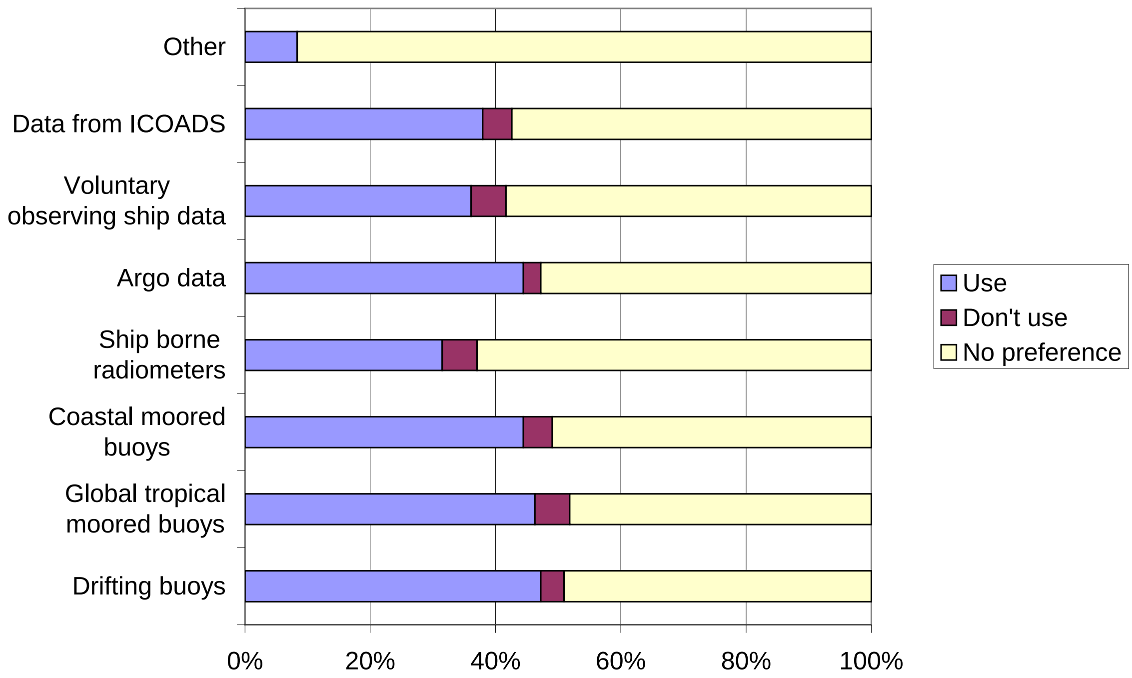


Figure 39. Preferences for which in situ data to be used to verify the CCI data.

4.3.2.24 Communication of quality information

Figure 40 shows preferences for how quality information should be communicated.

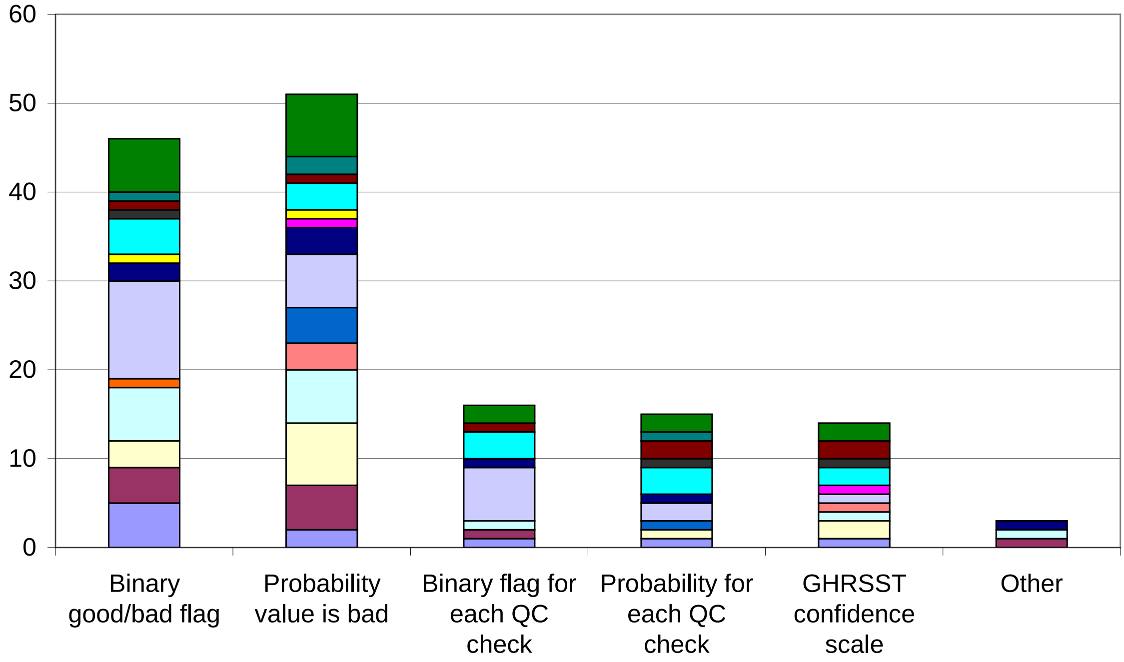


Figure 40. Preferences for how quality information should be communicated.

A roughly equal number of respondents chose to either have a binary good/bad flag for each SST value or to have a value for each SST to say the probability that it is bad. Other options, such as providing information about the quality control checks that had been failed, received fewer responses.

SST_CCI-UR-QUF-58	Quality information is needed for each SST value that is simple to use.	For example a single field indicating "good/bad" or the overall probability that a value is bad.

4.3.2.25 Other information to be provided in the data files

Respondents were asked what other information should be provided within the data files. The results are shown in Figure 41.

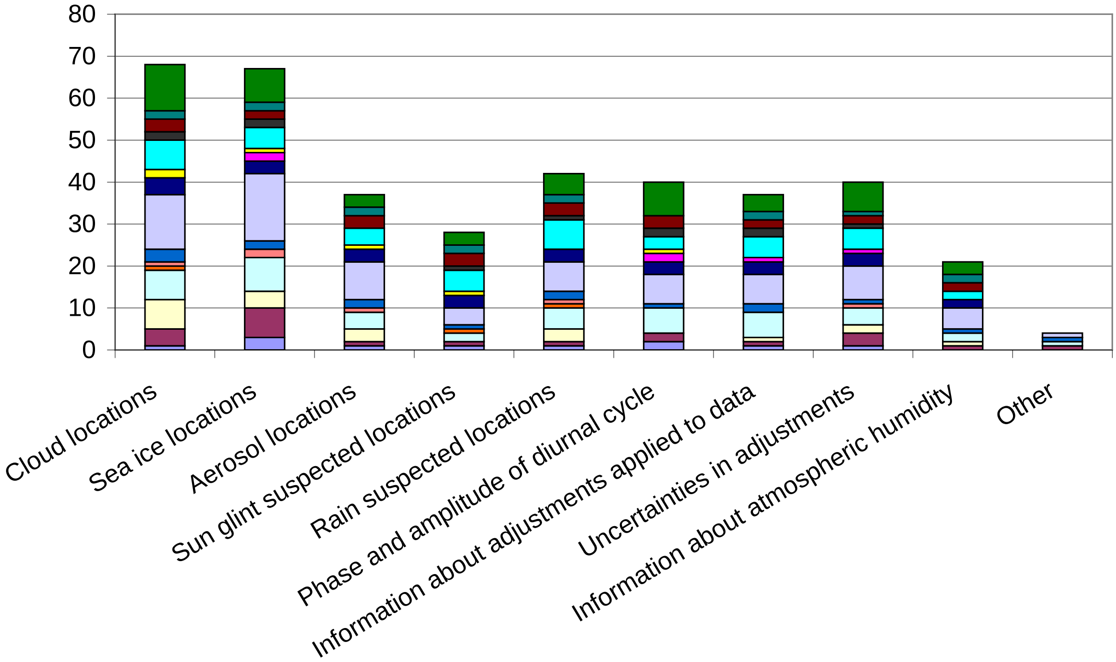


Figure 41. Additional information that should be provided in data files.

All the suggested information was of interest to some respondents. Information about cloud and sea ice locations were most commonly selected. However, all the options received a significant number of responses. Additionally, the number of pieces of information used to estimate the SST value was suggested as worthy of inclusion.

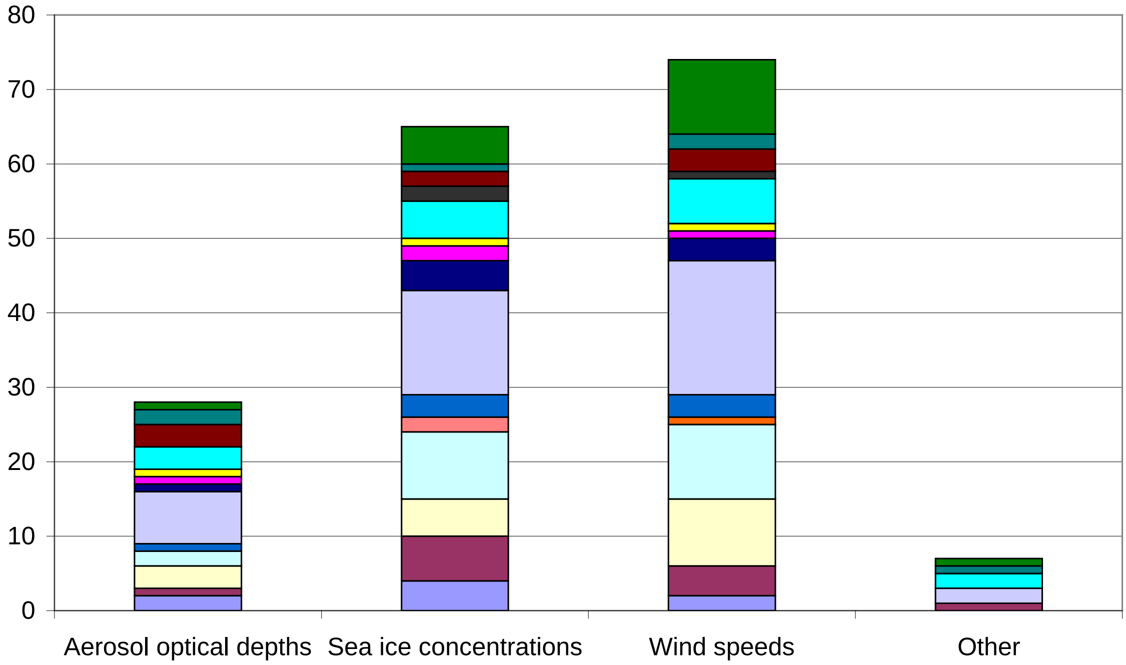


Figure 42. Preferences for what ancillary data to provide.

Respondents were also asked if they would like ancillary data to be provided, i.e. extra data that would compliment the SSTs. The results (Figure 42) demonstrate that all options provided (aerosol optical depth, sea ice concentration and wind speed) would be valuable to at least some respondents. Heat flux components, irradiance, cloud properties, amount of rain and fraction of land in a grid cell were also suggested.

Requirements for other information to be provided in the data files:

SST_CCI-UR-QUF-59	Provision of locations of clouds.	Required by 63% of respondents.
SST_CCI-UR-QUF-60	Provision of locations of sea ice locations.	Required by 62% of respondents.
SST_CCI-UR-QUF-61	Provisions of aerosol locations.	Required by 34% of respondents.
SST_CCI-UR-QUF-62	Provision of sun glint suspected locations	Required by 26% of respondents.
SST_CCI-UR-QUF-63	Provision of rain suspected locations	Required by 39% of respondents.
SST_CCI-UR-QUF-64	Provision of the phase and amplitude of diurnal cycle	Required by 37% of respondents.
SST_CCI-UR-QUF-65	Provision of information about adjustments applied to data	Required by 34% of respondents.
SST_CCI-UR-QUF-66	Provision of uncertainties in adjustments	Required by 37% of respondents.
SST_CCI-UR-QUF-67	Provision of information about atmospheric humidity	Required by 19% of respondents.
SST_CCI-UR-QUF-68	Provision of the number of pieces of information used to estimate each SST in the data files.	Suggested by one respondent.
SST_CCI-UR-QUF-69	Provision of sea ice concentration ancillary data.	Required by 60% of respondents.
SST_CCI-UR-QUF-70	Provision of wind speed ancillary data.	Required by 69% of respondents.
SST_CCI-UR-QUF-71	Provision of aerosol optical depth ancillary data.	Required by 26% of respondents.
SST_CCI-UR-QUF-72	Provision of heat flux components ancillary data.	Suggested by one respondent.
SST_CCI-UR-QUF-73	Provision of irradiance ancillary data.	Suggested by one respondent.
SST_CCI-UR-QUF-74	Provision of cloud property ancillary data.	Suggested by three respondents.

SST_CCI-UR-QUF-75	Provision of precipitation/rain quantity ancillary data.	Suggested by two respondents.
SST_CCI-UR-QUF-76	Provision of ancillary data that gives the fraction of land in a grid cell.	Suggested by one respondent.

4.3.2.26 Features of the data

This question aimed to determine if there were any features of the data, such as being subjected to peer review, that are of particular importance. Results are in Figure 43.

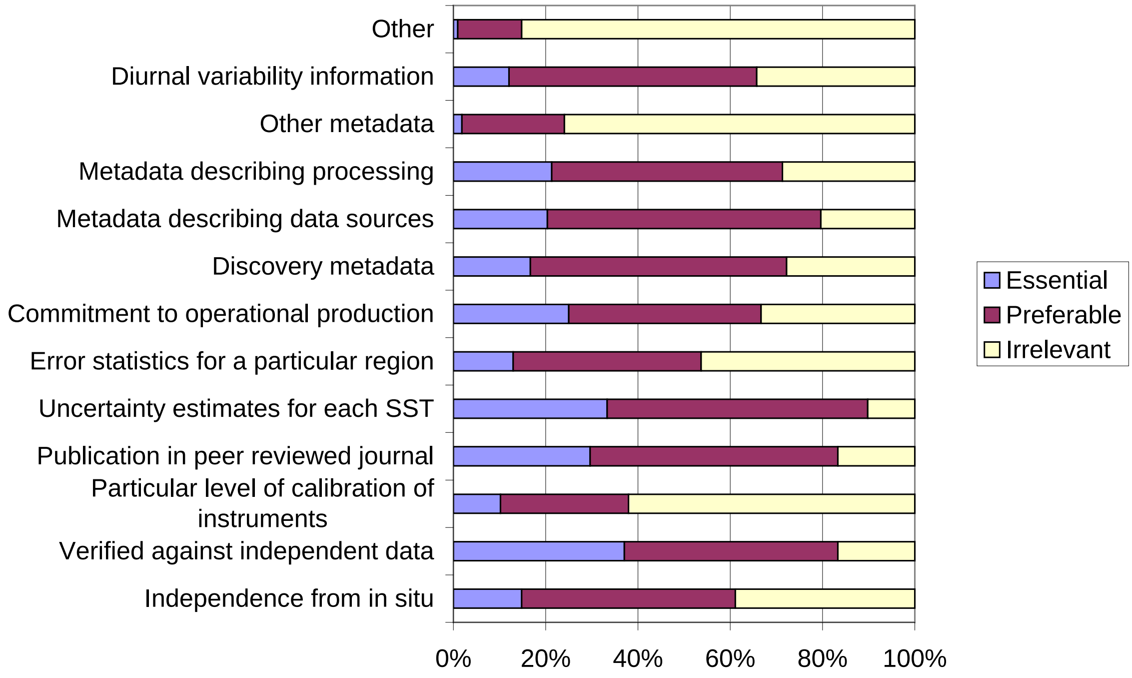


Figure 43. Preferences for features of the SST data.

Apart from ‘particular level of calibration of instruments’, ‘other metadata’ and ‘other’, all features that could be chosen achieved a majority of either essential or preferable responses.

Requirements for features of the SST data:

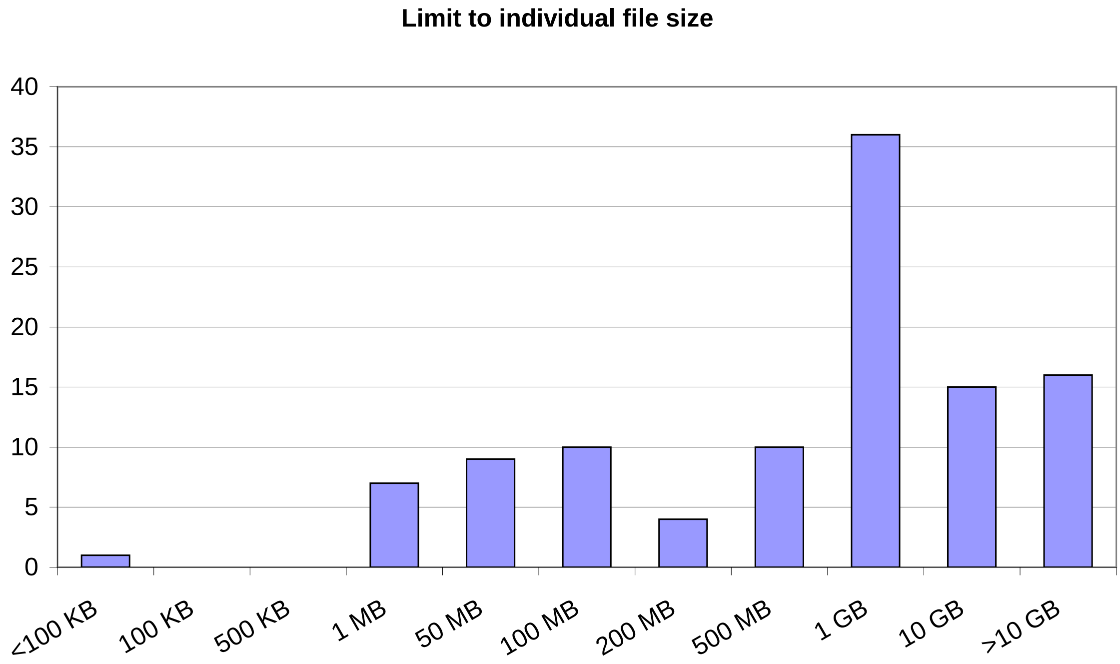
SST_CCI-UR-QUF-77	Provision of uncertainty estimates for each SST.	Classed as essential or preferable by 90% of respondents.
SST_CCI-UR-QUF-78	Verification against independent data.	Classed as essential or preferable by 83% of respondents.
SST_CCI-UR-QUF-79	Peer-reviewed publication.	Classed as essential or preferable by 83% of respondents.

SST_CCI-UR-QUF-80	Metadata describing data sources.	Classed as essential or preferable by 80% of respondents.
SST_CCI-UR-QUF-81	Discovery metadata.	Classed as essential or preferable by 72% of respondents.
SST_CCI-UR-QUF-82	Metadata describing processing applied to the data.	Classed as essential or preferable by 71% of respondents.
SST_CCI-UR-QUF-83	Commitment to operational production.	Classed as essential or preferable by 67% of respondents.
SST_CCI-UR-QUF-84	Diurnal variability information.	Classed as essential or preferable by 66% of respondents.
SST_CCI-UR-QUF-85	Independence from in situ measurements.	Classed as essential or preferable by 61% of respondents.
SST_CCI-UR-QUF-86	Error statistics for a particular region.	Classed as essential or preferable by 54% of respondents.

The following questions are from a section of the questionnaire that asked about future requirements that are not necessarily application specific. This included items such as the size of data file that could be handled.

4.3.2.27 File formats and sizes

Respondents were asked for the limit of individual file size and total dataset size that they could handle. The distributions of responses are shown in Figure 44.



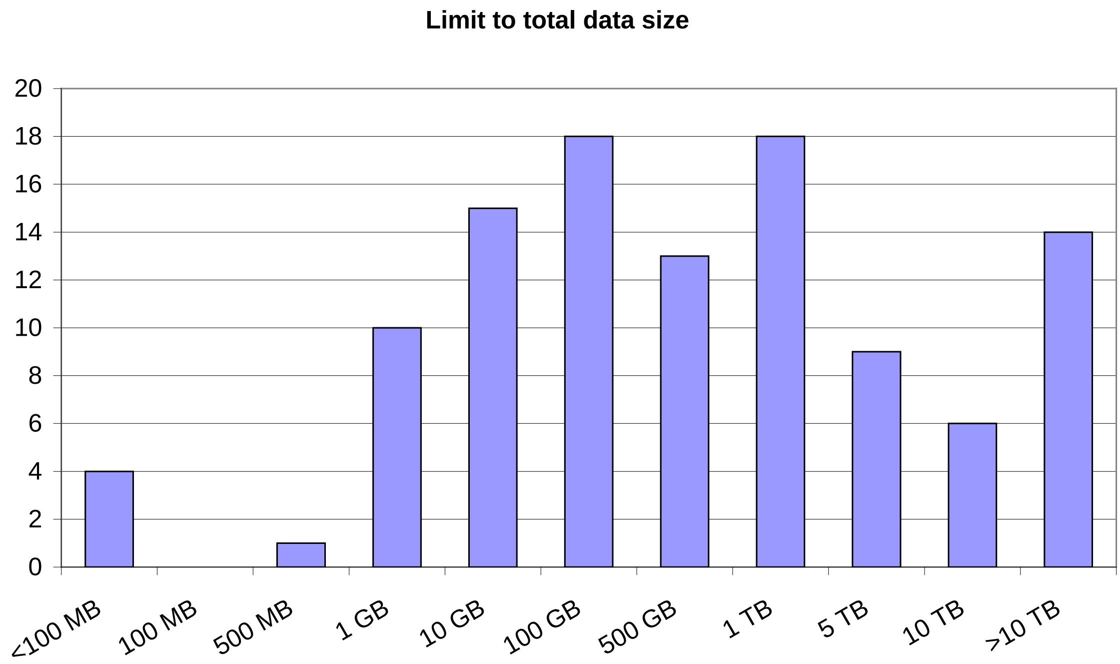


Figure 44. Limits to individual file size and total data size that users could handle.

A wide range of responses were received for both questions. For individual file size the maximum size that one respondent could handle was <100 KB. The remainder of responses were in the range 1 MB to >10 GB. The mode of the distribution is at 1 GB.

Similarly a wide range of responses were received for total size of the data. Minimum response was <100 MB, and maximum was >10 TB.

SST_CCI-UR-QUF-87	Respondents have widely varying capabilities in the size of individual files that they can handle.	Responses ranged between <100 KB and >10 GB.
SST_CCI-UR-QUF-88	Respondents have widely varying capabilities in the size of datasets that they can handle.	Responses ranged between <100 MB and >10 TB.

4.3.2.28 Format to be used for the data files

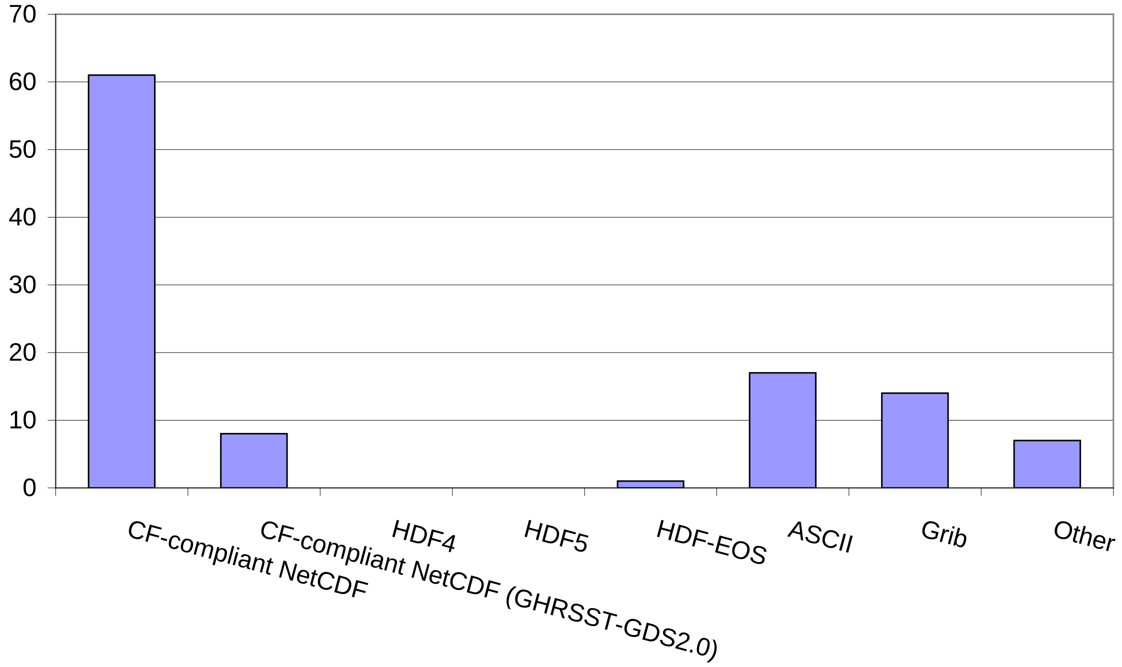


Figure 45. Format to be used for data files.

There was a clear preference shown in the responses for CF-compliant NetCDF to be used for the data files (Figure 45).

SST_CCI-UR-QUF-89	An overwhelming majority (64%) of respondents required data in CF-compliant NetCDF format.	Within that majority 12% specified the GHRSST GDS2.0 standard.

4.3.2.29 Data provision

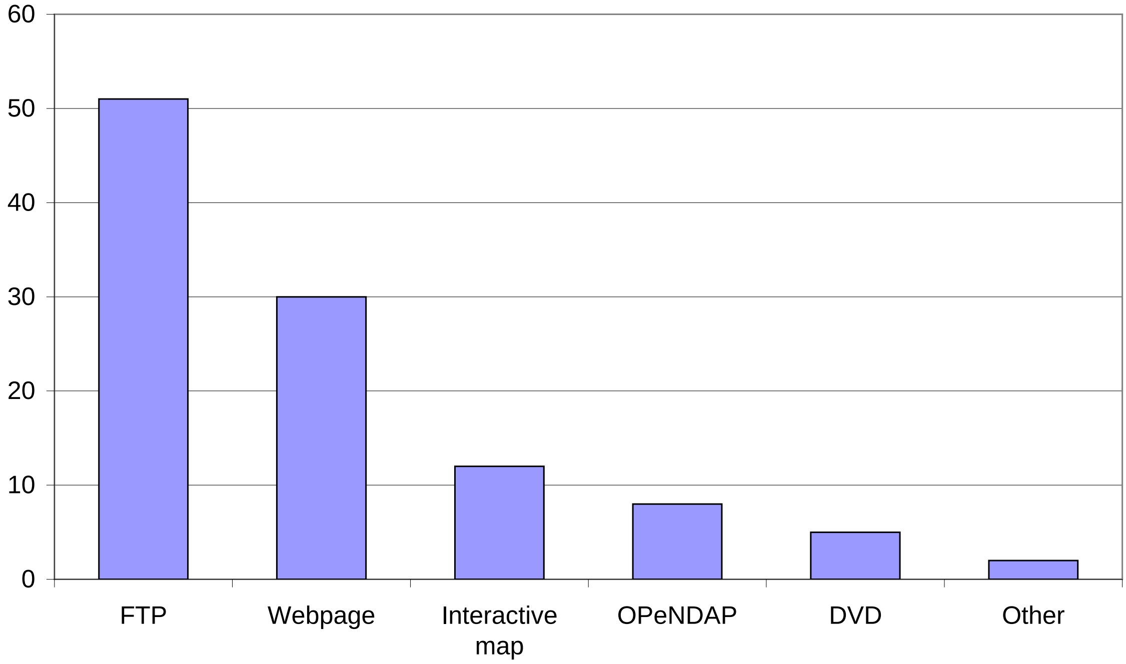


Figure 46. Method of transferring data

When asked which method of obtaining data they preferred, respondents gave a range of answers (Figure 46). The most popular method was File Transfer Protocol (FTP) but responses ranged all the way to having no local copy of the data at all.

Options for obtaining data:

SST_CCI-UR-QUF-90	Provide facility to obtain data by FTP.	Chosen by 47% of respondents.
SST_CCI-UR-QUF-91	Provide facility to obtain data from a webpage.	Chosen by 28% of respondents.
SST_CCI-UR-QUF-92	Provide facility to obtain data using an interactive map.	Chosen by 11% of respondents.
SST_CCI-UR-QUF-93	Provide facility to obtain data using OPeNDAP.	Chosen by 7% of respondents.
SST_CCI-UR-QUF-94	Provide facility to obtain data on a DVD.	Chosen by 5% of respondents.

4.3.2.30 Updating data

Respondents were asked how often they would like the data to be updated with improvements. The distribution of responses (Figure 47) contains two peaks; one for continuous incremental updates (28% of responses) and one for once a year (23% of responses. It is therefore not possible to define a single user requirement from these results.

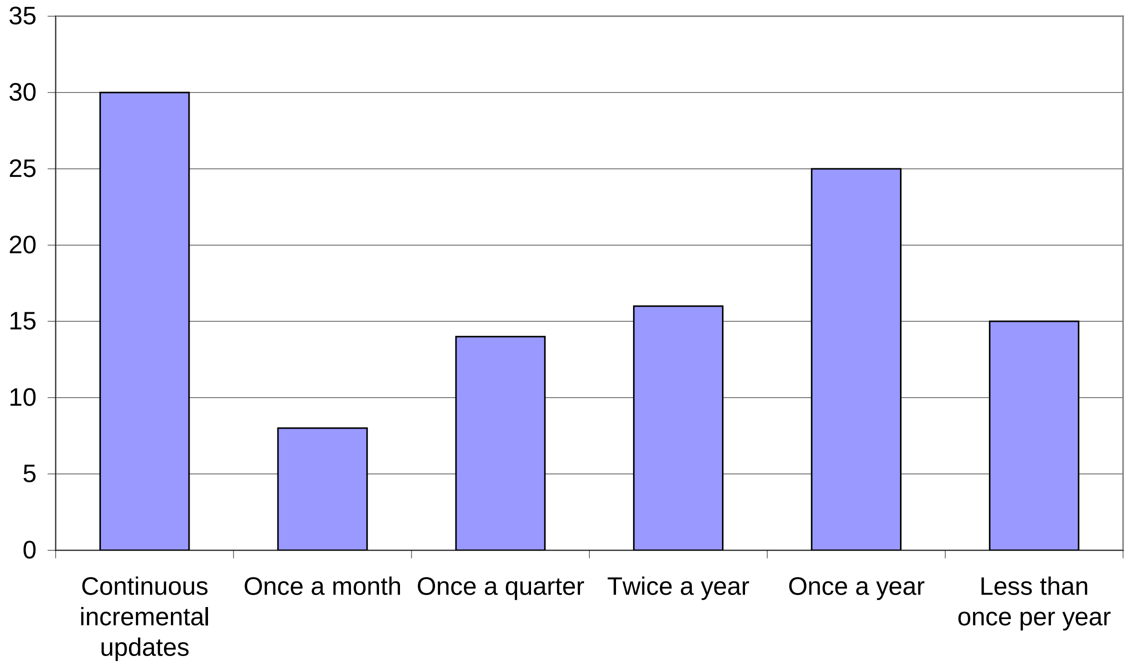


Figure 47. Preferences for frequency of updates to the data.

4.3.2.31 Alerts

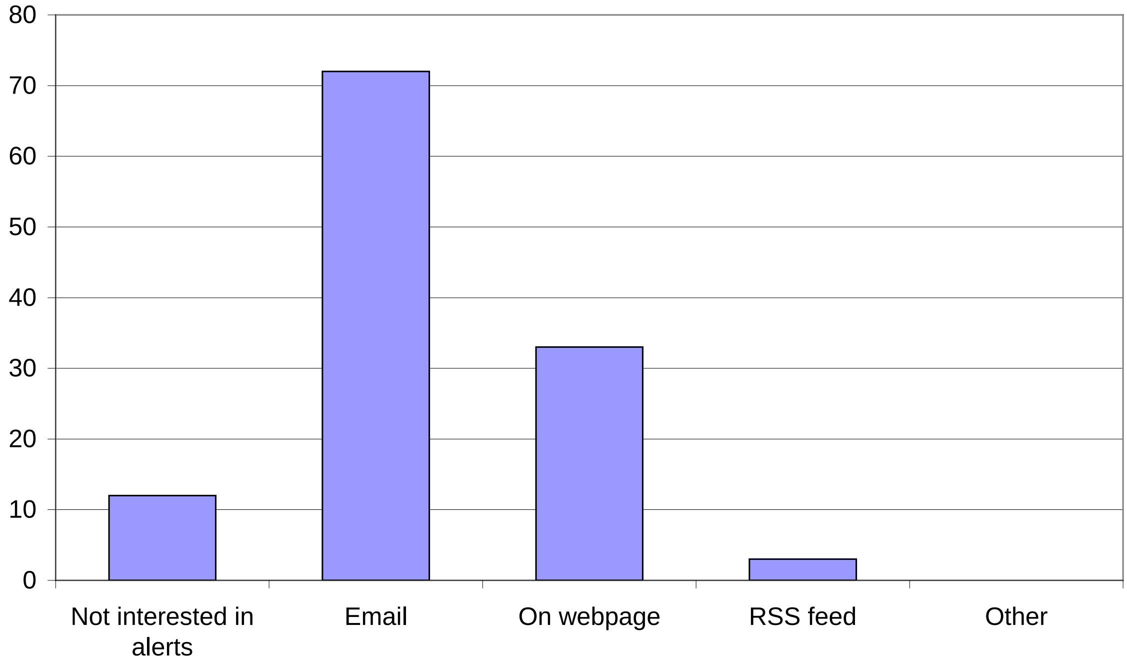


Figure 48. Preferences on how alerts about the data should be communicated.

Preferences were sought on how to receive updates about the data. As shown in Figure 48, email and on the project webpage had the most responses.

Options for receiving alerts about the data:

SST_CCI-UR-QUF-95	Provide alerts by email.	Chosen by 67% of respondents.
SST_CCI-UR-QUF-96	Provide alerts on the project webpage.	Chosen by 31% of respondents.

4.3.2.32 Software tools

Respondents were asked about the tools they currently make use of, and what they would like the SST_cci project to provide. The results are shown in Figure 49.

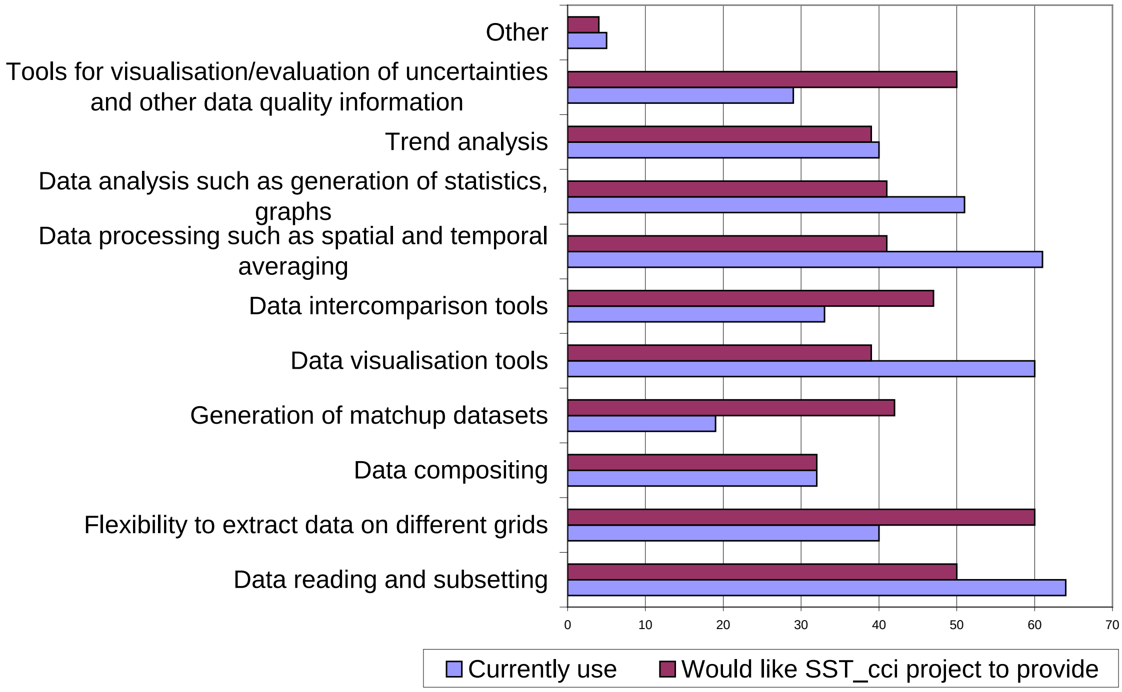


Figure 49. Tools that respondents currently use (blue) and would like the CCI project to provide (blue).

The results demonstrate that respondents are keen that a range of tools is provided by the SST_cci project. In particular, the flexibility to extract data on different grids is required.

Preferences for tools that respondents wish to have provided to them:

SST_CCI-UR-QUF-97	Provide tools to extract data on different grids.	Chosen by 56% of respondents.
SST_CCI-UR-QUF-98	Provide tools for data reading and subsetting.	Chosen by 46% of respondents.
SST_CCI-UR-QUF-99	Provide tools for visualisation/evaluation of uncertainty and quality information.	Chosen by 46% of respondents.

SST_CCI-UR-QUF-100	Provision of data intercomparison tools.	Chosen by 44% of respondents.
SST_CCI-UR-QUF-101	Provision of tools for generation of matchup datasets.	Chosen by 39% of respondents.
SST_CCI-UR-QUF-102	Provision of data processing tools such as spatial and temporal averaging.	Chosen by 38% of respondents.
SST_CCI-UR-QUF-103	Provision of data analysis tools such as generation of statistics, graphs.	Chosen by 38% of respondents.
SST_CCI-UR-QUF-104	Provision of data visualisation tools.	Chosen by 36% of respondents.
SST_CCI-UR-QUF-105	Provision of trend analysis tools.	Chosen by 36% of respondents.
SST_CCI-UR-QUF-106	Provision of data compositing tools.	Chosen by 30% of respondents.

4.3.2.33 Open source

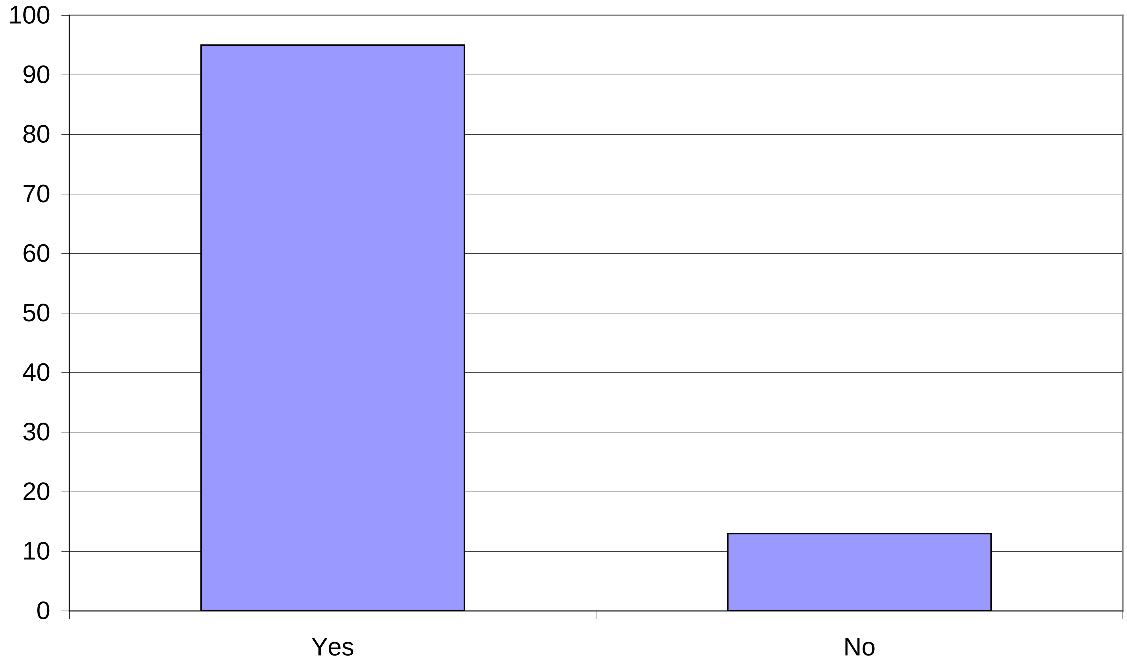


Figure 50. Should free tools be provided as open source code?

Figure 50 shows a very strong preference that code for free tools should be open source.

SST_CCI-UR-QUF-107	Respondents would prefer that code for free tools provided by data creators is open source.	

4.3.2.34 Dedicated software library

Respondents expressed a clear preference (72 out of the 108 responses) that a software library should be provided that could be embedded in their own code. Figure 51 shows the language that should be used for that library.

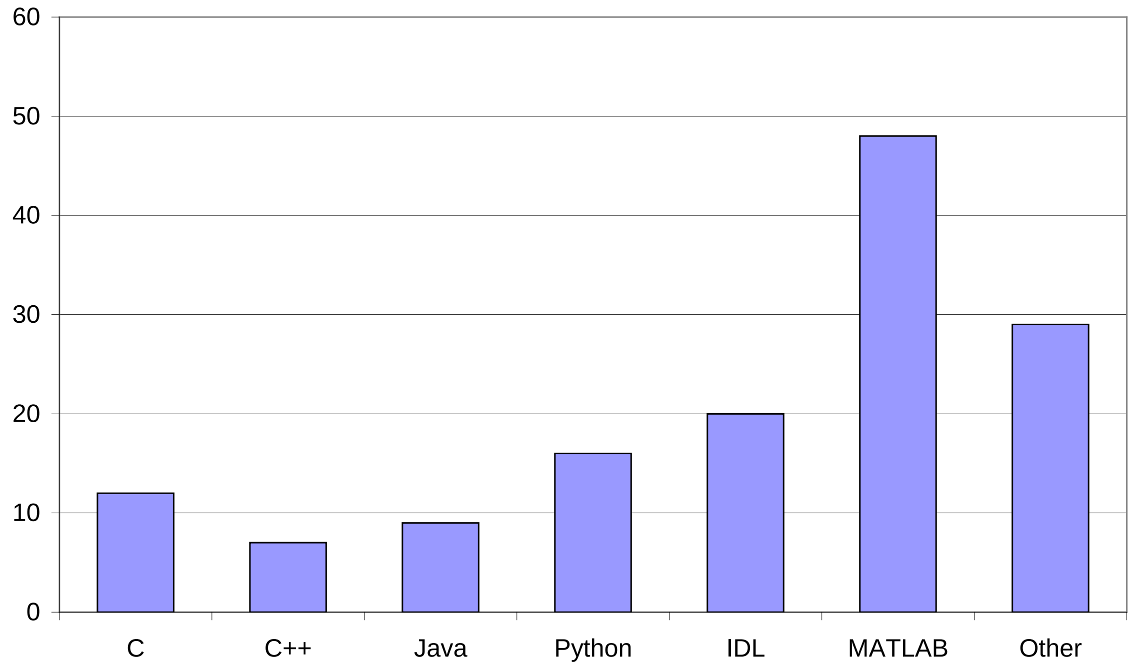


Figure 51. Language preferences for a software library.

MATLAB is the most popular choice followed by IDL and Fortran (which is contained within the 'other' category). The results demonstrate that researchers use a wide variety of programming languages in their work. It is noted that the use of languages such as MATLAB and IDL would facilitate the use of OPeNDAP for data transfer.

Preferences of programming language for a dedicated software library:

SST_CCI-UR-QUF-108	The most common choice of respondents for the language of a dedicated software library was MATLAB.	Chosen by 34% of respondents.
SST_CCI-UR-QUF-109	IDL was the joint second most common choice of language for a dedicated software library.	Chosen by 14% of respondents.

SST_CCI-UR-QUF-110	Fortran was the joint second most common choice of language for a dedicated software library.	Chosen by 14% of respondents.

4.3.2.35 Other services

Finally, respondents were asked which other services should be provided by the project. Results are in Figure 52.

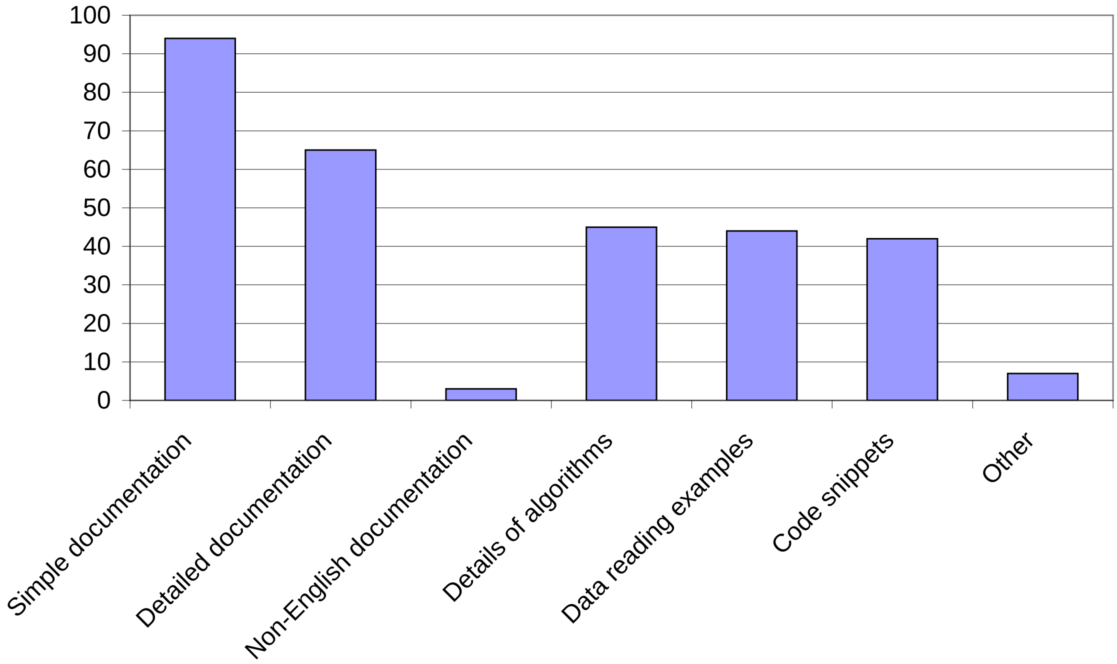


Figure 52. Other services to be provided by the project.

The main priority is identified as simple documentation to help users get started with the data. The languages that respondents entered for non-English documentation were Spanish, Russian and French.

Preferences for other services to be provided by the project:

SST_CCI-UR-QUF-111	Provision of simple documentation.	Chosen by 87% of respondents.
SST_CCI-UR-QUF-112	Provision of detailed documentation.	Chosen by 60% of respondents.
SST_CCI-UR-QUF-113	Provision of details about the algorithms used.	Chosen by 42% of respondents.
SST_CCI-UR-QUF-114	Provision of data reading examples.	Chosen by 41% of respondents.
SST_CCI-UR-QUF-115	Provision of code snippets.	Chosen by 39% of respondents.

SST_CCI-UR-QUF-116	Provision of non-English documentation.	Chosen by 3% of respondents.

4.4 Additional comments not provided through the questionnaire

Some respondents provided responses by email rather than filling out the questionnaire. Examples of some of the specific requirements in those comments, where specified, are given briefly below.

- Diurnal cycle needs to be resolved.
- Requirement for 1) high spatial (5-10 km) resolution data with low errors (0.1°C ideally, 0.5°C would be OK) and 2) long time series, lower resolution (1°, monthly) for high-latitude studies.
- Require information about covariance of errors.
- Require daily data; data not delayed by more than 5 days.
- Require estimates of uncertainty with metadata stating what data have been used to generate the dataset.
- Require data record of at least 10 years; spatial resolution of at least 1°, preferably 0.25° with an objective of 0.1°; 3 hourly values the objective, 6 hourly breakthrough and at minimum daily.
- Require a product similar to HadISST1 with trend removed. Spatial resolution of at least 1°, preferably 0.25° with an objective of 1/12°; 3 hourly values the objective, 6 hourly breakthrough and at minimum daily.

These and the other comments sent by email have been taken into consideration when wording the User Requirements.

4.5 Summary

Users were invited to enter their requirements for SST data into an online questionnaire. 108 full responses were analysed, plus some informal responses by email.

The results of the questionnaire have been presented. Wide ranges in responses were received for virtually all questions. This was also often the case when viewing responses from different people considering the needs of the same climate application. However, where possible, requirements have been formulated that reasonably represent the distribution of responses.

5. DISCUSSION SESSIONS

The final part of the user requirements gathering exercise was discussion sessions with potential users. These were aimed at understanding how their needs for SST would change over time and what might encourage or put them off from using the SST_cci products. It was hoped that the informal setting of these sessions would encourage discussions and provide extra information to that obtained from the questionnaire.

As an initial step, three discussion sessions were held within the Met Office Hadley Centre. Participants were specifically chosen to cover a broad range of research areas. It is the intention that in the near future further sessions will be held with users outside the Met Office Hadley Centre. This will be part of continuing engagement with users and will allow them to provide feedback on the specifications for SST products that will be drawn up based on this document.

Based on these discussion sessions, a series of user requirements have been identified (note that specific requirements, such as for spatial resolution, are not included here if they have been covered in the questionnaire). Full summaries of the discussion sessions can be found in Appendix B.

SST_CCI-UR-DIS-117	Data should be easily accessible.	
SST_CCI-UR-DIS-118	Data should be easy to use.	
SST_CCI-UR-DIS-119	Access to experts should be provided.	To answer queries about the data.
SST_CCI-UR-DIS-120	There is a requirement that the diurnal cycle is resolved.	
SST_CCI-UR-DIS-121	Seasonal forecasting requires daily, real-time (within hours) access to data.	
SST_CCI-UR-DIS-122	Decadal forecasting requires data within a month of the observation date.	
SST_CCI-UR-DIS-123	Data need to be available on different resolutions.	So users don’t have to re-grid.
SST_CCI-UR-DIS-124	Users require the ability to select data for a particular time period.	
SST_CCI-UR-DIS-125	Independent validation/verification by a separate [independent] group is required.	

SST_CCI-UR-DIS-126	Prototype products need to be updated while operationalisation is being set up.	Updates to the products with new data as they are collected will motivate users to continue to use the products between phases of the CCI project.
SST_CCI-UR-DIS-127	There is a requirement for uncertainty information in the form of realisations that efficiently sample the uncertainties.	Of the order 10 realisations are needed to match the size of ensembles that are run.
SST_CCI-UR-DIS-128	Users require information that allows the calculation of uncertainties on larger fields.	For example to produce global or regional averages.
SST_CCI-UR-DIS-129	Backwards compatibility with older data is required.	This would satisfy the needs of users who want to be able to use data from before the satellite era but also want to take advantage of the SST_cci products, i.e. it is important that the two are consistent.
SST_CCI-UR-DIS-130	Annual averages/climatologies are required.	

6. CONCLUSIONS

This document has presented the results of a user requirements gathering exercise for the ESA SST_cci project.

Requirements were gathered through an online questionnaire, discussion sessions, from reference documents and from lessons learned from other projects.

A series of requirements was identified, largely based on overall responses to the questionnaire; these are listed below. These requirements are listed in Table 6. Using these requirements and the full results, which allow responses to be broken down into climate research application categories, specifications for SST_cci products will be developed.

Requirement identifier	Requirement	Comments
Data level; combining data and analyses		
SST_CCI-UR-QUF-33	The most common requirement is for level 4 data (52%). However, some respondents require level 2 (19%) and 3 data (32%).	
SST_CCI-UR-QUF-35	The needs of different users can be met by making available single-sensor records, sensor-series datasets, and multiple-sensor analyses.	
SST_CCI-UR-QUE-30	Data should be combined where this will allow weaknesses in individual datasets to be overcome.	For those users who are happy with a multi-sensor SST record.
SST_CCI-UR-QUF-39	Versions of the data with gaps (if they exist) and versions without gaps are required.	A version without gaps could be achieved either as a result of combining data from multiple sensors or infilling using analysis techniques. There was no evidence in the results to suggest that either method was unacceptable.
SSTs to be reported		
SST_CCI-UR-QUF-46	SSTskin is the depth most commonly required by respondents, followed by SSTs at depths roughly corresponding to the range of traditional in situ observations (20 cm and 5 m).	

Requirement identifier	Requirement	Comments
SST_CCI-UR-QUF-47	Reporting of SST is most commonly required for sea-ice affected areas.	However, 38% of respondents expressing a requirement favoured either ice surface or radiometric temperature.
	Spatial coverage and grid	
SST_CCI-UR-REF-2 / SST_CCI-UR-QUF-42	Global coverage is required.	From questionnaire and [RD-14, RD-15].
SST_CCI-UR-QUF-34	Respondents have a clear preference that level *3* and level 4 data should be provided on a regular latitude-longitude grid.	
	Temporal coverage	
SST_CCI-UR-REF-3 / SST_CCI-UR-QUF-43	The most common response at the threshold requirement level is for temporal coverage of one year (24% of responses). However, temporal coverage of 10 years and >30 years received almost as many responses (22% and 21% respectively). At the breakthrough and objective requirements levels there is a clear requirement for data records longer than 30 years.	There is a requirement for products that cover at least 30 years to aid study of climate change and variability. From questionnaire and [RD-10].
	Spatial resolution	
SST_CCI-UR-QUF-36 / SST_CCI-UR-QUE-32	Overall, the most common responses for spatial resolution were 1° (threshold), 0.1° (breakthrough) and <1 km (objective).	Analyses with 10 km or finer spatial resolution and daily or more frequent temporal resolution are required for the number of respondents considering these characteristics as strengths of the data to strongly outweigh those viewing them as negatives.

Requirement identifier	Requirement	Comments
Frequency and times of SST data		
SST_CCI-UR-QUF-37	SST data corresponding to the same universal time is preferred to SSTs at the same local time by the majority of potential users of the SST_cci products.	
SST_CCI-UR-QUF-38	The most common requirements for data frequency at a location are monthly (threshold), daily (breakthrough) and 3 hourly (objective).	There were also significant numbers of users who had more stringent requirements. For example over a third of respondents selected 6 hourly or more frequent at the breakthrough requirement level.
SST_CCI-UR-QUF-40	For the majority of respondents it is acceptable to use temporal averaging when building datasets.	However, it is not acceptable for a significant minority of respondents.
SST_CCI-UR-QUF-41	SSTs are most commonly required at midnight, 6 am, midday and 6pm; additional data at midpoints between those times are required by many, and SSTs at half hour spacing would be used for some applications.	
Timeliness and reliability of data provision		
SST_CCI-UR-REF-1	There is a continuing need for a timely flow of climate quality data to climate monitoring and analysis centres.	See SST_CCI-UR-QUF-44 for a definition of timely; the continuing need for data can be addressed by ensuring that the data record is extendable in the future when new instrumentation is available. [RD-10, RD-14, RD-15]
SST_CCI-UR-QUF-44	The most common requirements for timeliness of data delivery were “longer than a year acceptable” (threshold), “within a year” (breakthrough) and “within a month” (objective).	However, some users have much tighter requirements and need data as quickly as within half a day.
SST_CCI-UR-DIS-121	Seasonal forecasting requires daily, real-time (within hours) access to data.	

Requirement identifier	Requirement	Comments
SST_CCI-UR-DIS-122	Decadal forecasting requires data within a month of the observation date.	
SST_CCI-UR-QUF-45	Where a preference was specified, the most common requirements for reliability of data delivery were 75% (threshold) and >99% (breakthrough and objective).	
	Bias, precision, drift	
SST_CCI-UR-QUF-48	The most common acceptable levels of bias were 0.1 and 0.3°C (threshold), and 0.1°C (breakthrough and objective). The most common response was that the achievement of this should be demonstrated over a spatial scale of 100 km.	
SST_CCI-UR-QUF-49	The most common response was that 0.1°C is the required precision and that the achievement of this should be demonstrated over a spatial scale of 100 km.	
SST_CCI-UR-QUF-50	At the threshold, breakthrough, and objective requirement levels, 0.1°C per decade was the most common response for the acceptable level of drift. The most common response for the spatial scale that the achievement of this should be demonstrated over was 100 km.	However, a significant number of users have stricter requirements, particularly at the breakthrough and objective levels.
SST_CCI-UR-QUF-51	At the threshold, breakthrough and objective requirement levels, the most common response for the acceptable drift in relative bias between day and night SSTs was 0.1°C per decade. The most common requirement was that the achievement of this should be demonstrated over a spatial scale of 100 km.	However, many users have stricter requirements.

Requirement identifier	Requirement	Comments
SST_CCI-UR-QUF-52	At all requirement levels, the most common response was that 0.1°C per decade is the acceptable change in bias over the annual cycle. The most common requirement was that the achievement of this should be demonstrated over a spatial scale of 100 km.	
Uncertainty information		
SST_CCI-UR-REF-4 / SST_CCI-UR-QUE-31	Uncertainties need to be characterised fully.	Characterisation of uncertainties needs to be improved relative to current datasets. This should include the full error budget of the translation from the input data to the products. [RD-3, RD-15]
SST_CCI-UR-REF-5	Uncertainties need to accompany the products.	[RD-16]
SST_CCI-UR-REF-6	Confidence in uncertainty estimates needs to be stated.	[RD-16]
SST_CCI-UR-REF-7	Uncertainty characteristics should be verified by comparison against independent observations.	[RD-3]
SST_CCI-UR-QUF-57	Information about the correlation structure of errors is essential or desirable for most respondents.	
SST_CCI-UR-DIS-128	Users require information that allows the calculation of uncertainties on larger fields.	For example to produce global or regional averages.
Preferences for how uncertainty should be expressed:		
SST_CCI-UR-QUF-53	An estimate of total uncertainty (root mean square of the total error distribution) is most commonly required by respondents.	Chosen by 33% of respondents.

Requirement identifier	Requirement	Comments
SST_CCI-UR-QUF-54	Confidence intervals were also required by a significant number of respondents. Where confidence intervals are provided, there is a clear preference for the 95% confidence interval.	Confidence intervals were chosen of 26%.
SST_CCI-UR-QUF-55	Separate indicators of likely magnitude of bias, precision and stability are required by many respondents.	Chosen by 19%.
SST_CCI-UR-QUF-56	Uncertainty information in the form of probability distributions are required by many.	16% of respondents chose this option.
SST_CCI-UR-DIS-127	There is a requirement for uncertainty information in the form of realisations that efficiently sample the uncertainties.	Of the order 10 realisations are needed to match the size of ensembles that are run.
Quality information		
SST_CCI-UR-QUF-58	Quality information is needed for each SST value that is simple to use.	For example a single field indicating “good/bad” or the overall probability that a value is bad.
Requirements for other data to be provided in the files		
SST_CCI-UR-QUF-59	Provision of locations of clouds.	Required by 63% of respondents.
SST_CCI-UR-QUF-60	Provision of locations of sea ice locations.	Required by 62% of respondents.
SST_CCI-UR-QUF-61	Provisions of aerosol locations.	Required by 34% of respondents.
SST_CCI-UR-QUF-62	Provision of sun glint suspected locations	Required by 26% of respondents.
SST_CCI-UR-QUF-63	Provision of rain suspected locations	Required by 39% of respondents.
SST_CCI-UR-QUF-64	Provision of the phase and amplitude of diurnal cycle	Required by 37% of respondents.
SST_CCI-UR-QUF-65	Provision of information about adjustments applied to data	Required by 34% of respondents.

Requirement identifier	Requirement	Comments
SST_CCI-UR-QUF-66	Provision of uncertainties in adjustments	Required by 37% of respondents.
SST_CCI-UR-QUF-67	Provision of information about atmospheric humidity	Required by 19% of respondents.
SST_CCI-UR-QUF-68	Provision of the number of pieces of information used to estimate each SST in the data files.	Suggested by one respondent.
SST_CCI-UR-QUF-69	Provision of sea ice concentration ancillary data.	Required by 60% of respondents.
SST_CCI-UR-QUF-70	Provision of wind speed ancillary data.	Required by 69% of respondents.
SST_CCI-UR-QUF-71	Provision of aerosol optical depth ancillary data.	Required by 26% of respondents.
SST_CCI-UR-QUF-72	Provision of heat flux components ancillary data.	Suggested by one respondent.
SST_CCI-UR-QUF-73	Provision of irradiance ancillary data.	Suggested by one respondent.
SST_CCI-UR-QUF-74	Provision of cloud property ancillary data.	Suggested by three respondents.
SST_CCI-UR-QUF-75	Provision of precipitation/rain quantity ancillary data.	Suggested by two respondents.
SST_CCI-UR-QUF-76	Provision of ancillary data that gives the fraction of land in a grid cell.	Suggested by one respondent.
Data quantity, format and access		
SST_CCI-UR-REF-10	The requirements of users with access to the least developed computing infrastructures need to be addressed.	[RD-10]
SST_CCI-UR-REF-12 / SST_CCI-UR-DIS-117 / SST_CCI-UR-LLP-24	Data need to be easily accessible.	It is beneficial to users to reduce as much as possible any barriers to obtaining and using data. [RD-10]
SST_CCI-UR-REF-13	Data need to be free.	[RD-10]
SST_CCI-UR-REF-14	Data need to be unrestricted in their availability.	[RD-10]

Requirement identifier	Requirement	Comments
SST_CCI-UR-DIS-118	Data should be easy to use.	
SST_CCI-UR-QUF-87	Respondents have widely varying capabilities in the size of individual files that they can handle.	Responses ranged between <100 KB and >10 GB.
SST_CCI-UR-QUF-88	Respondents have widely varying capabilities in the size of datasets that they can handle.	Responses ranged between <100 MB and >10 TB.
SST_CCI-UR-QUF-89	An overwhelming majority (64%) of respondents required data in CF-compliant NetCDF format.	Within that majority 12% specified the GHRSST GDS2.0 standard.
SST_CCI-UR-DIS-123	Data need to be available on different resolutions.	So users don't have to re-grid.
SST_CCI-UR-DIS-124	Users require the ability to select data for a particular time period.	
Options for obtaining the data:		
SST_CCI-UR-QUF-90	Provide facility to obtain data by FTP.	Chosen by 47% of respondents.
SST_CCI-UR-QUF-91	Provide facility to obtain data from a webpage.	Chosen by 28% of respondents.
SST_CCI-UR-QUF-92	Provide facility to obtain data using an interactive map.	Chosen by 11% of respondents.
SST_CCI-UR-QUF-93	Provide facility to obtain data using OPeNDAP.	Chosen by 7% of respondents.
SST_CCI-UR-QUF-94	Provide facility to obtain data on a DVD.	Chosen by 5% of respondents.
Options for receiving alerts about the data		
SST_CCI-UR-QUF-95	Provide alerts by email.	Chosen by 67% of respondents.
SST_CCI-UR-QUF-96	Provide alerts on the project webpage.	Chosen by 31% of respondents.
Data storage and metadata		
SST_CCI-UR-REF-15	Standards should be followed for data storage and information sharing.	For example, in order to reduce operating costs. [RD-2]

Requirement identifier	Requirement	Comments
SST_CCI-UR-REF-16	Standards and procedures for storage of metadata should be developed.	[RD-10]
SST_CCI-UR-REF-17	Full information about input data and any processing applied needs to be archived.	To allow future reprocessing. [RD-3]
User interactions		
SST_CCI-UR-LLP-27	Users need to be kept informed of developments.	By publishing results throughout the lifetime of the project.
SST_CCI-UR-REF-11	All steps taken during product development should be published.	Including algorithm selection and statements about accuracy, resolution and homogeneity. [RD-14]
SST_CCI-UR-REF-18	There is a requirement to publish information about data and algorithm maturity.	For example which parts have undergone peer-review. [RD-14]
SST_CCI-UR-REF-19	A statement saying point by point which GCOS guidelines have been followed should be published.	[RD-14]
SST_CCI-UR-REF-20	Access to data, products and documentation needs to be provided.	[RD-14]
SST_CCI-UR-REF-22	Appropriate user groups need to be consulted systematically.	To establish requirements and to inspire global participation in use of data. [RD-2]
SST_CCI-UR-REF-23	A mechanism for feedback from users needs to be provided.	[RD-14]
SST_CCI-UR-LLP-25	Requests from users for support need to be dealt with quickly and thoroughly.	
SST_CCI-UR-LLP-26	It is important to foster good communication between the project, users and other interested parties.	
SST_CCI-UR-LLP-28	The project should be made to feel open and inclusive to users and other scientists.	By making meeting reports, presentations and minutes available.

Requirement identifier	Requirement	Comments
SST_CCI-UR-LLP-29	Users should have easy access to information, documents, products and contacts through a high quality website.	
SST_CCI-UR-DIS-119	Access to experts should be provided.	To answer queries about the data.
Requirements for features of the data		
SST_CCI-UR-QUF-77	Provision of uncertainty estimates for each SST.	Classed as essential or preferable by 90% of respondents.
SST_CCI-UR-QUF-78	Verification against independent data.	Classed as essential or preferable by 83% of respondents.
SST_CCI-UR-QUF-79	Peer-reviewed publication.	Classed as essential or preferable by 83% of respondents.
SST_CCI-UR-QUF-80	Metadata describing data sources.	Classed as essential or preferable by 80% of respondents.
SST_CCI-UR-QUF-81	Discovery metadata.	Classed as essential or preferable by 72% of respondents.
SST_CCI-UR-QUF-82	Metadata describing processing applied to the data.	Classed as essential or preferable by 71% of respondents.
SST_CCI-UR-QUF-83	Commitment to operational production.	Classed as essential or preferable by 67% of respondents.
SST_CCI-UR-QUF-84	Diurnal variability information.	Classed as essential or preferable by 66% of respondents.
SST_CCI-UR-QUF-85	Independence from in situ measurements.	Classed as essential or preferable by 61% of respondents.
SST_CCI-UR-QUF-86	Error statistics for a particular region.	Classed as essential or preferable by 54% of respondents.

Requirement identifier	Requirement	Comments
SST_CCI-UR-DIS-125	Independent validation/verification by a separate [independent] group is required.	
SST_CCI-UR-DIS-129	Backwards compatibility with older data is required.	This would satisfy the needs of users who want to be able to use data from before the satellite era but also want to take advantage of the SST_cci products, i.e. it is important that the two are consistent.
Preferences for tools to be provided by the SST_cci project		
SST_CCI-UR-QUF-97	Provide tools to extract data on different grids.	Chosen by 56% of respondents.
SST_CCI-UR-QUF-98	Provide tools for data reading and subsetting.	Chosen by 46% of respondents.
SST_CCI-UR-QUF-99	Provide tools for visualisation/evaluation of uncertainty and quality information.	Chosen by 46% of respondents.
SST_CCI-UR-QUF-100	Provision of data intercomparison tools.	Chosen by 44% of respondents.
SST_CCI-UR-QUF-101	Provision of tools for generation of matchup datasets.	Chosen by 39% of respondents.
SST_CCI-UR-QUF-102	Provision of data processing tools such as spatial and temporal averaging.	Chosen by 38% of respondents.
SST_CCI-UR-QUF-103	Provision of data analysis tools such as generation of statistics, graphs.	Chosen by 38% of respondents.
SST_CCI-UR-QUF-104	Provision of data visualisation tools.	Chosen by 36% of respondents.
SST_CCI-UR-QUF-105	Provision of trend analysis tools.	Chosen by 36% of respondents.
SST_CCI-UR-QUF-106	Provision of data compositing tools.	Chosen by 30% of respondents.

Requirement identifier	Requirement	Comments
SST_CCI-UR-QUF-107	Respondents would prefer that code for free tools provided by data creators is open source.	
Preferences of programming language for a dedicated software library:		
SST_CCI-UR-QUF-108	The most common choice of respondents for the language of a dedicated software library was MATLAB.	Chosen by 34% of respondents.
SST_CCI-UR-QUF-109	IDL was the joint second most common choice of language for a dedicated software library.	Chosen by 14% of respondents.
SST_CCI-UR-QUF-110	Fortran was the joint second most common choice of language for a dedicated software library.	Chosen by 14% of respondents.
Preferences for other services to be provided by the project		
SST_CCI-UR-QUF-111	Provision of simple documentation.	Chosen by 87% of respondents.
SST_CCI-UR-QUF-112	Provision of detailed documentation.	Chosen by 60% of respondents.
SST_CCI-UR-QUF-113	Provision of details about the algorithms used.	Chosen by 42% of respondents.
SST_CCI-UR-QUF-114	Provision of data reading examples.	Chosen by 41% of respondents.
SST_CCI-UR-QUF-115	Provision of code snippets.	Chosen by 39% of respondents.
SST_CCI-UR-QUF-116	Provision of non-English documentation.	Chosen by 3% of respondents.
Miscellaneous		
SST_CCI-UR-REF-8	Conversion of the system from research to operational use needs to be promoted.	For example by converging climate requirements with operational requirements. [RD-2, RD-7]
SST_CCI-UR-REF-9	Feedback is required to producers of data used by the project to inform them of any issues that have been discovered with their data.	[RD-3, RD-7]

Requirement identifier	Requirement	Comments
SST_CCI-UR-REF-21	Version control should be instigated.	[RD-14]
SST_CCI-UR-DIS-120	There is a requirement that the diurnal cycle is resolved.	
SST_CCI-UR-DIS-126	Prototype products need to be updated while operationalisation is being set up.	Updates to the products with new data as they are collected will motivate users to continue to use the products between phases of the CCI project.
SST_CCI-UR-DIS-130	Annual averages/climatologies are required.	

Table 6. Full list of user requirements, organised into categories.

APPENDIX A CURRENT SST DATA – RESULTS BY APPLICATION CATEGORY

The following plots show the results from the questionnaire section about current SST data, with the responses divided by primary application category. For descriptions of the plots see Figure 4 to Figure 6. Plots are not included if they do not contain any responses.

Climate model initialisation

	ATSR series	AVHRR Pathfinder V5	Other AVHRR	SEVIRI	AMSR−E	TMI	HadSST2	ICOADS	Other
Spatial resolution	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**
Spatial sampling	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**
Grid	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**
Frequency of observations	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 1	0 : 0
	0 : 0	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 1**	**0 : 0**
Bias characteristics	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**
Precision of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**
Stability of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**
Well characterised uncertainties	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**
Depth that the SST corresponds to	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**
Format of the data files	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**
Timeliness of data delivery	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**
Reliability of the data delivery	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**
Length of the data record	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 0	0 : 0
	0 : 0	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**1 : 0**	**0 : 0**
Reputation of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0
	0 : 0	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**1 : 0**	**0 : 0**	**0 : 0**
Other	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**	**0 : 0**

Climate model initialisation

	HadISST1	Reynolds et al Daily OI (2007)	Reynolds et al OI v2 (2002)	RSS MWOI merged analysis (9 km)	Kaplan et al (1998)	ERSST v3	COBE	OSTIA
Spatial resolution	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 1 **0 : 1**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 1 **0 : 1**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
On a suitable grid for this application	0 : 0 **0 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Analysis frequency	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
The bias characteristics	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
The precision of the data	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
The stability of the data	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Well characterised uncertainties	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 1 **0 : 1**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 1 **0 : 1**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Depth that the SST corresponds to	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
The format of the data files	0 : 0 **0 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Timeliness of data delivery	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Reliability of the data delivery	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
The length of the data record	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**	1 : 0 **1 : 0**	0 : 0 **0 : 0**
The reputation of the data	0 : 0 **0 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Other	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**

Climate model evaluation

	ATSR series	AVHRR Pathfinder V5	Other AVHRR	SEVIRI	AMSR-E	TMI	HadSST2	ICOADS	Other
Spatial resolution	0 : 0 **0 : 0**	1 : 0 **1 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**
Spatial sampling	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**
Grid	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	2 : 0 **2 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**
Frequency of observations	0 : 0 **0 : 0**	0 : 1 **0 : 1**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 1 **0 : 2**	0 : 0 **0 : 0**	1 : 0 **1 : 0**
Bias characteristics	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Precision of the data	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 1 **0 : 1**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Stability of the data	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Well characterised uncertainties	0 : 0 **0 : 0**	0 : 1 **0 : 1**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 2 **0 : 2**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Depth that the SST corresponds to	0 : 0 **0 : 0**	1 : 1 **1 : 1**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**	0 : 1 **0 : 1**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Format of the data files	0 : 0 **0 : 0**	1 : 0 **1 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	3 : 0 **3 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**
Timeliness of data delivery	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	1 : 1 **1 : 1**	0 : 0 **0 : 0**	1 : 0 **1 : 0**
Reliability of the data delivery	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**
Length of the data record	0 : 0 **0 : 0**	1 : 0 **1 : 0**	1 : 0 **1 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	4 : 0 **4 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Reputation of the data	0 : 0 **0 : 0**	1 : 0 **1 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	3 : 0 **3 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Other	0 : 0 **0 : 0**	0 : 0 **0 : 1**	0 : 0 **0 : 1**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 1**	0 : 0 **0 : 0**	0 : 0 **0 : 0**

Climate model evaluation

	HadISST1	Reynolds et al Daily OI (2007)	Reynolds et al OI v2 (2002)	RSS MWOI merged analysis (9 km)	Kaplan et al (1998)	ERSST v3	COBE	OSTIA
Spatial resolution	2 : 0 / 2 : 0	2 : 0 / 2 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 1 / 0 : 1	0 : 0 / 0 : 0	0 : 0 / 0 : 0
On a suitable grid for this application	2 : 0 / 2 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Analysis frequency	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
The bias characteristics	0 : 1 / 0 : 1	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
The precision of the data	0 : 0 / 0 : 0	0 : 1 / 0 : 1	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
The stability of the data	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Well characterised uncertainties	0 : 1 / 0 : 1	0 : 1 / 0 : 1	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Depth that the SST corresponds to	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
The format of the data files	2 : 0 / 2 : 0	2 : 0 / 2 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Timeliness of data delivery	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Reliability of the data delivery	0 : 0 / 0 : 0	1 : 0 / 1 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
The length of the data record	2 : 0 / 2 : 0	0 : 1 / 0 : 1	0 : 1 / 0 : 1	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 0 : 1	0 : 0 / 0 : 0	0 : 0 / 0 : 0
The reputation of the data	1 : 0 / 1 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Other	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0

Regional modelling

	ATSR series	AVHRR Pathfinder V5	Other AVHRR	SEVIRI	AMSR-E	TMI	HadSST2	ICOADS	Other
Spatial resolution	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 0 : 1	0 : 0 / 0 : 1	1 : 0 / 1 : 1	0 : 0 / 0 : 0	1 : 2 / 1 : 2
Spatial sampling	0 : 1 / 0 : 1	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Grid	1 : 0 / 1 : 1	0 : 0 / 0 : 1	0 : 0 / 0 : 1	0 : 0 / 0 : 1	0 : 0 / 0 : 1	0 : 0 / 0 : 1	0 : 0 / 0 : 1	0 : 0 / 0 : 1	1 : 0 / 1 : 0
Frequency of observations	1 : 0 / 1 : 1	1 : 0 / 1 : 1	0 : 0 / 0 : 1	0 : 0 / 0 : 1	0 : 0 / 0 : 1	0 : 0 / 0 : 1	1 : 0 / 1 : 1	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Bias characteristics	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Precision of the data	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Stability of the data	0 : 0 / 0 : 0	0 : 0 / 0 : 1	0 : 0 / 0 : 1	0 : 0 / 0 : 1	0 : 0 / 0 : 1	0 : 0 / 0 : 1	1 : 0 / 0 : 1	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Well characterised uncertainties	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Depth that the SST corresponds to	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Format of the data files	1 : 0 / 1 : 1	1 : 0 / 1 : 1	0 : 0 / 0 : 1	0 : 0 / 0 : 1	0 : 0 / 0 : 1	0 : 0 / 0 : 1	1 : 0 / 1 : 1	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Timeliness of data delivery	1 : 0 / 1 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Reliability of the data delivery	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Length of the data record	0 : 1 / 0 : 1	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	1 : 0 / 1 : 0	0 : 1 / 0 : 1
Reputation of the data	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Other	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0

Regional modelling

	HadISST1	Reynold et al Daily OI (2007)	Reynolds et al OI v2 (2002)	RSS MWOI merged analysis (9 km)	Kaplan et al (1998)	ERSST v3	COBE	OSTIA
Spatial resolution	0 : 1 0 : 1	0 : 1 0 : 1	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
On a suitable grid for this application	1 : 0 1 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Analysis frequency	0 : 0 0 : 0	1 : 0 1 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
The bias characteristics	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
The precision of the data	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
The stability of the data	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Well characterised uncertainties	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Depth that the SST corresponds to	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
The format of the data files	0 : 0 0 : 1	1 : 0 1 : 1	1 : 0 1 : 1	0 : 0 0 : 1	0 : 0 0 : 1	0 : 0 0 : 1	0 : 0 0 : 1	0 : 0 0 : 1
Timeliness of data delivery	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Reliability of the data delivery	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
The length of the data record	1 : 0 1 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
The reputation of the data	0 : 0 0 : 0	1 : 0 1 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Other	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0

Seasonal forecasting

	ATSR series	AVHRR Pathfinder V5	Other AVHRR	SEVIRI	AMSR−E	TMI	HadSST2	ICOADS	Other
Spatial resolution	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 1 0 : 1	0 : 0 0 : 0	1 : 0 1 : 0
Spatial sampling	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 1 0 : 1	0 : 0 0 : 0	0 : 0 0 : 0
Grid	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	2 : 0 2 : 0	0 : 0 0 : 0	1 : 0 1 : 0
Frequency of observations	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 1 1 : 1	0 : 0 0 : 0	0 : 0 0 : 0
Bias characteristics	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 1 0 : 1
Precision of the data	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Stability of the data	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	2 : 0 2 : 0	0 : 0 0 : 0	1 : 0 1 : 0
Well characterised uncertainties	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 1 0 : 1
Depth that the SST corresponds to	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Format of the data files	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 0	0 : 0 0 : 0	1 : 0 1 : 0
Timeliness of data delivery	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 1 1 : 1	0 : 0 0 : 0	1 : 0 1 : 0
Reliability of the data delivery	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Length of the data record	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	3 : 0 3 : 0	0 : 0 0 : 0	1 : 0 1 : 0
Reputation of the data	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Other	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0

Seasonal forecasting

	HadISST1	Reynold et al Daily OI (2007)	Reynolds et al OI v2 (2002)	RSS MWOI merged analysis (9 km)	Kaplan et al (1998)	ERSST v3	COBE	OSTIA
Spatial resolution	1 : 1 1 : 1	1 : 0 1 : 0	1 : 1 1 : 1	0 : 0 0 : 0	0 : 0 0 : 0	3 : 0 3 : 0	0 : 0 0 : 0	2 : 0 2 : 0
On a suitable grid for this application	0 : 0 0 : 0	1 : 0 1 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 0	0 : 0 0 : 0	1 : 0 1 : 0
Analysis frequency	0 : 1 0 : 1	2 : 0 2 : 0	1 : 1 1 : 1	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 0
The bias characteristics	0 : 0 0 : 0	1 : 1 1 : 1	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
The precision of the data	0 : 0 0 : 0	1 : 0 1 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
The stability of the data	1 : 0 1 : 0	1 : 0 1 : 0	2 : 0 2 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	2 : 0 2 : 0
Well characterised uncertainties	0 : 0 0 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 1 0 : 1	0 : 0 0 : 0	0 : 1 0 : 1
Depth that the SST corresponds to	0 : 0 0 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
The format of the data files	0 : 0 0 : 0	3 : 1 3 : 1	2 : 0 2 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 0	0 : 0 0 : 0	1 : 0 1 : 0
Timeliness of data delivery	0 : 1 0 : 1	1 : 1 1 : 1	1 : 1 1 : 1	0 : 0 0 : 0	0 : 0 0 : 0	1 : 1 1 : 2	0 : 0 0 : 0	3 : 0 3 : 0
Reliability of the data delivery	1 : 0 1 : 0	1 : 0 1 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	2 : 0 2 : 0
The length of the data record	2 : 0 2 : 0	2 : 1 2 : 1	3 : 1 3 : 1	0 : 0 0 : 0	0 : 0 0 : 0	2 : 0 2 : 0	0 : 0 0 : 0	0 : 2 0 : 2
The reputation of the data	0 : 0 0 : 0	2 : 0 2 : 0	2 : 0 2 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Other	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 0

Seasonal forecasting

	NOCS daily OI	RTG SST	FNMOC 10 km high res analysis	RAMSSA 9 km	Odyssea	Medspiration	Other
Spatial resolution	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
On a suitable grid for this application	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Analysis frequency	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 0
The bias characteristics	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The precision of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The stability of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Well characterised uncertainties	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 1
Depth that the SST corresponds to	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The format of the data files	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Timeliness of data delivery	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 0
Reliability of the data delivery	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 0
The length of the data record	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The reputation of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Other	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0

Monitoring of climate

	ATSR series	AVHRR Pathfinder V5	Other AVHRR	SEVIRI	AMSR−E	TMI	HadSST2	ICOADS	Other
Spatial resolution	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 2	0 : 0	0 : 0
	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 2	0 : 0	0 : 0
Spatial sampling	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 1	0 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 1	0 : 1	0 : 0
Grid	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	2 : 1	0 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	2 : 1	0 : 0	0 : 0
Frequency of observations	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	2 : 1	0 : 1	0 : 0
	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	2 : 1	0 : 1	0 : 0
Bias characteristics	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 1	0 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 1	0 : 0	0 : 0
Precision of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 1	0 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 1	0 : 0	0 : 0
Stability of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 1	0 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 1	0 : 0	0 : 0
Well characterised uncertainties	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 1	0 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 1	0 : 0	0 : 0
Depth that the SST corresponds to	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 1	0 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 1	0 : 0	0 : 0
Format of the data files	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	2 : 0	0 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	2 : 0	0 : 0	0 : 0
Timeliness of data delivery	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	1 : 1	0 : 0	0 : 0
	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	1 : 1	0 : 0	0 : 0
Reliability of the data delivery	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0
	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0
Length of the data record	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	3 : 0	1 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	3 : 0	1 : 0	0 : 0
Reputation of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	3 : 0	0 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	3 : 0	0 : 0	0 : 0
Other	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0

Monitoring of climate

	HadISST1	Reynolds et al Daily OI (2007)	Reynolds et al OI v2 (2002)	RSS MWOI merged analysis (9 km)	Kaplan et al (1998)	ERSST v3	COBE	OSTIA
Spatial resolution	2 : 0	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	1 : 1	0 : 0	1 : 0	0 : 0	0 : 1	0 : 1	0 : 1	0 : 0
On a suitable grid for this application	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Analysis frequency	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	1 : 0	0 : 0
	0 : 1	0 : 0	1 : 0	0 : 0	0 : 1	0 : 1	1 : 1	0 : 0
The bias characteristics	0 : 1	0 : 0	0 : 0	0 : 0	0 : 1	0 : 1	0 : 1	0 : 1
	0 : 1	0 : 0	0 : 0	0 : 0	0 : 1	0 : 1	0 : 1	0 : 1
The precision of the data	0 : 1	0 : 0	0 : 0	0 : 0	0 : 1	0 : 1	0 : 1	0 : 0
	0 : 1	0 : 0	0 : 0	0 : 0	0 : 1	0 : 1	0 : 1	0 : 0
The stability of the data	0 : 1	0 : 0	0 : 0	0 : 0	0 : 1	0 : 1	0 : 1	0 : 1
	0 : 1	0 : 0	0 : 0	0 : 0	0 : 1	0 : 1	0 : 1	0 : 1
Well characterised uncertainties	0 : 1	0 : 0	0 : 0	0 : 0	0 : 1	0 : 1	0 : 1	0 : 1
	0 : 1	0 : 0	0 : 0	0 : 0	0 : 1	0 : 1	0 : 1	0 : 1
Depth that the SST corresponds to	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The format of the data files	1 : 0	0 : 0	1 : 0	0 : 0	1 : 0	1 : 0	1 : 0	0 : 0
	1 : 0	0 : 0	1 : 0	0 : 0	1 : 0	1 : 0	1 : 0	0 : 0
Timeliness of data delivery	1 : 1	0 : 0	1 : 0	0 : 0	0 : 1	1 : 0	0 : 1	1 : 0
	1 : 1	0 : 0	1 : 0	0 : 0	0 : 1	1 : 0	0 : 1	1 : 0
Reliability of the data delivery	1 : 0	0 : 0	1 : 0	0 : 0	0 : 0	1 : 0	0 : 0	1 : 0
	1 : 0	0 : 0	1 : 0	0 : 0	0 : 0	1 : 0	0 : 0	1 : 0
The length of the data record	2 : 0	0 : 0	0 : 0	0 : 0	0 : 1	1 : 0	1 : 0	0 : 1
	2 : 0	0 : 0	0 : 0	0 : 0	0 : 1	1 : 0	1 : 0	0 : 1
The reputation of the data	2 : 0	0 : 0	1 : 0	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0
	2 : 0	0 : 0	1 : 0	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0
Other	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0

Climate variability

	ATSR series	AVHRR Pathfinder V5	Other AVHRR	SEVIRI	AMSR−E	TMI	HadSST2	ICOADS	Other
Spatial resolution	1 : 0	8 : 2	2 : 0	1 : 0	4 : 0	4 : 0	7 : 5	2 : 5	0 : 0
	1 : 0	7 : 2	2 : 0	1 : 0	4 : 0	4 : 0	5 : 8	1 : 7	0 : 0
Spatial sampling	1 : 0	3 : 3	1 : 1	0 : 0	3 : 0	0 : 0	2 : 4	2 : 6	0 : 0
	1 : 0	3 : 3	1 : 1	0 : 0	3 : 0	0 : 0	1 : 5	1 : 6	0 : 0
Grid	0 : 0	4 : 0	1 : 0	0 : 0	1 : 0	2 : 1	7 : 1	3 : 0	0 : 0
	0 : 0	4 : 0	1 : 0	0 : 0	1 : 0	2 : 1	6 : 3	2 : 1	0 : 0
Frequency of observations	1 : 0	6 : 0	2 : 0	1 : 0	4 : 0	3 : 0	3 : 3	4 : 4	0 : 0
	1 : 0	6 : 0	2 : 0	1 : 0	4 : 0	3 : 0	1 : 4	2 : 4	0 : 0
Bias characteristics	0 : 0	1 : 1	0 : 1	0 : 0	0 : 2	0 : 0	1 : 1	0 : 3	0 : 0
	0 : 1	1 : 2	0 : 2	0 : 0	0 : 3	0 : 0	1 : 1	0 : 3	0 : 0
Precision of the data	1 : 0	3 : 0	1 : 0	0 : 0	1 : 0	1 : 0	2 : 1	1 : 1	0 : 0
	1 : 0	3 : 0	1 : 0	0 : 0	1 : 0	1 : 0	2 : 1	1 : 1	0 : 0
Stability of the data	0 : 0	2 : 0	0 : 0	0 : 0	0 : 0	0 : 0	5 : 0	3 : 1	0 : 0
	0 : 0	2 : 0	0 : 0	0 : 0	0 : 0	0 : 0	5 : 0	3 : 1	0 : 0
Well characterised uncertainties	0 : 0	0 : 0	0 : 0	0 : 0	0 : 1	0 : 0	3 : 2	1 : 2	0 : 0
	0 : 1	0 : 1	0 : 1	0 : 0	0 : 1	0 : 0	2 : 3	0 : 3	0 : 0
Depth that the SST corresponds to	1 : 0	2 : 0	1 : 0	0 : 0	1 : 1	0 : 0	1 : 1	1 : 1	0 : 0
	1 : 0	2 : 0	1 : 0	0 : 0	1 : 1	0 : 0	1 : 1	1 : 1	0 : 0
Format of the data files	0 : 0	1 : 1	0 : 0	0 : 0	1 : 0	2 : 0	10 : 1	6 : 1	0 : 0
	0 : 0	1 : 1	0 : 0	0 : 0	1 : 0	2 : 0	10 : 1	6 : 1	0 : 0
Timeliness of data delivery	1 : 0	2 : 1	1 : 1	0 : 0	2 : 0	2 : 0	2 : 0	0 : 0	0 : 0
	1 : 0	2 : 1	1 : 1	0 : 0	2 : 0	2 : 0	2 : 0	0 : 0	0 : 0
Reliability of the data delivery	0 : 0	2 : 0	0 : 0	0 : 0	0 : 0	1 : 0	2 : 0	2 : 0	0 : 0
	0 : 0	2 : 0	0 : 0	0 : 0	0 : 0	1 : 0	2 : 1	2 : 1	0 : 0
Length of the data record	0 : 1	3 : 3	1 : 1	0 : 0	1 : 3	0 : 2	15 : 1	9 : 1	0 : 0
	0 : 1	3 : 4	1 : 1	0 : 1	1 : 3	0 : 3	15 : 1	9 : 1	0 : 0
Reputation of the data	1 : 0	6 : 0	3 : 0	0 : 0	3 : 0	1 : 0	12 : 0	9 : 0	0 : 0
	1 : 0	6 : 0	3 : 0	0 : 0	3 : 0	1 : 0	12 : 1	9 : 0	0 : 0
Other	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 1	1 : 0	0 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 1	1 : 0	0 : 0	0 : 0

Climate variability

	HadISST1	Reynolds et al Daily OI (2007)	Reynolds et al OI v2 (2002)	RSS MWOI merged analysis (9 km)	Kaplan et al (1998)	ERSST v3	COBE	OSTIA
Spatial resolution	7 : 5	4 : 0	4 : 0	1 : 0	1 : 2	3 : 1	0 : 1	0 : 0
	6 : 7	3 : 3	4 : 2	1 : 0	1 : 2	2 : 5	0 : 1	0 : 0
On a suitable grid for this application	6 : 1	1 : 0	2 : 0	1 : 0	2 : 2	1 : 0	0 : 0	0 : 0
	5 : 2	1 : 0	2 : 0	0 : 0	2 : 2	1 : 1	0 : 0	0 : 0
Analysis frequency	2 : 2	5 : 0	5 : 0	1 : 0	0 : 1	2 : 1	0 : 0	0 : 0
	2 : 2	4 : 1	5 : 0	0 : 0	0 : 1	1 : 2	0 : 0	0 : 0
The bias characteristics	0 : 2	2 : 0	1 : 0	0 : 0	0 : 1	1 : 1	0 : 0	0 : 0
	0 : 3	2 : 0	1 : 0	0 : 0	0 : 2	1 : 2	0 : 1	0 : 0
The precision of the data	1 : 4	3 : 0	2 : 0	1 : 0	0 : 2	0 : 2	0 : 0	0 : 0
	1 : 4	3 : 0	2 : 1	0 : 0	0 : 2	0 : 3	0 : 0	0 : 0
The stability of the data	4 : 1	4 : 0	4 : 0	1 : 0	2 : 1	3 : 0	0 : 0	0 : 0
	4 : 1	4 : 0	4 : 0	0 : 0	2 : 1	3 : 0	0 : 0	0 : 0
Well characterised uncertainties	1 : 3	2 : 1	3 : 0	0 : 0	0 : 2	2 : 4	0 : 0	0 : 0
	1 : 4	2 : 1	2 : 1	0 : 0	0 : 2	1 : 5	0 : 0	0 : 0
Depth that the SST corresponds to	0 : 0	0 : 1	0 : 1	0 : 1	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 1	0 : 1	0 : 1	0 : 1	0 : 1	0 : 1	0 : 0	0 : 0
The format of the data files	9 : 1	2 : 0	6 : 0	0 : 0	3 : 0	7 : 0	0 : 0	0 : 0
	9 : 1	2 : 0	6 : 0	0 : 0	3 : 0	7 : 0	0 : 0	0 : 0
Timeliness of data delivery	3 : 0	0 : 0	4 : 0	0 : 0	0 : 0	4 : 0	0 : 0	0 : 0
	3 : 0	0 : 0	4 : 0	0 : 0	0 : 0	4 : 0	0 : 0	0 : 0
Reliability of the data delivery	3 : 0	0 : 0	3 : 0	0 : 0	0 : 0	4 : 0	0 : 0	0 : 0
	3 : 0	0 : 0	3 : 0	0 : 0	0 : 0	4 : 0	0 : 0	0 : 0
The length of the data record	13 : 2	1 : 3	3 : 3	0 : 1	4 : 2	6 : 1	2 : 0	0 : 0
	12 : 2	1 : 4	3 : 3	0 : 1	3 : 2	6 : 1	2 : 0	0 : 0
The reputation of the data	10 : 1	1 : 0	3 : 0	0 : 0	2 : 1	4 : 0	0 : 0	0 : 0
	10 : 1	1 : 0	3 : 0	0 : 0	2 : 1	4 : 0	0 : 0	0 : 0
Other	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0

Climate variability

	NOCS daily OI	RTG SST	FNMOC 10 km high res analysis	RAMSSA 9 km	Odyssea	Medspiration	Other
Spatial resolution	1 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
On a suitable grid for this application	1 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Analysis frequency	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The bias characteristics	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The precision of the data	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The stability of the data	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Well characterised uncertainties	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Depth that the SST corresponds to	0 : 0	0 : 1	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The format of the data files	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Timeliness of data delivery	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Reliability of the data delivery	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The length of the data record	1 : 0	0 : 1	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The reputation of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Other	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0

Ocean reanalysis

	HadISST1	Reynolds et al Daily OI (2007)	Reynolds et al OI v2 (2002)	RSS MWOI merged analysis (9 km)	Kaplan et al (1998)	ERSST v3	COBE	OSTIA
Spatial resolution	0 : 1 **0 : 1**	0 : 0 **0 : 0**	0 : 1 **0 : 1**	0 : 0 **0 : 0**	0 : 1 **0 : 1**	0 : 0 **0 : 0**	0 : 0 **0 : 1**	1 : 0 **1 : 0**
On a suitable grid for this application	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Analysis frequency	0 : 0 **0 : 1**	0 : 0 **0 : 1**	0 : 0 **0 : 1**	0 : 0 **0 : 1**	0 : 0 **0 : 1**	0 : 0 **0 : 1**	0 : 0 **0 : 1**	0 : 0 **0 : 1**
The bias characteristics	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**	1 : 0 **1 : 0**
The precision of the data	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 1 **0 : 1**	1 : 0 **1 : 0**
The stability of the data	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Well characterised uncertainties	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Depth that the SST corresponds to	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
The format of the data files	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Timeliness of data delivery	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Reliability of the data delivery	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
The length of the data record	1 : 0 **1 : 0**	1 : 0 **1 : 0**	1 : 0 **1 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**	0 : 0 **0 : 0**	1 : 0 **1 : 0**	0 : 0 **0 : 0**
The reputation of the data	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**
Other	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**	0 : 0 **0 : 0**

Ocean reanalysis

	NOCS daily OI	RTG SST	FNMOC 10 km high res analysis	RAMSSA 9 km	Odyssea	Medspiration	Other
Spatial resolution	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 1
On a suitable grid for this application	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Analysis frequency	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The bias characteristics	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The precision of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The stability of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 1
Well characterised uncertainties	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Depth that the SST corresponds to	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The format of the data files	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Timeliness of data delivery	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Reliability of the data delivery	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The length of the data record	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 1
The reputation of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Other	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0

Atmospheric reanalysis

	HadISST1	Reynolds et al Daily OI (2007)	Reynolds et al OI v2 (2002)	RSS MWOI merged analysis (9 km)	Kaplan et al (1998)	ERSST v3	COBE	OSTIA
Spatial resolution	0 : 1 0 : 1	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 0
On a suitable grid for this application	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Analysis frequency	0 : 1 0 : 1	1 : 0 0 : 1	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
The bias characteristics	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
The precision of the data	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 0
The stability of the data	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Well characterised uncertainties	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Depth that the SST corresponds to	0 : 0 0 : 1	0 : 0 0 : 1	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
The format of the data files	1 : 0 1 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Timeliness of data delivery	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Reliability of the data delivery	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
The length of the data record	1 : 0 1 : 0	0 : 1 0 : 1	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 1 0 : 1
The reputation of the data	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Other	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0

Atmospheric reanalysis

	NOCS daily OI	RTG SST	FNMOC 10 km high res analysis	RAMSSA 9 km	Odyssea	Medspiration	Other
Spatial resolution	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
On a suitable grid for this application	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Analysis frequency	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The bias characteristics	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The precision of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The stability of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Well characterised uncertainties	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Depth that the SST corresponds to	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The format of the data files	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Timeliness of data delivery	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Reliability of the data delivery	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The length of the data record	0 : 0	1 : 1	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The reputation of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Other	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0

Ocean biology or chemistry

	ATSR series	AVHRR Pathfinder V5	Other AVHRR	SEVIRI	AMSR−E	TMI	HadSST2	ICOADS	Other
Spatial resolution	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	1 : 0 / **1 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 2 / **0 : 2**	0 : 1 / **0 : 1**	0 : 0 / **0 : 0**
Spatial sampling	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 1 / **0 : 1**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**
Grid	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	2 : 1 / **2 : 1**	0 : 0 / **0 : 0**	1 : 0 / **1 : 0**
Frequency of observations	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	1 : 0 / **1 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	1 : 0 / **1 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**
Bias characteristics	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**
Precision of the data	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	1 : 0 / **1 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	1 : 0 / **1 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**
Stability of the data	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	1 : 0 / **1 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	1 : 0 / **1 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**
Well characterised uncertainties	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**
Depth that the SST corresponds to	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	1 : 0 / **1 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	1 : 0 / **1 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**
Format of the data files	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 1 / **0 : 1**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	1 : 1 / **1 : 1**	1 : 0 / **1 : 0**	0 : 0 / **0 : 0**
Timeliness of data delivery	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**
Reliability of the data delivery	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	1 : 0 / **1 : 0**	1 : 0 / **1 : 0**	0 : 0 / **0 : 0**
Length of the data record	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	1 : 0 / **1 : 0**	1 : 0 / **1 : 0**	0 : 0 / **0 : 0**
Reputation of the data	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	2 : 0 / **2 : 0**	1 : 0 / **1 : 0**	1 : 0 / **1 : 0**
Other	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	0 : 0 / **0 : 0**	1 : 0 / **1 : 0**

Ocean biology or chemistry

	HadISST1	Reynolds et al Daily OI (2007)	Reynolds et al OI v2 (2002)	RSS MWOI merged analysis (9 km)	Kaplan et al (1998)	ERSST v3	COBE	OSTIA
Spatial resolution	0 : 2 / 0 : 2	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
On a suitable grid for this application	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Analysis frequency	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
The bias characteristics	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
The precision of the data	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
The stability of the data	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Well characterised uncertainties	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Depth that the SST corresponds to	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
The format of the data files	0 : 0 / 0 : 1	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Timeliness of data delivery	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Reliability of the data delivery	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
The length of the data record	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
The reputation of the data	2 : 0 / 2 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Other	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0

Coastal oceanography

	ATSR series	AVHRR Pathfinder V5	Other AVHRR	SEVIRI	AMSR−E	TMI	HadSST2	ICOADS	Other
Spatial resolution	1 : 0 / 1 : 0	1 : 0 / 1 : 1	2 : 0 / 2 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 1 / 0 : 1	0 : 1 / 0 : 1	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Spatial sampling	0 : 0 / 0 : 0	0 : 0 / 0 : 1	1 : 0 / 1 : 1	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Grid	0 : 0 / 0 : 0	1 : 0 / 1 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0
Frequency of observations	0 : 1 / 0 : 1	0 : 0 / 0 : 1	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Bias characteristics	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 1 / 0 : 1	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Precision of the data	1 : 0 / 1 : 0	1 : 0 / 1 : 0	2 : 0 / 2 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Stability of the data	1 : 0 / 1 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Well characterised uncertainties	1 : 0 / 1 : 0	1 : 0 / 1 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Depth that the SST corresponds to	1 : 0 / 1 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 1 / 0 : 1	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Format of the data files	1 : 0 / 1 : 0	1 : 0 / 1 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 1 / 0 : 1	1 : 0 / 1 : 0	0 : 0 / 0 : 0
Timeliness of data delivery	1 : 0 / 1 : 0	1 : 0 / 1 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0
Reliability of the data delivery	1 : 0 / 1 : 0	1 : 0 / 1 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0
Length of the data record	0 : 0 / 0 : 0	1 : 0 / 1 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 1 / 0 : 1	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0
Reputation of the data	1 : 0 / 1 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 1 / 0 : 1	0 : 0 / 0 : 0
Other	0 : 1 / 0 : 1	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0

Coastal oceanography

	HadISST1	Reynolds et al Daily OI (2007)	Reynolds et al OI v2 (2002)	RSS MWOI merged analysis (9 km)	Kaplan et al (1998)	ERSST v3	COBE	OSTIA
Spatial resolution	0 : 0 0 : 0	0 : 1 0 : 1	1 : 1 1 : 1	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 0
On a suitable grid for this application	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 0
Analysis frequency	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 1
The bias characteristics	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
The precision of the data	0 : 0 0 : 0	0 : 0 0 : 1	0 : 0 0 : 1	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
The stability of the data	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Well characterised uncertainties	0 : 0 0 : 0	1 : 0 1 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Depth that the SST corresponds to	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
The format of the data files	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Timeliness of data delivery	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 1
Reliability of the data delivery	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
The length of the data record	0 : 0 0 : 0	1 : 0 1 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 1 0 : 1
The reputation of the data	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Other	0 : 0 0 : 0	0 : 1 0 : 1	0 : 1 0 : 1	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0

Coastal oceanography

	NOCS daily OI	RTG SST	FNMOC 10 km high res analysis	RAMSSA 9 km	Odyssea	Medspiration	Other
Spatial resolution	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 0	0 : 0
On a suitable grid for this application	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 0	0 : 0
Analysis frequency	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 0	0 : 0
The bias characteristics	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The precision of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The stability of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Well characterised uncertainties	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Depth that the SST corresponds to	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The format of the data files	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Timeliness of data delivery	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 1	0 : 0
Reliability of the data delivery	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The length of the data record	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 1	0 : 0
The reputation of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Other	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0

Dataset production

	ATSR series	AVHRR Pathfinder V5	Other AVHRR	SEVIRI	AMSR−E	TMI	HadSST2	ICOADS	Other
Spatial resolution	2 : 0	2 : 0	1 : 0	0 : 0	0 : 1	0 : 0	1 : 1	0 : 1	0 : 0
	2 : 0	2 : 0	1 : 0	0 : 0	0 : 1	0 : 0	0 : 2	0 : 1	0 : 0
Spatial sampling	1 : 1	2 : 2	1 : 1	0 : 0	1 : 0	0 : 0	0 : 1	1 : 3	0 : 0
	1 : 1	2 : 2	1 : 1	0 : 0	1 : 0	0 : 0	0 : 1	1 : 3	0 : 0
Grid	1 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0
	1 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0
Frequency of observations	0 : 2	1 : 1	0 : 1	0 : 0	1 : 1	0 : 0	0 : 1	1 : 2	0 : 0
	0 : 2	1 : 1	0 : 1	0 : 0	1 : 1	0 : 0	0 : 2	1 : 2	0 : 0
Bias characteristics	3 : 0	1 : 1	0 : 1	0 : 0	1 : 0	0 : 0	1 : 2	0 : 2	0 : 0
	3 : 0	1 : 1	0 : 1	0 : 0	1 : 0	0 : 0	1 : 2	0 : 2	0 : 0
Precision of the data	2 : 0	1 : 0	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	2 : 0	0 : 1	0 : 0	0 : 0	1 : 0	0 : 0	0 : 1	0 : 1	0 : 0
Stability of the data	3 : 0	1 : 1	0 : 1	0 : 0	1 : 0	0 : 0	0 : 1	0 : 2	0 : 0
	3 : 0	1 : 1	0 : 1	0 : 0	1 : 0	0 : 0	0 : 1	0 : 2	0 : 0
Well characterised uncertainties	0 : 0	1 : 1	0 : 1	0 : 0	1 : 1	0 : 0	1 : 2	0 : 2	0 : 0
	0 : 0	1 : 1	0 : 1	0 : 0	1 : 1	0 : 0	1 : 2	0 : 2	0 : 0
Depth that the SST corresponds to	1 : 1	0 : 1	0 : 1	0 : 1	1 : 1	0 : 1	0 : 1	1 : 1	0 : 0
	1 : 1	0 : 2	0 : 1	0 : 1	1 : 1	0 : 1	0 : 1	1 : 1	0 : 0
Format of the data files	1 : 0	1 : 0	0 : 0	0 : 0	1 : 0	0 : 0	1 : 0	1 : 0	0 : 0
	1 : 0	1 : 0	0 : 0	0 : 0	1 : 0	0 : 0	0 : 1	1 : 0	0 : 0
Timeliness of data delivery	1 : 0	1 : 1	1 : 0	0 : 0	2 : 0	0 : 0	2 : 0	0 : 0	0 : 0
	1 : 0	1 : 1	1 : 0	0 : 0	2 : 0	0 : 0	1 : 1	0 : 1	0 : 0
Reliability of the data delivery	1 : 1	0 : 1	0 : 1	0 : 1	0 : 1	0 : 1	1 : 1	0 : 1	0 : 0
	1 : 1	0 : 1	0 : 1	0 : 1	0 : 1	0 : 1	1 : 1	0 : 1	0 : 0
Length of the data record	1 : 2	2 : 1	0 : 1	0 : 1	0 : 1	0 : 1	1 : 1	3 : 1	0 : 0
	1 : 2	2 : 1	0 : 1	0 : 1	0 : 1	0 : 1	1 : 1	3 : 1	0 : 0
Reputation of the data	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 0	1 : 0	0 : 0
	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 0	1 : 0	0 : 0
Other	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	1 : 0	0 : 0

Dataset production

	HadISST1	Reynolds et al Daily OI (2007)	Reynolds et al OI v2 (2002)	RSS MWOI merged analysis (9 km)	Kaplan et al (1998)	ERSST v3	COBE	OSTIA
Spatial resolution	2 : 1	2 : 1	1 : 2	1 : 0	0 : 1	0 : 0	0 : 0	1 : 0
	2 : 1	2 : 1	1 : 2	1 : 0	0 : 1	0 : 0	0 : 0	1 : 0
On a suitable grid for this application	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Analysis frequency	1 : 1	1 : 0	1 : 1	0 : 0	0 : 1	0 : 1	0 : 0	1 : 0
	1 : 1	1 : 0	1 : 1	0 : 0	0 : 1	0 : 1	0 : 0	1 : 0
The bias characteristics	2 : 0	2 : 0	1 : 0	1 : 0	0 : 0	0 : 1	0 : 0	1 : 0
	2 : 0	2 : 0	1 : 0	0 : 0	0 : 0	0 : 1	0 : 0	1 : 0
The precision of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The stability of the data	0 : 0	1 : 0	1 : 0	1 : 1	1 : 0	0 : 1	0 : 0	0 : 0
	0 : 0	1 : 0	1 : 0	0 : 1	1 : 0	0 : 1	0 : 0	0 : 0
Well characterised uncertainties	1 : 1	1 : 1	0 : 1	0 : 1	0 : 1	0 : 1	0 : 0	0 : 1
	1 : 1	1 : 1	0 : 1	0 : 1	0 : 1	0 : 1	0 : 0	0 : 1
Depth that the SST corresponds to	0 : 1	1 : 1	1 : 1	0 : 1	0 : 1	0 : 1	0 : 0	1 : 0
	0 : 1	1 : 1	1 : 1	0 : 1	0 : 1	0 : 1	0 : 0	1 : 0
The format of the data files	1 : 0	1 : 0	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	1 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Timeliness of data delivery	0 : 0	1 : 0	1 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	1 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Reliability of the data delivery	1 : 0	1 : 0	1 : 0	0 : 0	1 : 0	1 : 0	0 : 0	0 : 0
	1 : 0	1 : 0	1 : 0	0 : 0	1 : 0	1 : 0	0 : 0	0 : 0
The length of the data record	2 : 1	3 : 0	2 : 0	0 : 1	1 : 1	1 : 0	0 : 0	0 : 1
	2 : 1	3 : 0	2 : 0	0 : 1	1 : 1	1 : 0	0 : 0	0 : 1
The reputation of the data	2 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	2 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Other	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0

Dataset production

	NOCS daily OI	RTG SST	FNMOC 10 km high res analysis	RAMSSA 9 km	Odyssea	Medspiration	Other
Spatial resolution	1 : 0	1 : 0	1 : 0	1 : 0	1 : 0	0 : 0	0 : 0
On a suitable grid for this application	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Analysis frequency	1 : 0	0 : 1	1 : 0	0 : 1	0 : 1	0 : 0	0 : 0
The bias characteristics	0 : 0	0 : 1	0 : 1	0 : 1	0 : 1	0 : 0	0 : 0
The precision of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
The stability of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Well characterised uncertainties	1 : 0	0 : 1	0 : 1	0 : 1	0 : 1	0 : 0	0 : 0
Depth that the SST corresponds to	0 : 0	0 : 1	0 : 1	0 : 1	0 : 1	0 : 0	0 : 0
The format of the data files	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Timeliness of data delivery	0 : 0	1 : 0	1 : 0	1 : 0	0 : 0	0 : 0	0 : 0
Reliability of the data delivery	0 : 0	1 : 0	1 : 0	1 : 0	0 : 0	0 : 0	0 : 0
The length of the data record	1 : 0	0 : 1	0 : 1	0 : 1	0 : 1	0 : 0	0 : 0
The reputation of the data	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Other	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0

Clouds

	ATSR series	AVHRR Pathfinder V5	Other AVHRR	SEVIRI	AMSR–E	TMI	HadSST2	ICOADS	Other
Spatial resolution	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 1 / 0 : 1	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Spatial sampling	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Grid	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Frequency of observations	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Bias characteristics	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 1 / 0 : 1	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Precision of the data	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Stability of the data	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Well characterised uncertainties	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 1 / 0 : 1	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Depth that the SST corresponds to	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Format of the data files	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Timeliness of data delivery	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Reliability of the data delivery	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Length of the data record	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Reputation of the data	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	1 : 0 / 1 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0
Other	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0	0 : 0 / 0 : 0

Sea ice

	ATSR series	AVHRR Pathfinder V5	Other AVHRR	SEVIRI	AMSR−E	TMI	HadSST2	ICOADS	Other
Spatial resolution	1 : 0 1 : 0	0 : 0 0 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 1 0 : 1	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Spatial sampling	0 : 1 0 : 1	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Grid	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Frequency of observations	0 : 1 0 : 1	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Bias characteristics	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 1 0 : 1	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Precision of the data	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 1 0 : 1	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Stability of the data	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Well characterised uncertainties	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Depth that the SST corresponds to	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Format of the data files	1 : 0 1 : 0	0 : 0 0 : 0	1 : 0 1 : 0	0 : 0 0 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Timeliness of data delivery	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Reliability of the data delivery	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Length of the data record	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Reputation of the data	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Other	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0

Other

	ATSR series	AVHRR Pathfinder V5	Other AVHRR	SEVIRI	AMSR−E	TMI	HadSST2	ICOADS	Other
Spatial resolution	4 : 0 4 : 0	4 : 0 4 : 0	6 : 0 6 : 0	0 : 0 0 : 0	0 : 3 0 : 3	1 : 2 1 : 3	3 : 3 3 : 4	2 : 4 2 : 4	0 : 0 0 : 0
Spatial sampling	0 : 4 0 : 4	0 : 2 0 : 2	1 : 3 1 : 3	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 1 0 : 1	0 : 5 0 : 5	0 : 0 0 : 1
Grid	0 : 0 0 : 0	4 : 0 4 : 0	4 : 0 4 : 0	0 : 0 0 : 0	1 : 0 1 : 0	2 : 0 2 : 0	2 : 0 2 : 0	2 : 0 2 : 0	0 : 0 0 : 0
Frequency of observations	0 : 3 0 : 3	3 : 1 3 : 1	3 : 0 2 : 1	2 : 0 2 : 0	3 : 1 2 : 1	3 : 0 3 : 1	3 : 0 2 : 1	0 : 2 0 : 2	0 : 0 0 : 0
Bias characteristics	2 : 0 2 : 0	1 : 1 1 : 1	0 : 1 0 : 1	0 : 0 0 : 0	1 : 1 1 : 1	0 : 1 0 : 1	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Precision of the data	3 : 0 3 : 0	1 : 0 1 : 1	1 : 1 1 : 2	1 : 0 1 : 0	1 : 0 1 : 1	1 : 0 1 : 1	0 : 3 0 : 3	1 : 0 1 : 0	0 : 0 0 : 1
Stability of the data	0 : 0 0 : 0	2 : 0 2 : 0	1 : 0 1 : 0	0 : 0 0 : 0	1 : 0 1 : 1	0 : 0 0 : 1	2 : 0 2 : 0	1 : 0 1 : 0	0 : 0 0 : 0
Well characterised uncertainties	1 : 0 1 : 0	1 : 2 1 : 2	0 : 3 0 : 3	0 : 0 0 : 0	0 : 0 0 : 1	1 : 2 1 : 2	1 : 0 1 : 1	0 : 0 0 : 0	0 : 1 0 : 2
Depth that the SST corresponds to	1 : 0 1 : 0	0 : 0 0 : 0	1 : 0 1 : 0	0 : 0 0 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Format of the data files	1 : 0 1 : 0	0 : 1 0 : 1	3 : 0 3 : 0	2 : 0 2 : 0	4 : 0 4 : 0	2 : 0 2 : 0	1 : 1 1 : 1	1 : 0 1 : 0	0 : 1 0 : 1
Timeliness of data delivery	1 : 0 1 : 0	2 : 0 2 : 0	2 : 0 2 : 0	1 : 0 1 : 0	3 : 0 3 : 0	1 : 0 1 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Reliability of the data delivery	1 : 0 1 : 0	1 : 0 1 : 0	2 : 0 2 : 0	1 : 0 1 : 0	2 : 0 2 : 0	1 : 0 1 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0
Length of the data record	0 : 1 0 : 1	4 : 1 4 : 1	3 : 1 3 : 1	0 : 1 0 : 1	0 : 1 0 : 1	0 : 1 0 : 1	6 : 0 6 : 0	6 : 0 6 : 0	0 : 0 0 : 0
Reputation of the data	2 : 0 2 : 0	4 : 0 4 : 0	1 : 0 1 : 0	0 : 0 0 : 0	1 : 0 1 : 0	1 : 1 1 : 1	3 : 0 3 : 0	2 : 0 2 : 0	0 : 0 0 : 0
Other	0 : 1 0 : 1	0 : 0 0 : 1	0 : 0 0 : 1	1 : 0 1 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 1	0 : 0 0 : 0

Other

	HadISST1	Reynolds et al Daily OI (2007)	Reynolds et al OI v2 (2002)	RSS MWOI merged analysis (9 km)	Kaplan et al (1998)	ERSST v3	COBE	OSTIA
Spatial resolution	3 : 1 2 : 2	2 : 3 2 : 3	2 : 2 2 : 2	1 : 0 1 : 0	0 : 2 0 : 2	1 : 2 1 : 3	0 : 1 0 : 1	0 : 1 0 : 2
On a suitable grid for this application	1 : 1 1 : 1	2 : 0 2 : 1	1 : 0 1 : 1	1 : 0 0 : 0	0 : 1 0 : 1	0 : 1 0 : 2	1 : 0 1 : 0	0 : 0 0 : 1
Analysis frequency	0 : 0 0 : 1	2 : 0 2 : 0	0 : 0 0 : 0	1 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 1
The bias characteristics	1 : 0 1 : 1	2 : 0 2 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 0
The precision of the data	2 : 1 2 : 2	0 : 1 0 : 1	0 : 0 0 : 0	0 : 1 0 : 1	0 : 1 0 : 1	0 : 1 0 : 1	1 : 0 1 : 0	1 : 0 1 : 0
The stability of the data	0 : 0 0 : 1	2 : 0 2 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 0
Well characterised uncertainties	0 : 0 0 : 1	1 : 1 1 : 1	0 : 0 0 : 0	0 : 1 0 : 1	0 : 0 0 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 1 0 : 1
Depth that the SST corresponds to	0 : 0 0 : 0	0 : 1 0 : 1	0 : 0 0 : 0	1 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 1
The format of the data files	3 : 0 3 : 0	4 : 0 4 : 0	2 : 0 2 : 0	1 : 0 0 : 0	1 : 0 1 : 0	2 : 0 2 : 0	0 : 0 0 : 0	2 : 0 1 : 1
Timeliness of data delivery	1 : 0 1 : 0	1 : 0 1 : 0	1 : 0 1 : 0	0 : 0 0 : 0	1 : 0 1 : 0	1 : 0 1 : 0	0 : 0 0 : 0	1 : 0 0 : 1
Reliability of the data delivery	1 : 0 1 : 1	3 : 0 3 : 0	2 : 0 2 : 0	1 : 0 0 : 0	1 : 0 1 : 0	1 : 0 1 : 0	0 : 0 0 : 0	2 : 0 1 : 1
The length of the data record	9 : 0 9 : 0	2 : 1 2 : 1	1 : 1 1 : 1	1 : 0 0 : 0	2 : 0 2 : 0	5 : 0 5 : 0	2 : 0 2 : 0	0 : 1 0 : 2
The reputation of the data	3 : 0 3 : 0	2 : 0 2 : 0	1 : 0 1 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	1 : 0 1 : 0	0 : 0 0 : 0
Other	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0	0 : 0 0 : 0

Other

	NOCS daily OI	RTG SST	FNMOC 10 km high res analysis	RAMSSA 9 km	Odyssea	Medspiration	Other
Spatial resolution	0 : 0	1 : 0	0 : 0	1 : 0	1 : 0	0 : 0	0 : 0
On a suitable grid for this application	0 : 0	0 : 0	0 : 0	1 : 0	1 : 0	0 : 0	0 : 0
Analysis frequency	0 : 0	0 : 0	0 : 0	1 : 0	1 : 0	0 : 0	0 : 0
The bias characteristics	0 : 0	0 : 0	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0
The precision of the data	0 : 0	0 : 0	0 : 0	1 : 0	1 : 0	0 : 0	0 : 0
The stability of the data	0 : 0	0 : 0	0 : 0	1 : 0	0 : 1	0 : 0	0 : 0
Well characterised uncertainties	0 : 0	0 : 0	0 : 0	0 : 0	0 : 1	0 : 1	0 : 0
Depth that the SST corresponds to	0 : 0	0 : 0	0 : 0	1 : 0	1 : 0	0 : 0	0 : 0
The format of the data files	0 : 0	0 : 0	0 : 0	1 : 0	1 : 0	0 : 0	0 : 0
Timeliness of data delivery	0 : 0	0 : 0	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0
Reliability of the data delivery	0 : 0	0 : 0	0 : 0	1 : 0	0 : 1	0 : 0	0 : 0
The length of the data record	0 : 0	0 : 1	0 : 0	0 : 0	0 : 1	0 : 1	0 : 0
The reputation of the data	0 : 0	1 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0
Other	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0	0 : 0

APPENDIX B DISCUSSION SESSION SUMMARIES

The following are summaries of three discussions sessions held at the Met Office Hadley Centre. The agenda at each was:

- Round the table introduction and how do you currently use SST data?
- Project briefing
- Questions
- Discussion:
    - o Thinking ahead five years, how do you think your use of SST might change?
    - o What would make you want to use the sst_cci products? What would satisfy you that they met your needs?
    - o What would/could prevent you from using the sst_cci products? (Model developments needed?)
    - o If you were given the prototype sst_cci products, what could you do with them?

B.1 Discussion on 01/09/2010

Led by: Nick Rayner

Potential users present:

Peili Wu, *Senior Research Scientist, Global Water Cycle Group, Understanding Climate Change, Met Office Hadley Centre* – identified in summary by HC (Hydrological Cycle)

Alberto Arribas, *Seasonal Forecasting Manager, Met Office Hadley Centre* – SF (Seasonal Forecasting)

Dan Copsey, *Climate Scientist, Global Coupled Model Development, Met Office Hadley Centre* – CM (Climate Modelling)

Matt Palmer, *Manager of Ocean Model Evaluation, Met Office Hadley Centre* – ME (Model Evaluation)

Pete Falloon, *Manager of Impacts Model Development, Met Office Hadley Centre* – CI (Climate Impacts)

B.1.1 How do you currently use SST data?

Identifier	Response
HC	Explore decadal variability of air/sea interactions and ocean heat content change. In future we will examine how SSTs affect the hydrological cycle.
SF	Initialisation of routine seasonal forecast. Verification of seasonal forecast system. Use analysis for hindcasts of decadal

Identifier	**Response**
	system.
CM	Forcing atmosphere-only GCM. Compare long coupled climate simulations with climatology.
ME	Calculate ocean metrics describing teleconnections and variability in geographical regions for verification of coupled climate simulations. Explore the relationship between SST and other variables, e.g. precip. Indirectly, through generation of forcing data, e.g. reanalyses, used in ocean-only simulations, but not directly assimilated.
CI	Regional models, driven by SST, are run for commercial activities. Create updated climatologies based on a blend of recent observations and decadal predictions.

B.1.2 Thinking ahead five years, how do you think your use of SST might change?

Name	**Response**
HC	If good quality can do something meaningful. Useful for constraining future projections.
SF	Higher resolution, at least ¼ degree. Create multiple analyses of ocean data via assimilation. Uncertainties useful. Need real time. Timely within hours. Assimilation of the diurnal cycle should be developed in next five years.
CM	Currently use daily SST to drive AGCM. In five years will need 3-hourly SST. Will need higher spatial resolution. It would be good to have something to compare diurnal cycle simulation to currently.
ME	Use NEMO at two resolutions: ¼ degree and 1/12 degree. Unlikely to go much above 1/12 degree in UK in next five years. Diurnal cycle will be resolved. An hourly climatology of the diurnal cycle might be useful for validation. Could look at sub region (using SEVIRI). Be clear about using 1-d model here.
CI	Statistical relationships/models of crop yields etc. Range of indices to use. Blending near term modelling with recent past to calculate climatologies. Could potentially use a lot.

B.1.3 What would make you want to use the sst_cci products? What would satisfy you that they met your needs?

Identifier	**Response**
HC	Demonstration of better quality and better coverage. Easy format. Less bureaucracy. Easy to download. Has error bars. Clear definition of all aspects of the products and concise instructions. Award for best scientific outputs.
SF	Timeliness. Real time L2 data. Verified with in situ.

Identifier	**Response**
	Uncertainties for hindcasts. Available on GTS. Coverage in Arctic. Need to include in situ too.
CM	Inland seas, e.g. Aral, Gt Lakes and bigger. Which lakes will be available? SSTskin. Sea ice data to go with SST.
ME	Needs to be clear what you are getting in addition relative to Reynolds ¼ degree, HadISST1, etc. 10m profile? For validating top of ocean model. Compare products against existing products.

B.1.4 What would/could prevent you from using the sst_cci products? (Model developments needed?)

Identifier	**Response**
SF	Lack of timeliness. Includes only satellite data (need all data for verification).
CM	Lack of sea ice data would make it more awkward.
CI	Large uncertainties across sensors, so little could be gained. Are there issues of IPR for commercial use? Develop ways to use them for crop index modelling.
Generally	Opposites of what went before.

B.1.5 If you were given the prototype sst_cci products, what could you do with them?

Identifier	**Response**
HC	Air/sea coupling, e.g. NAO. Air/sea fluxes - look at how they're different. How SSTs change pattern of the hydrological cycle and model validation (with long-term data set).
SF	Hindcast 1991-2010.
CM	Force latest AGCMs and compare to latest CGCMs. AMIP run using higher resolution SSTs.
ME	Test impact. Is 1991-2010 any different? Use as a baseline for assessing SST biases in ORCA025. Could test ORCA1/12th degree (NOCS)
CI	As mentioned before. Variability and sensitivity. forecasts/hindcasts. Both data sets might be of interest. New regional runs and new climatologies.

B.2 Discussion on 02/09/2010

Led by: Nick Rayner

Potential users present:

Doug Smith, *Manager of Decadal Climate Prediction, Met Office Hadley Centre* – identified in summary by DF (Decadal Forecasting)

Paul Halloran, *Research Scientist Biogeochemical Modelling, Met Office Hadley Centre* – BM (Biogeochemical Modelling)

John Kennedy, *Climate Monitoring and Research Scientist, Met Office Hadley Centre* – CM (Climate Monitoring)

Malcolm Roberts, *Manager High Resolution Global Climate Modelling, Met Office Hadley Centre* – HR (High Resolution climate modelling)

B.2.1 How do you currently use SST data?

Identifier	Response
DF	Initialising decadal climate predictions. Included in the ocean analysis and information spread downwards beneath the surface. Evaluate forecasts and assessment of climate variability.
BM	Validation of physical model. Calculating biogeochemical parameters, e.g. CO2 concentration. Assess which components introduce error in CO2 concentration. Air/sea gas flux. Parameterising DMS (modelled using chlorophyll and SST). Test parameterisations (which all use SST) for other things that we can't explicitly model. Model error in SST – calculate parameters.
CM	Blend with land temperature and calculate global and regional averages. Monitor the current state of the climate. Write reports on this including pictures and how current climate fits with long term trend. Compare to our SST analyses. Create SST analyses.
HR	Driving AGCM (resolution can be important). Model validation. Coupled model is coupled every 3 hours. No data sets to validate diurnal cycle. Length of data set is important (>30 years). When NWP model is coupled, resolution will be important; 1/4 degree ocean.

B.2.2 Thinking ahead five years, how do you think your use of SST might change?

Identifier	Response
DF	Higher resolution ~ ¼ degree. Data need to be received within a month. Needs to be accurate and all together, (i.e. surface and sub-surface measurements)
BM	Driving biogeochemical models (1-d at present, if successful will be developed further) without physical models. SST for air/sea fluxes of gases. Requirements will depend on other data sets. Will be interesting to look at effect of resolution on

Identifier	Response
	biogeochemistry. Currently couple daily, which is a major limitation. Would be useful to test effects of higher temporal resolution. Benthic respiration is temperature sensitive, leads to anoxic areas – would like to explore this. Monitoring carbon fluxes - using SST to see where ocean is absorbing/emitting. Link freshwater to the ocean.
CM	People want answers quickly (e.g. annual average temperatures far before the year has ended), this will be an increasing trend. Regional monitoring, e.g. UK MCCIP, need information on small regions around coastal waters. Extremes of SST not currently tackled. Maximum SSTs have effects on corals. No good measurements at present in the Arctic. Important to monitor new ice-free areas. In five years, we will need to keep a close eye on whether global temperature change is accelerating or decelerating – the measurements need to be really stable for this.
HR	Currently ocean model has a 1m top box (which represents an average of the top 1m of ocean). Ocean-only simulations will increase resolution to 1/12th degree. Information on how 1-d model derives diurnal cycle and changes with depth could be useful for how to best drive ocean-only models. Diurnal cycle: MJO timescales can be short – spinning up tropical cyclones. SST wake from tropical cyclones could be important for NWP. In the Southern Ocean the model currently has a 4 degree warm bias and it will be useful to compare this to improved SST data in this region. Combine with SSH and salinity in a combined analysis. 1-5km resolution regional models in 5 years (12km now). Cloud resolving models - if no data under cloud this is an issue. Commercial marine people in the Met Office need information on SST on specific days – this could be useful to them.

B.2.3 What would make you want to use the sst_cci products? What would satisfy you that they met your needs?

Identifier	Response
DF	Demonstrated accuracy and verified error bars. Comparison to existing data sets like HadISST1. Need sea ice compatible with SSTs. If flagged as -1.8C where observed sea ice, that would be fine.
BM	Right format, easy to use. Available on different resolutions so don't have to re-grid. Can select time period, flexible. Web page doesn't time out. Provision of annual averages/climatologies.
CM	Web page tested by users. Transparency – how data is processed. Ability to pick apart to look at different components. Pick data apart, test it and follow processing through (if incorporating into own analysis). Independent validation/verification by separate group.
HR	Don't have to spend weeks downloading. Can specify temporal

Identifier	Response
	resolution. Like for like comparisons against existing data sets. Filling algorithm available to use on model data to see effect on model. Need to provide sea ice mask.

B.2.4 What would/could prevent you from using the sst_cci products? (Model developments needed?)

Identifier	Response
DF	If somebody developed something even better
CM	If noone else used it. Restrictions on downloading (of any kind). If prototypes not updated until end of operationalisation phase. (HR: e.g. still waiting for forcing data sets needed to run simulation of sea ice minimum of 2007.)
HR	Having to average high resolution fields to the resolution you want. If it was very different from data sets you had used previously (although could eventually be persuaded if this was a good thing). Needs to be well QCed, e.g. sea ice around UK in Reynolds Daily OI.
Generally	Opposites of what went before.

B.2.5 If you were given the prototype sst_cci products, what could you do with them?

Identifier	Response
DF	Blend with other data and produce hindcast/forecast as do now.
BM	Use it instead of a different data set. Start to validate models in currently data sparse regions, e.g. the Arctic and west tropical Pacific
CM	Look at areas without in situ, e.g. Arctic, Southern Ocean, west tropical Pacific. Blend with high resolution land temperature data and use for monitoring reports.
HR	Validate diurnal cycle simulations from coupled model. Test IR vs IR/PM data sets under cloud. Radiation balance under clouds. Case studies, e.g. tropical cyclones. Could use 6-month prototype for this - testing model or validate from cold wake in the data set.

B.3 Discussion on 23/09/2010

Led by: Simon Good

Potential users present:

Jeff Knight, *Manager of Modelling Climate Variability, Met Office Hadley Centre* – identified in the summary as CV (Climate Variability)

Andrew Colman, *Senior Climate Analyst, Met Office Hadley Centre* – SF (Seasonal Forecasting)

B.3.1 How do you currently use SST data?

Identifier **Response**

CV

- Diagnose features in observed climate record e.g. variability of the AMO.
- Provide boundary conditions for model runs to study climate variability.

SF

- SST is the main tool in statistical models for seasonal forecasting. Regular forecasts are produced, some combining dynamical models with statistical models; there is a global scope to forecasts but some are region specific e.g. UK/Europe winter forecast.
- Also need SSTs to track how the seasonal forecast is doing and to supply collaborators with diagnostics.

B.3.2 Thinking ahead five years, how do you think your use of SST might change?

Identifier **Response**

CV

- With the move towards climate services, will want to produce diagnostics to demonstrate the performance of systems.
- Increasing need for up to date data e.g. for monitoring - better to have a first guess available and then refine it later than nothing at all.
- Use for investigations of high resolution interactions between the ocean and atmosphere (scales of few km).
- High resolution not so important for seasonal to decadal predictions as surface can dominate compared to the subsurface so interested in ~1 degree data. However, possibility of better assimilation schemes in next 3-4 years that could cope with high res.
- Subdaily data might be of use for studying some processes.
- Need for uncertainty information in the form of realisations that efficiently sample the N dimensional uncertainty space (of the order 10 realisations to match the size of ensembles that are run).

SF

- Important to have data with no more than 2-3 days delay.
- Currently focus on monthly fields but will want to move towards daily data.
- Doesn’t foresee use for subdaily data.
- Requirement for information that allows the calculation of uncertainties on larger fields e.g. global or regional averages.

B.3.3 What would make you want to use the sst_cci products? What would satisfy you that they met your needs?

Identifier **Response**

CV

- Good resolution, frequently updated in near real time.
- Experts on hand to advise on use.
- On the subject of backwards compatibility (see below), could breakpoint analysis (as is used for land temperature records etc.) be

Identifier	Response
	used to determine if there are jumps in the record between datasets?
SF	• Ease of use. • Backwards compatibility with older data is extremely important. Wants data before 1991 but also wants to take advantage of best available data, so it is important that the two are consistent. • Ease of access to the data. • Will rely on experts on SST observations for advice on what data to use – therefore it is important to have a good reputation with SST experts.
CV and SF	File format – NetCDF/Grib (NetCDF noted as becoming quite a standard way of storing data).

B.3.4 What would/could prevent you from using the sst_cci products? (Model developments needed?)

Identifier	Response
CV	• Use of highest resolution data for seasonal to decadal prediction will depend on developments in assimilation techniques. • The datasets won't be long enough for decadal forecast hindcasts – need compatibility with longer datasets. • Infilled data are desirable if they are to be used for display e.g. to show monitoring diagrams.
SF	• Use will depend on what other data are available – will use whatever is most suitable for application. • For seasonal applications need backward compatibility with longer datasets. • Wants data to be available within 2-3 days.
Generally	Opposites of what went before.

B.3.5 If you were given the prototype sst_cci products, what could you do with them?

Identifier	Response
CV	• Unlikely to want to go to effort of changing the seasonal and decadal forecasts for tests, would want to wait for the full operational system. • Might be useful for high resolution AMIP runs (although question mark about what would be used for the sea ice), at 10-20 km resolution.
SF	• Look at the how the data are different in diagnostics such as global temperature compared e.g. to reanalyses. • There might be possibilities with high resolution to look at sensitivity of marine life to temperature
CV and SF	• Depends a lot on what is happening at the time; the high resolution will open up possibilities in climate services such as to produce

detailed maps of temperature around the UK.

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