ESA Climate Change Initiative – Fire_cci
D1.2 Product Specification Document (PSD)

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Summary

This document is the version 6.3 of the Product Specification Document for the Fire_cci project. It refers to the product specifications of burned area products, according to the users requirements described in the User Requirements Document v5.1 document (Heil et al. 2016). It also includes information to create the small-fire dataset.

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Document Status Sheet

Issue	Date	Details
1.0	14/12/2010	First Document Issue (Draft)
1.4	27/01/2011	Second version
1.5	24/02/2011	Third major revision
1.6	21/03/2011	Adaption to ESA comments
1.7	10/05/2011	Minor adaption
2.0	20/06/2011	Minor adaption and changes
2.1	08/06/2012	Adaption and synchronisation to LC_cci specifications
3.0	13/03/2013	Updating pixel and grid product specifications and metadata
4.0	26/06/2013	Final updates with agreements derived from the Hamburg PM
4.1	13/08/2013	Addressing comments according to CCI-FIRE-EOPS-MM-13-0024.pdf
4.2	10/09/2014	Updating according to modifications implemented in output products
4.3	27/10/2014	Updating references
5.0	01/11/2015	Fifth version, first corresponding to Phase 2 of Fire_cci
5.1	15/01/2016	Minor changes
6.0	20/09/2016	Changes to address the new URD, and include information for the small fire database
6.1	30/12/2016	Addressing comments according to CCI-FIRE-EOPS-MM-16-0129.
6.2	30/09/2017	Inclusion of layers in the pixel and grid product
6.3	05/12/2017	Addressing comments according to CCI-FIRE-EOPS-MM-17-0097.

Document Change Record

Issue	Date	Request	Location	Details
1.4	27/01/2011	UAH	Whole Document	Partner Input included
1.5	24/02/2011	UAH	Whole Document	Comments from partners included after Progress Meeting 2
1.6	21/03/2011	UAH	Whole Document	Revision following receipt of review comments from Stephen Plummer (ESA) and Fire_cci team members
1.7	10/05/2011	UAH	Whole Document Section 2.3 Section 5.1.6, page 7	Revision following comments from Stephen Plummer (ESA) Applicable Documents recompiled Batch conversion utilities added

Issue	Date	Request	Location	Details
			Section 5.1.9 Page 10, table 3 Page 11, table 4	File metadata for pixel product introduced Additional information for BA pixel product introduced Footnote added
2.0	20/06/2011	UAH /GAF	Page 7, table 1 Page 12, table 6 Section 5.6, page 14 Page 13 Whole document	Confidence level of pre-processing excluded Graduation of dominant vegetation introduced GOFC-GOLD comments addressed Auxiliary file including permanent fields Typo and formatting corrections
2.1	08/06/2012	UAH	Section 5.1 Figure 1/Table 2 Sections 5.1.8 and 5.2.8	Introducing GeoTIFF output format for pixel product Update of BA geographical tiles (in compliance with LC_cci) Adaptation of product file name convention according to ESA DS-WG
3.0	13/03/2013	UAH	Section 2.4 Section 3.4 Section 5 Section 5.1.4, Table 1 Section 5.1.6 Section 5.1.9, Table 3 Section 5.2.4, Table 5 Section. 5.2.5 Section 5.3 Section 5.7 Section 5.8 Annex 3 Whole document	Adaptation of title of chapters Fixing 15-day composites, weekly discarded Introducing cross-indices to sub-sections Upgrade, introducing “Data Type” column; deleting footnotes Change format to GeoTIFF Listing Globcover land cover classes; deleting Table 3 in v2.0 “Additional information for BA pixel product” Upgrading information layers of grid product Including links to GFEDv3.1 and GFAS v1.0 Introducing URL link to host BA products Introducing modifications from LC_cci agreements Introducing changes from v2.0 to v3.0 Enclosing NetCDF metadata structure Typo corrections, layout update
4.0	26/06/2013	UAH	Section 1 Section 5.1.3 Section 5.2.4, Table 4	Update and further remarks Spatial resolution of pixel product modified Modifying values and definitions of layers
4.1	13/08/2013	UAH	Whole document Section 3.1	Renaming CUG to CRG Including references to ATBD I/III v2
4.2	10/09/2014	UAH	Section 5.1.1 Section 5.1.4 Section 5.1.8 Section 5.2.2 Section 5.2.4 Section 5.2.8 Section 5.6 Whole document	Indicating on individual layers Indicating on separate GeoTIFF files; Table 1 updated Naming convention updated Amendment on temporal composition Table 2 updated Naming convention updated Amendment on patch numbers (point 4) Updating references
4.3	27/10/2014	GAF	Whole document	Updating references
5.0	01/11/2015	UAH	Name Whole document Page 2 Sections 2.1, 2.2, 2.3, 3.2, 5, 5.1.4, Section 3.3 Table 1	New naming convention for the document New format and layout, updated references Inclusion of team members of Phase 2 Updated Eliminated Minimum Spatial Unit reference Layer 2 of the pixel product (input sensor) was removed.

Issue	Date	Request	Location	Details
			Section 5.1.5 and 5.1.6 Section 5.1.7, Figure 1 and Table 2. Sections 5.1.8 and 5.2.8 Section 5.1.9 Sections 5.2.3, 5.2.5 and 5.2.6 Table 4	Changed order Changed to reflect new non-overlapping tiles Modified naming conventions Added processing version to metadata The spatial resolution was changed to 0.25 deg., and other information accordingly Variables changed to include new LC_cci reference product
5.1	15/01/2016	ESA	Summary and text Sections 1, 2.1, 3.1, 4, 5.1, 5.1.2, 5.1.3, 5.1.9, 5.2 Sections 5.1.1. and 5.1.4 Section 5.1.5 Tables 1 and 4 Annexes	Changed reference to new version of URD v4.1. Minor changes in the text. Added missing identifier. New section added to the document Information added to the notes. Annex 2 has been deleted, and the following annexes were renumbered. The references to the annexes were updated in the text.
6.0	20/09/2016	UAH	Whole document Summary and executive summary Sections 2.2, 3.2, 5.2.2, 5.2.3, 5.2.5, 5.3, 5.6 Section 2.4 Section 3.1 Sections 5.1, 5.1.2, 5.2.6, Section 5.1.3 Table 1 Section 5.1.5 Section 5.1.8 Section 5.1.9 Section 5.1.10 Table 4 Section 5.2.8 Section 5.2.10 Section 5.4 Section 5.5 Section 6 Annex 2 Acronyms	Replaced the acronym CCI_LC with LC_cci to be consistent with other deliverables. The references to the URD and ATBD documents were updated. Updated text. Minor changes in the text. Section deleted. Changes in the text to include other sensors and continental products. Updated text. Updated text to include other sensors Updated text. Inclusion of a new layer to account for different sensors. Inclusion of the LC_cci 2010 dataset. Updated text. Added Figure 2. Information on indicative sensor and additional segregator updated. Updated metadata information. Updated text in layers 1to 4. New layer included to account for fraction of burnable area. Information on indicative sensor updated Section deleted. This topic is addressed in the new Section 5.3. The rest of the section numbers were changed accordingly. Updated text to reference to the new downloading method. Updated link. New references included. Updated text. New acronyms added.
6.1	30/12/2016	ESA	Front Page Sections 1, 2.1, 3.1,	Authors added to author list. Small changes in the text.

Issue	Date	Request	Location	Details
			3.4, 4, 5.1, 5.1.9, 5.2.1, 5.2.4, Table 1 Sections 5, 5.2.6, 5.2.1. Section 5.1.8 Section 5.2.6 References Annex 2 Annex 4	 Text expanded. Subset size of the medium-resolution products has been changed to 5x5 degrees. Last sentences deleted. Updated references. Metadata updated. Acronym added and acronyms re-ordered.
	30/09/2017	UAH	All document Sections 2.2, 3.1, 5.1.9 Section 5.1.4 Section 5.1.5, 5.2.2, 5.6 Section 5.2.4 References Annex 2	GCOS reference updated Minor changes in the text Notes on confidence level updated Text updated Table 3 updated Updated references Updated metadata
6.3	05/12/2017	UAH CCI UAH CCI UAH	Section 5.1.3 Table 1 Section 5.1.9 Section 5.2.8 Section 5.6	Deleted reference to Proba-V 300m. Complemented the notes in layer 2. Inclusion of information detailing that the pixel layers can be provided in individual files. Inclusion of AVHRR in the indicative sensor Information updated

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1. Executive Summary

Fires emit greenhouse gases (GHGs) and aerosols, important climate forcing factors which need to be estimated and modelled to better understand climate and carbon cycling. Fires are also a major factor in land cover changes, and hence affect fluxes of energy and water to the atmosphere. In this context, spatial and temporal monitoring of trace gas emissions from fires is of primary importance.

These can be inferred using both land-surface and atmospheric measurements, preferably in combination (Csiszar et al. 2009). The Fire Disturbance Essential Climate Variable provides baseline products for the land-surface to allow this.

Burned area (BA), as derived from satellites, is considered the primary variable that requires climate-standard continuity. It can be combined with information on burn efficiency and available fuel load to estimate emissions of trace gases and aerosols. Measurements of BA may be used as direct input (driver) to climate and carbon cycle models or, when long time series of data are available, to parameterise climate-driven models for BA (GCOS 2016).

This document is the Fire_cci Product Specification Document (PSD) corresponding to the different global cycles and the small-fire dataset of Phase 2 of the Fire_cci project. It describes the product specifications that will lead to the generation of the BA products. The product specifications address the main requirements expressed by the users in the last version of the User Requirements Document (URDv5.1) (Heil et al. 2016) and those expressed by the Fire_cci climate research group (CRG). Since the range of potential user communities of a BA product is very wide, including climate-vegetation-carbon modellers, atmospheric scientists, fire managers, natural hazards officers, carbon inventory experts, etc., it is not possible to cover all those requirements, which are sometimes contradictory. For this reason, the PSD establishes priorities between those requirements, putting in the first place those more sensible to climate researchers, while considering current technical constraints.

Updating the specifications from the previous version of this document, and taking into account the requirements expressed in the newest version of the URD (Heil et al. 2016), two BA products will be offered, one including monthly composites of BA pixels at full spatial resolution and another one based on 15-day composites of 0.25 x 0.25 grid information. Both products include different layers that have been defined based on the needs of end users as included in the URD, and taking into account current constrains of input datasets. One of the main novelties of this version of the document is the inclusion, apart from the global BA products, of products derived from the small-fire database (Africa and Indonesia).

2. Introduction

2.1. Background

The ESA CCI initiative stresses the importance of providing a higher scientific visibility to data acquired by ESA sensors, especially in the context of the IPCC reports. This implies to produce consistent time series of accurate Essential Climate Variables (ECV) products, which can be used by the climate, atmospheric and ecosystem scientists for their modelling efforts. The importance of keeping long-term observations and the international links with other agencies currently generating ECV data is also stressed.

The fire disturbance ECV identifies burned area (BA) as the primary fire variable. Accordingly, the Fire_cci project shall focus on developing and validating algorithms to meet GCOS ECV requirements for (consistent, stable, uncertainty-characterised) global satellite data products from multi-sensor data archives (GCOS 2016).

In order to generate a long and consistent time series of BA products, which can be used by the climate, atmospheric and ecosystem scientists for their modelling efforts, it is necessary to understand in detail their needs. For this reason, this document is based on the inputs of our climate research group (CRG) and external comments from scientists using BA products, which were received within the elaboration of the URD. Hence, the PSD is built upon main user requirements and transforms those requirements into product specifications that will lead to the BA production process.

We have tried to follow the main user requirements, searching for an equilibrated choice for potentially contradictory demands, following the suggestions of the CCI Co-location meeting held at Frascati in September, 2010 [AD-1], updated within the framework of the CCI Phase 2 [AD-3]. In addition, we have considered the diversity of those requirements related to the various scientific communities interested in the BA product, although we have emphasised those of the climate-vegetation modellers, who are the main target of the CCI programme.

2.2. Purpose of the document

This document describes in detail product specifications in order to obtain a BA product that is consistent, stable and error-characterised and to ensure the longest possible temporal record, derived from multi-sensor data. The purpose of this document is to present the structure, syntax and file naming conventions used to describe the different BA products. It provides all the necessary data needed by BA algorithm developers to write and read the BA products. Following the CCI Statement of Work for Phase 1 [AD-2] and Phase 2 [AD-3], this document has evolved during the progress of the project. The current version is the baseline for the prototyping and production of the global and small fire database BA product datasets for Year 3 of the Phase 2 of the Fire_cci project.

2.3. Applicable Documents

[AD-1]	ESA Climate Change Initiative - CCI Project Guidelines. Ref. EOP-DTEX-EOPS-SW-10-0002, issue 1.0, date of issue 05 November 2010, available at http://cci.esa.int/filedepot_download/40/4
[AD-2]	ESA Climate Change Initiative (CCI) Phase 1, Scientific User Consultation and Detailed Specification, Statement of Work, EOP-SEP/SOW/0031-09/SP, v1.4, 2009, available at http://www.esa-fire-cci.org/webfm_send/110
[AD-3]	ESA Climate Change Initiative (CCI) Phase 2 Statement of Work, prepared by ESA Climate Office, Reference CCI-PRGM-EOPS-SW-12-0012, Issue 1.3, date of issue 24 March 2015, available at http://www.esa-fire-cci.org/webfm_send/828

3. Terms of Reference

3.1. Burned Area

Burned Area (BA) is defined in this document as any vegetated area that has been completely or partially consumed by a fire, regardless of whether that fire was human or natural caused, or whether that fire affected wildland areas or human managed territories (agricultural or pastures).

Following the Fire_cci Statement of Work specifications [AD-2], the BA product will only comprise a discrimination of burned and unburned areas (information on radiated energy or biomass consumed is not included). Biomass burning implies a partial or total loss of dead and/or live green vegetation, which results in either a substitution of vegetation by char, ash or scorched leaves, especially just after the fire (this signal will last longer or shorter depending on the ecosystem adaptation to fire, particularly to vegetation recovery). The spectral signature of burned surfaces is very diverse, depending on the type and amount of vegetation consumed, the post fire evolution, and whether it was burned by a ground or a crown fire. For this reason, to generate an accurate algorithm able to detect surface changes caused by fires is a very challenging task.

The current version of the PSD includes both global and continental BA products. The former are derived from MERIS, MODIS and Sentinel-3 sensors, while the latter on Sentinels-1 & -2, and Proba-V. The different BA products are obtained with the spatial and temporal resolution defined in the next sections.

3.2. Spatial resolution

Spatial resolution identifies the size in metres or degrees of the minimum unit included in the image. In satellite remote sensing, spatial resolution is commonly defined by the pixel or cell area (in hectares or m^2: i.e. for MERIS FRS 9 ha), but the length of the pixel is also frequently used (the square root of the area: i.e. for MERIS FRS 300 m). This latter definition is used throughout this document.

3.3. Temporal resolution

This term is defined as follows: on the one hand it is the temporal reporting accuracy of the product, and on the other it is the period of temporal compositing. The former refers to how often an area is observed and therefore what is the temporal span between two consequent BA pixels. The latter refers to what will be the minimum temporal period of the product to be delivered to the users, for instance in bi-weekly or monthly composites. All Fire_cci products include the date when the pixel is detected. Temporal resolution depends on the observing cycle of the sensor used (MERIS: 2-3 days; MODIS, daily; MSI: 10 days). The temporal compositing is described in sections 5.1.2 and 5.2.2.

3.4. File formats

The different products that are proposed in this document include a description of file format that follows suggestions from the URD and technical constraints, mostly related to support open standards and avoid proprietary formats. The products follow standards published by ESA for all CCI products (ESA 2015).

3.5. File name conventions

The naming of the products stated in sections 5.1.9 and 5.2.8 follows the ECV naming convention.

4. Outcomes of the User Requirements Survey

As requested in the ESA CCI project guidelines [AD-1] and the Statement of Work for Phase 1 [AD-2], the current product specifications are based on the main outputs of the user requirement survey of Phase 1 of the Fire_cci project, updated with suggestions from the Climate Research Group (CRG) on Phase 2. The main conclusions and recommendations derived from the comprehensive URD survey of Phase 1 and consequent updates are described in the URDv.5.1 (Heil et al. 2016).

Following these recommendations, the product specifications for the BA products within the ESA Fire_cci project are described in Section 5. These specifications include the definition of the product, the spatial and temporal resolution, the file formats and naming conventions, metadata, and accuracy and consistency standards.

5. Product Specifications

The following sections include the specifications of the two products that will be produced within the Fire_cci project: pixel and grid based.

While the BA products based on coarse resolution sensors (MERIS, MODIS, OLCI, SLSTR) will have a global coverage, the products based on medium resolution sensors (S-1, S-2, PROBA-V), corresponding to the small fire database, will only cover certain regions of Africa, Indonesia, and Tropical South America. At this point, products derived from different sensors will be released separately, and merging options will be evaluated based on their outputs.

5.1. Pixel BA product

Pixel-based products were demanded in the URD (Heil et al. 2016), particularly in regards to the increasing need in fire patch characterisation (Yue et al. 2014), and daily fire spread processes within patches by the fire modelling and fire regime characterisation communities (Mansuy et al. 2014). Similar projects leading to global evaluation of BAs (such as MODIS MCD45, Globcarbon, GIO-GL1_BA or L3JRC) provide pixel products, and therefore these products should be offered to the scientific community for consistency with existing products.

5.1.1. Product description

The pixel product is a raster dataset consisting of individual layers that together describe the attributes of the BA product. Attributes are described in Section 5.1.4.

5.1.2. Temporal compositing

The pixel product of the Fire_cci project generates monthly composites, including all pixels detected as burned during that period. Monthly products allow discriminating pixels that might be burned more than once in a calendar year (which may occur, for instance, in tropical regions that have the dry season between December and February).

5.1.3. Spatial Resolution

The Spatial resolution of the BA product will be linked to the best available resolution of the input sensor: SLSTR 500m, MERIS FRS 300 m, OLCI 300 m, MODIS 250 m, Proba-V 100 m, Sentinel-2 (S-2) 20 m; Sentinel-1 (S-1) 20 m (interferometric wide swath mode), and 20 m for those areas where both S-2 and S-1 input data are combined. For the later sensors, this resolution meets the 30 m target resolution suggested by the GCOS requirements (2016).

5.1.4. Pixel attributes

Each pixel of the monthly files will have the fields described in Table 1.

Table 1: Layers of the Target BA pixel based product

Layer	Attribute	Units	Data Type	Notes
1	Date of the first detection	Day of the year	Integer	Possible values: • 0 (zero): when the pixel is not burned. • 1 to 366: day of the first detection when the pixel is burned. • -1: when the pixel is not observed in the month. • -2: used for pixels that are not burnable: continuous water, bare land, urban, permanent ice-snow. Further description on the methodology to obtain the date of detection is available in the Algorithm Theoretical Basis Document of each BA product (see www.esa-fire-cci.org/documents).
2	Confidence level	%	Byte	Probability of detecting a pixel as burned. Possible values: • 0 (zero): when the pixel is not observed in the month, or it is not burnable. • 1 to 100: Probability values. The closer to 100, the higher the confidence that the pixel is actually burned. This applies to all pixels in the map except the ones classified as 0, independently of being classified as burned or not in layer 1. This value expresses the uncertainty of the detection. Further description of the methodology to obtain the confidence level is available in the Algorithm Theoretical Basis Document of each BA product (see www.esa-fire-cci.org/documents).
3	Land cover of burned pixels	Land cover code	Byte	Possible values: • 0 (zero): when the pixel is not burned in the month. • 10 to 180: land cover code when the pixel is burned (codes listed in Annex 3). Land cover of the pixel detected as burned, extracted from the Land Cover CCI (LC_cci) maps. See Section 5.1.5 for further information.
4	Sensor detecting the BA pixel	Sensor code	Byte	Possible values : • 0 (zero): when the pixel is not burned in the month. • 1: MERIS (on the ENVISAT satellite) • 2: MODIS (on the Terra and Aqua satellites) • 3: OLCI (on the Sentinel-3 satellite) • 4: SLSTR (on the Sentinel-3 satellite) • 5: Vegetation (on the Proba-V satellite) • 6: MSI (on the Sentinel-2 satellite) • 7: SAR (on the Sentinel-1 satellite) Combination of sensors will be expressed by combining the sensor codes. For instance 67 means a pixel detected by MSI and SAR

5.1.5. Land Cover information

The land cover information was selected to provide information about the pre-fire land cover category, and for this reason the reference land cover used is the closest available product prior to the year being processed The land cover assigned to the pixel detected as burned was extracted from the LC_cci[1] product (Kirches et al. 2013, Santoro et al. 2017), to assure consistency with other variables within the CCI programme. As this land cover product has several versions, the following versions were used:

- For the MERIS Fire_cci v4.1 and MODIS Fire_cci v5.0 products, the LC_cci v1.6.1 was used (Kirches et al. 2013), as it was the latest available product at the moment of burned area processing. This product includes three epochs, and different land cover maps were used according to the year of the BA product:
    - LC_cci of the period 1998-2002 (designed LC_cci 2000) for the 2002-2007 BA products.
    - LC_cci of the period 2002-2007 (designed LC_cci 2005) for the 2008-2012 BA products.
    - LC_cci of the period 2008-2012 (designed LC_cci 2010) for the 2013-2015 BA products.
- The remaining BA products will use LC_cci v2.0.7 (Santoro et al. 2017), which consists in annual land cover maps from 1992 to 2015. In this case, the LC_cci map of the previous year of each of BA data was employed (e.g. for the 2015 BA product, the 2014 LC_cci map was used).

The land cover categories included in the BA product are listed in Annex 3.

5.1.6. File formats

The product will be delivered in GeoTIFF format. Files will be compressed using standard algorithms (i.e. tar.gz) to reduce downloading file sizes.

5.1.7. Product projection system

The Coordinate Reference System (CRS) used for the global BA products is a geographic coordinate system (GCS) based on the World Geodetic System 84 (WGS84) reference ellipsoid and using a Plate Carrée projection (see Annex 1) with geographical coordinates of equal pixel size. The projection makes use of an equatorial radius (also called semi-major axis) of 6378.14 km and of a polar radius (also called semi-minor axis) of 6356.76 km. The inverse flattening parameter is of 298.26 m. The coordinates are specified in decimal degrees. Information on product projection, ellipsoid and pixel size are included in the GeoTIFF file header, so every pixel in the file can be geographically referenced without the need of adding specific pixel indicators of geographical position. This projection system is the same as used by the LC_cci project.

5.1.8. Subsets

The global BA products will be distributed in continental tiles, following a similar approach to other international projects. Producing global mosaics of BA products at the finest resolution of the input images would create huge file sizes, with a lot of oceanic areas that are not relevant for fire information. For this reason, geographical subsets

[1] For the generation of the small fire database, the global LC_cci product may not be accurate enough. Improved versions using medium resolution sensors (Sentinel-2) currently ongoing the LC_cci project will be used whenever available.

have been defined. All subsets are non-overlapping regions. They cover mostly continental tiles, excluding areas that do not burn or are very small and surrounded by large proportions of water. Figure 1 shows the extent of these tiles, which are referenced in Table 2.

Table 2: Geographical distribution of BA tiles for the pixel product

Areas	Name	Upper left		Lower right	
1	North America	180°W	83°N	50°W	19°N
2	South America	105°W	19°N	34°W	57°S
3	Europe & Northern Africa	26°W	83°N	53°E	25°N
4	Asia	53°E	83°N	180°E	0°N
5	Sub-Saharan Africa	26°W	25°N	53°E	40°S
6	Australia & New Zealand	95°E	0°N	180°E	53°S

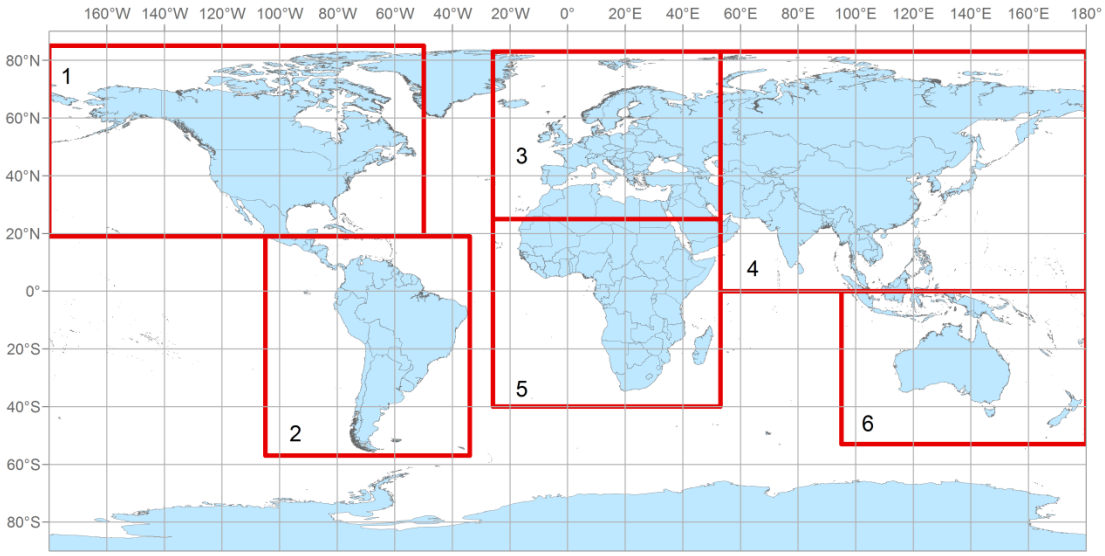

Figure 1: Geographical distribution of subsets for the global BA product

The BA products generated from medium-resolution sensors (S-2, S-1), will be delivered in geographical tiles of 5x5 degrees (see Figure 2). In the case of the Proba-V product, it will be a single tile covering Area 5 of Figure 1.

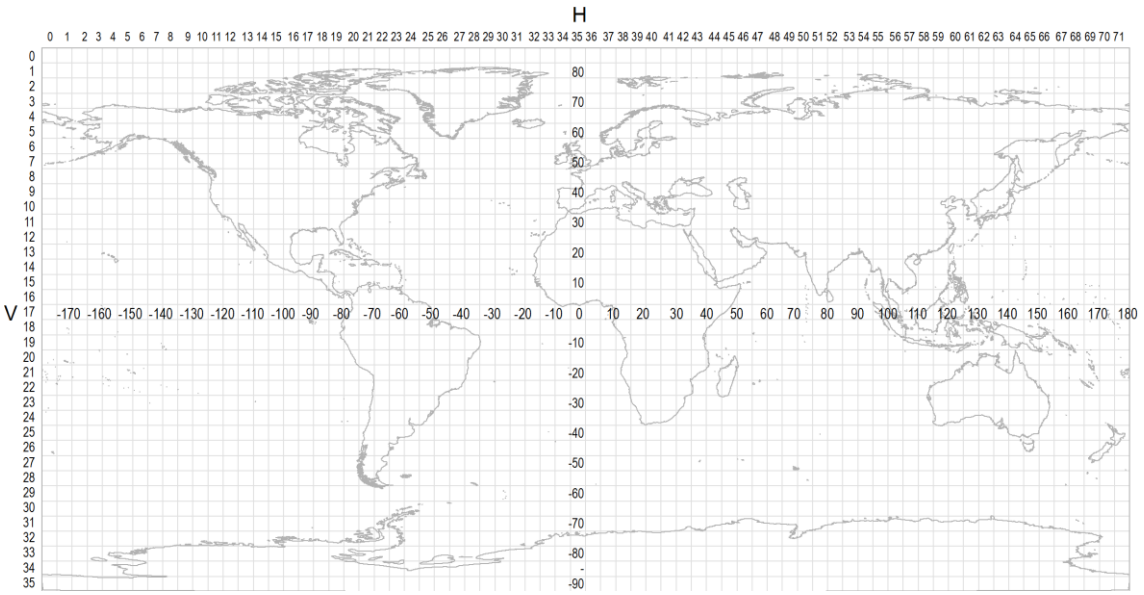

Figure 2: Geographical distribution of tiles for medium-resolution products

5.1.9. Product file naming conventions

The files for each sensor and month will be named as follows:

<Indicative Date> -ESACCI-L3S_FIRE-BA- <Indicative sensor> [-<Additional Segregator>] - [-v<GDS version>] - fv<xx.x>[-<Layer>].tiff

<Indicative Date>

The identifying date for this data set:

Format is YYYYMMDD, where YYYY is the four digit year, MM is the two digit month from 01 to 12 and DD is the two digit day of the month from 01 to 31. For monthly products DD=01.

<Indicative sensor>

MERIS, when data coming from MERIS sensor. MODIS when outputs come from MODIS 250 m channels; OLCI and SLSTR for the Sentinel-3 sensors; PROBA for Proba-V. For the small fire database, MSI will be used for Sentinel-2 MSI outputs; SAR for S-1 outputs, and MSI_SAR for a combination of optical and radar data.

<Additional Segregator>

This should be AREA_<TILE_NUMBER> being the tile number the subset index described in 5.1.8. (see Table 2 for more information).

For the small-fire database the tile number will correspond to the column and row of the global 5x5 degree grid (see Figure 2).

v<GDS version>

Including the version number of the GHRSST Data Specification is optional for the CCI file naming convention. If used it should be 02.0.

fv<File Version>

File version number in the form n{1,}[.n{1,}] (That is 1 or more digits followed by optional . and another 1 or more digits). The most recent version is fv5.0 (released in October 2017).

<Layer>

In case that the individual layers of the pixel product are provided as different GeoTIFF files, the code of each layer will be detailed as follows:

- JD: layer 1, corresponding to the Julian day, or day of the year of detection of the BA.
- CL: layer 2, corresponding to the confidence level
- LC: layer 3, corresponding to the land cover
- SN: layer 4, corresponding to the sensor that detected the BA.

Example:

20050301-ESACCI-L3S_FIRE-BA-MODIS-AREA_3-fv05.0-JD.tif

20050301-ESACCI-L3S_FIRE-BA- MODIS -AREA_3-fv05.0-JD.xml

5.1.10. File metadata

For each BA file product, an additional xml file with the same name is created. This file holds the metadata information following the ISO 19115 standard. The following fields are populated:

- Universal Unique Identifier
- Language
- Contact
- Date stamp
- Metadata Standard Name
- Reference System
- Citation
  - Title
  - Creation date
  - Publication date
  - DOI
  - Abstract (contains information about each layer)
- Point of Contact
  - Resource provider
  - Distributor
  - Principal investigator
  - Processor
- Keywords
- Resource constraints
- Spatial resolution
- Extent
  - Geographical extent
  - Temporal extent
- Spatial resolution
- Processing version

5.2. Grid BA product

Grid-based products were demanded in the URD, especially by those modellers working with climate-vegetation-atmospheric emission models and were confirmed in internal discussions in the Fire_cci consortium. Therefore, the grid product is of greater interest for climate-vegetation-atmospheric modellers, as they commonly work with global grids on input weather data, and many of the current models have grids as the main input factors.

5.2.1. Product description

The grid product is a raster file that integrates the pixel BA information at a set of geographical cells that cover the whole globe. Each file includes the total BA affecting each cell area and for a certain time period. The raster file includes different auxiliary layers, described in section 5.2.4, which can help climate modellers to better characterize the burning conditions in each grid cell.

In the case of grid products coming from the small-fire database, only the cells corresponding to areas covered by this database (Africa, Indonesia, tropical South America) will have data. The other cells will have 0 in all attributes, implying that other areas were not observed.

5.2.2. Temporal compositing

The grid products are offered in 15-day periods (or their equivalent when months are 31, 29 or 28 days long), which implies a good compromise between temporal resolution and repeating coverage of the input datasets..

5.2.3. Spatial Resolution

Following the recommendations of the URD and in line with other global BA products, the spatial resolution of the grid product is 0.25 x 0.25 degrees. Grid attributes are computed from all pixels included in each cell of that size within the time period previously indicated. To assure consistency, the grid product will have the same spatial and temporal resolution regardless of which input sensor has been used to generate the BA information.

5.2.4. Grid attributes

Table 3 shows the attributes that are stored for each grid cell. These variables have been based on the requirements described in the URDv5.1 (Heil et al. 2016), and further discussed within the Climate Research Group (CRG) and the fire researchers of the CMUG.

Table 3: Layers of the BA grid products

Layer	Attribute	Units	Data Type	Notes
1	Sum of BA	Square metres	Float	Sum of area of all pixels detected as burned within each grid cell and period. Further description on the methodology to obtain the burned area from the BA detections is included in the Algorithm Theoretical Basis Document (formatting tool) (see www.esa-fire-cci.org/documents).
2	Standard Error	Square metres	Float	This value is the standard error of the estimation of BA in each grid cell, based on the aggregation of the confidence level of the pixel product. Further description on the methodology to obtain this value is available in the Algorithm Theoretical Basis Document (formatting tool) (see www.esa-fire-cci.org/documents).
3	Fraction of burnable area	0 to 100	Float	The fraction of area in the grid that corresponds to land covers that could be affected by fire.
4	Fraction of observed area	0 to 100	Float	The fraction of the total burnable area in the grid that was observed for the whole 15-day period (without cloud cover / haze or low quality pixels)
5	Number of patches	0 to N	Float	Number of contiguous groups of burned pixels. Contiguity is defined as any burned pixel that has contact with the side of another burned pixel during the whole 15 day period. Further description on the methodology to obtain this value is available in the Algorithm Theoretical Basis Document (formatting tool) (see www.esa-fire-cci.org/documents).

Layer	Attribute	Units	Data Type	Notes
6	Sum of BA of Cropland, rainfed	Square metres	Float	Sum of all burned pixels of this Land cover as defined by the LC_cci *.
7	Sum of BA of Cropland, irrigated or post-flooding	Square metres	Float	Sum of all burned pixels of this Land cover as defined by the LC_cci *.
8	Sum of BA of Mosaic cropland (>50%) / natural vegetation (tree, shrub, herbaceous cover) (<50%)	Square metres	Float	Sum of all burned pixels of this Land cover as defined by the LC_cci *.
9	Sum of BA of Mosaic natural vegetation (tree, shrub, herbaceous cover) (>50%) / cropland (<50%)	Square metres	Float	Sum of all burned pixels of this Land cover as defined by the LC_cci *.
10	Sum of BA of Tree cover, broadleaved, evergreen, closed to open (>15%)	Square metres	Float	Sum of all burned pixels of this Land cover as defined by the LC_cci *.
11	Sum of BA of Tree cover, broadleaved, deciduous, closed to open (>15%)	Square metres	Float	Sum of all burned pixels of this Land cover as defined by the LC_cci *.
12	Sum of BA of Tree cover, needleleaved, evergreen, closed to open (>15%)	Square metres	Float	Sum of all burned pixels of this Land cover as defined by the LC_cci *.
13	Sum of BA of Tree cover, needleleaved, deciduous, closed to open (>15%)	Square metres	Float	Sum of all burned pixels of this Land cover as defined by the LC_cci *.
14	Sum of BA of Tree cover, mixed leaf type (broadleaved and needleleaved)	Square metres	Float	Sum of all burned pixels of this Land cover as defined by the LC_cci *.
15	Sum of BA of Mosaic tree and shrub (>50%) / herbaceous cover (<50%)	Square metres	Float	Sum of all burned pixels of this Land cover as defined by the LC_cci *.
16	Sum of BA of Mosaic herbaceous cover (>50%) / tree and shrub (<50%)	Square metres	Float	Sum of all burned pixels of this Land cover as defined by the LC_cci *.
17	Sum of BA of Shrubland	Square metres	Float	Sum of all burned pixels of this Land cover as defined by the LC_cci *.
18	Sum of BA of Grassland	Square metres	Float	Sum of all burned pixels of this Land cover as defined by the LC_cci *.
19	Sum of BA of Lichens and mosses	Square metres	Float	Sum of all burned pixels of this Land cover as defined by the LC_cci *.
20	Sum of BA of Sparse vegetation (tree, shrub, herbaceous cover) (<15%)	Square metres	Float	Sum of all burned pixels of this Land cover as defined by the LC_cci *.
21	Sum of BA of Tree cover, flooded, fresh or brackish water	Square metres	Float	Sum of all burned pixels of this Land cover as defined by the LC_cci *.
22	Sum of BA of Tree cover, flooded, saline water	Square metres	Float	Sum of all burned pixels of this Land cover as defined by the LC_cci *.
23	Sum of BA of Shrub or herbaceous cover, flooded, fresh/saline/brackish water	Square metres	Float	Sum of all burned pixels of this Land cover as defined by the LC_cci *.

* See Section 5.1.5 for further information.

5.2.5. Product projection system

This product is stored in geographical coordinates. Each cell has a latitude and longitude assignment which is tied to the centre of the grid cell. For example, a series of

adjacent grid cells have longitude references of -67.625°, -67.375°, -67.125° and -66.875°. Similarly a series of latitude references are 0.125°, -0.125°, -0.375° and -0.625°.

5.2.6. Subsets

No subsetting takes place. A global coverage of the referred grid resolution (0.25 x 0.25 degrees) is stored in a single file for each 15 day period.

5.2.7. File formats

The product is delivered in raster format, on a regular geographical grid. The product format is NetCDF-CF (see http://www.unidata.ucar.edu/software/netcdf/docs for detailed information about this format and section). This format was selected by most modellers as well as by consensus within the guidelines of the first CCI programme co-location Meeting.

5.2.8. Product file naming conventions

The grid files are named as following:

<Indicative Date> -ESACCI-L4_FIRE-BA- <Indicative sensor> [-<Additional Segregator>][-v<GDS version>] -fv<xx.x>.nc

<Indicative Date>

The identifying date for this data set:

Format is YYYYMMDD, where YYYY is the four digit year, MM is the two digit month from 01 to 12 and DD is the two digit day of the month from 01 to 31. For 15-day products, the first half of the month have date = 07 and the second half date = 22, which are approximately the average dates of each biweekly period.

<Indicative sensor>

MERIS, when data coming from MERIS sensor. MODIS when outputs come from MODIS 250 m channels; OLCI and SLSTR for the Sentinel-3 sensors; PROBA for Proba-V, AVHRR for the LTDR-AVHRR data. For the small fire database, MSI will be used for Sentinel-2 MSI outputs; SAR for S-1 outputs, and MSI_SAR for a combination of optical and radar data.

<Additional Segregator>

This should be left empty.

v<GDS version>

Including the version number of the GHRSST Data Specification is optional for the CCI file naming convention. If used it should be 02.0.

fv<File Version>

Version number of the Fire_cci BA algorithm. It should be in the form n{1,}[.n{1,}] (That is 1 or more digits followed by optional . and another 1 or more digits). The most recent version is fv5.0 (released in October 2017).

Example:

20051207-ESACCI-L4_FIRE-BA-MODIS-fv05.0.nc

5.2.9. File metadata

The grid files follow the NetCDF Climate and Forecast (CF) Metadata Convention (http://cfconventions.org/cf-conventions/cf-conventions.html). Annex 2 describes the fields included in the .nc files.

5.3. Product Accuracy

Following the recommendations of international bodies (GCOS, IGOS) and the CMUG, compiled and reviewed in the URD (Heil et al., 2016), all BA products to be generated within the Fire_cci project will be validated using internationally agreed validation protocols. More specifically, the CEOS Cal-Val guidelines to generate reference fire perimeters will be used (Padilla at al., 2011).

In addition, all BA products contain traceable uncertainty characterization and quality flags (e.g. for missing detections due to clouds). The pixel product includes the confidence level (see 5.1.4) and the grid product the standard error (see 5.2.4) to account for uncertainties of the different phases of the product generation.

In terms of specific thresholds of global thematic accuracy and temporal stability, the BA products will aim to fulfil the requirements stated by GCOS and other international bodies, with a threshold of 15% in terms of commission and omission errors, as well as temporal stability, defined as long-term variations (10 years) in accuracy metrics. In terms of geolocation accuracy, most respondents require mean accuracy below 1 km. For temporal reporting accuracy, the values range from 2 to 15 days. All these thresholds should be considered as average values to guide the methodological design of the project

Meeting the thematic and temporal accuracy requirements is very challenging. In fact, global validation studies have shown that none of the existing global BA products obtain those accuracies (Padilla et al., 2015). Since Fire_cci will use different sensors, some areas and periods may meet them, subject to the quality of input sensors available and the specific complexities of fire regimes in particular regions.

5.4. Data dissemination for all products

The pixel products are compressed with standard algorithms (.tar.gz files) to reduce download volumes, while for grid products the standard NetCDF is kept.

The product is served through the CCI Open Data Portal FTP (ftp://anon-ftp.ceda.ac.uk/neodc/esacci/fire/). The users are encouraged to provide their contact information, for statistical and communication purposes, using a registration form (https://geogra.uah.es/fire_cci), although this step is not compulsory and the data can be downloaded from the FTP directly.

5.5. Data Documentation

The Product User Guide is available in the web page for data downloading (https://geogra.uah.es/fire_cci), which includes a detailed explanation of the product characteristics, fields and formats, so any user (both familiar and unfamiliar with satellite information) can easily access and use the product.

5.6. Main corrections introduced from v6.1 to v.6.2 and v.6.3

- Specification that the confidence level of the pixel product should include probability of burn information even for pixels classified as not burned.
- Land cover information updated to include the LC_cci v2.0.7.
- Change of definition of the Fraction of Observed Area in the grid product: it is not the fraction of the total area of the cell, but of the burnable area.
- Change in naming convention of the pixel product to address the possibility to provide each layer in an individual file.

6. References

Csiszar, I., Arino, O., Geraci, R., Giglio, L., Goldammer, J.G., de Groot, W.J., Justice, C.O., Kondragunta, S., Prins, E., Sessa, R., & Tansey, K. (2009). Assessment of the status of the development of the standards for the Terrestrial Essential Climate Variables: T13 - Fire Disturbance. In N. GTOS Secretariat, FAO (Ed.) (p. 38 pp.). Rome: GTOS Secretariat, NRL, FAO.

ESA Climate Office (2015). Data Standards Requirements for CCI Data Producers, Issue 1, Rev. 2. Ref. CCI-PRGM-EOPS-TN-13-0009.

GCOS (2016). The global observing system for climate: implementation needs. (p. WMO GCOS Rep. 200). Guayaquil, Ecuador: World Meteorological Organization.

Heil, A., Yue, C., Mouillot, F., & Kaiser, J.W. (2016). ESA CCI ECV Fire Disturbance D1.1 User Requirement Document v5.1. Available at https://www.esa-fire-cci.org/documents.

Mansuy, N., Boulanger, Y., Terrier, A., Gauthier, S., Robitaille, A., & Bergeron, Y. (2014). Spatial attributes of fire regime in eastern Canada: influences of regional landscape physiography and climate. Landscape Ecology, 29, 1157-1170.

Kirches, G., Krueger, O., Boettcher, M., Bontemps, S., Lamarche, C., Verheggen, A., Lembrée, C., Radoux, J., & Defourny, P. (2013). Land Cover CCI: Algorithm Theoretical Basis Document Version 2. In UCL-Geomatics (Ed.) (p. 191 pp.). Louvain, Belgium.

Padilla, M., Stehman, S. V., Hantson, S., Oliva, P., Alonso-Canas, I., Bradley, A., Tansey, K., Mota, B., Pereira, J. M., Chuvieco, E. (2015). Comparing the accuracies of remote sensing global burned area products using stratified random sampling and estimation. Remote Sensing of Environment, 160, 114- 121.

Padilla M, Chuvieco E, Hantson S, Theis R, Sandow C (2011) ESA CCI ECV Fire Disturbance – D2.1 Product Validation Plan Version 3.1. Available at: www.esa-fire-cci.org/webfm_send/241.

Santoro, M, Kirches, G., Wevers, J., Boettcher, M., Brockmann, C., Lamarche, C. Bontemps, S., Defourny, P. (2017) Land Cover Product User Guide Version 2.0 (CCI-LC-PUGv2). Available at: https://www.esa-landcover-cci.org/?q=webfm_send/112.

Yue, C., Ciais, P., Cadule, P., Thonicke, K., Archibald, S., Poulter, B., Hao, W., Hantson, S., Mouillot, F., & Friedlingstein, P. (2014). Modelling the role of fires in the terrestrial carbon balance by incorporating SPITFIRE into the global vegetation model ORCHIDEE–Part 1: simulating historical global burned area and fire regimes. Geoscientific Model Development, 7, 2747-2767.

Annex 1: Description of the Plate Carrée Projection

It is an equirectangular projection (also named equidirectional projection, equidistant cylindrical projection, geographic projection). It has become a standard in computer applications to process global maps because of the relationship between pixels and its geographical position (Google Earth, JRC, MODIS, VEGETATION).

The projection maps meridians to equally spaced vertical straight lines, and circles of latitude to evenly spread horizontal straight lines. The projection is neither equal area nor conformal, but because if its simplicity is commonly used in thematic mapping.

It is defined by the equation:

$$x = \lambda \cos(\phi_1)$$

$$y = \phi$$

Where:

λ is the length of the central meridian of the projection. ϕ is the latitude and ϕ_1 are the standard parallels (north and south of the equator), where the scale of the projection is real. The coordinates λ and ϕ are linear measurements, not angular. The point (0.0) is in the centre of the projection.

There is a horizontal section that increases with distance from the equator.

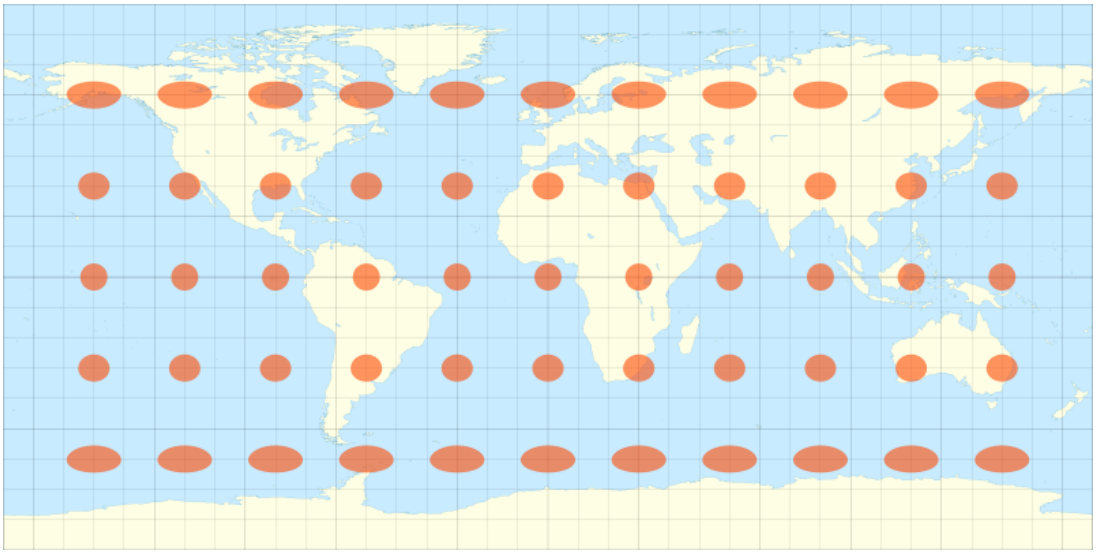

Figure 3: Deformations introduced by the Plate Carrée projection

(from http://en.wikipedia.org/wiki/File:Tissot_indicatrix_world_map_equirectangular_proj.svg)

Annex 2: Dimensions, variables and metadata of the gridded BA product (NetCDF file)

Here is an example of the dimensions and variables of the gridded product for the

20051207-ESACCI-L4_FIRE-BA-MODIS-fv05.0.nc

file:

Global Attributes:

title = 'Fire_cci Gridded MODIS Burned Area product'
institution = 'University of Alcala'
source = MODIS MOD09GQ Collection 6, MODIS MOD09GA Collection 6, MODIS MCD14ML Collection 6, ESA CCI Land Cover dataset v1.6.1'
history = 'Created on 2017-08-29 15:07:31'
references = 'See www.esa-fire-cci.org'
tracking_id = 'b2c006a9-2a92-44b7-bfcc-b798c72fc032'
Conventions = 'CF-1.6'
product_version = '5.0'
summary = The grid product is the result of summing up burned area pixels within each cell of 0.25 degrees in a regular grid covering the whole Earth in biweekly composites. The attributes stored are sum of burned area, standard error, fraction of burnable area, fraction of observed area, number of patches and the burned area for 18 land cover classes of LC_cci.'
keywords = 'Burned Area, Fire Disturbance, Climate Change, ESA, GCOS'
id = '20051207-ESACCI-L4_FIRE-BA-MODIS-fv05.0.nc
doi = 'doi:10.5285/D80636D4-7DAF-407E-912D-F5BB61C142FA'
naming authority= 'org.esa-fire-cci'
keywords_vocabulary = 'none'
cdm_data_type = 'Grid'
comment = 'These data were produced as part of the ESA Fire_cci programme. '
date_created = '20170829T150731Z'
creator_name = 'University of Alcala'
creator_url = 'www.esa-fire-cci.org'
creator_email = 'emilio.chuvieco@uah.es'
project = 'Climate Change Initiative – European Space Agency'
geospatial_lat_min = '-90'
geospatial_lat_max = '90'
geospatial_lon_min = '-180'
geospatial_lon_max = '180'
geospatial_vertical_min = '0'
geospatial_ vertical _max = '0'
time_coverage_start = '20051201T000000Z'
time_coverage_end = '20051215T235959Z'
time_coverage_duration = 'P14D'
time_coverage_resolution = 'P01D'
standard_name_vocabulary = 'NetCDF Climate and Forecast (CF) Metadata Convention
licence = ESA CCI Data Policy: free and open access'
platform = 'Terra, Aqua'
sensor = 'MODIS'
spatial_resolution = '0.25 degrees'

geospatial_lat_units = 'degrees_north'
geospatial_lon_units = 'degrees_east'
geospatial_lon_resolution = '0.25'
geospatial_lat_resolution = '0.25'

Dimensions:
vegetation_class = 18
lat = 720
lon = 1440
nv = 2
strlen = 150
time = 1 (UNLIMITED)

Variables:
lat
Size: 720x1
Dimensions: lat
Datatype: single
Attributes:
units = 'degree_north'
standard_name = 'latitude'
long_name = 'latitude'
bounds = 'lat_bnds'
lat_bnds
Size: 2x720
Dimensions: nv,lat
Datatype: single
lon
Size: 1440x1
Dimensions: lon
Datatype: single
Attributes:
units = 'degree_east'
standard_name = 'longitude'
long_name = 'longitude'
bounds = 'lon_bnds'
lon_bnds
Size: 2x1440
Dimensions: nv,lon
Datatype: single
time
Size: 1x1
Dimensions: time
Datatype: double
Attributes:
units = 'days since 1970-01-01 00:00:00'
standard_name = 'time'
long_name = 'time'
bounds = 'time_bnds'
calendar = 'standard'

time_bnds
Size: 2x1
Dimensions: nv,time
Datatype: single
vegetation_class
Size: 18x1
Dimensions: vegetation_class
Datatype: int32
Attributes:
units = '1'
long_name = 'vegetation class number'
vegetation_class_name
Size: 150x18
Dimensions: strlen,vegetation_class
Datatype: char
Attributes:
units = '1'
long_name = 'vegetation class name'
burned_area
Size: 1440x720x1
Dimensions: lon,lat,time
Datatype: single
Attributes:
units = 'm2'
standard_name = 'burned_area'
long_name = 'total burned_area'
cell_methods = 'time: sum'
standard_error
Size: 1440x720x1
Dimensions: lon,lat,time
Datatype: single
Attributes:
units = 'm2'
long_name = 'standard error of the estimation of burned area'
fraction_of_burnable_area
Size: 1440x720x1
Dimensions: lon,lat,time
Datatype: single
Attributes:
units = '1'
long_name = 'fraction of burnable area'
comment = 'The fraction of burnable area is the fraction of the cell that corresponds to vegetated land covers that could burn. The land cover classes are those from CCI Land Cover, http://www.esa-landcover-cci.org/
fraction_of_observed_areaa
Size: 1440x720x1
Dimensions: lon,lat,time
Datatype: single
Attributes:
units = '1'

long_name = 'fraction of observed area'
comment = 'The fraction of observed area is the fraction of the total burnable area in the cell (fraction_of_burnable_area variable of this file) that was observed during the time interval, and was not marked as unsuitable/not observable. The latter refers to the area where it was not possible to obtain observational burned area information for the whole time interval because of lack of input data (non-existing images for that location and period), cloud cover, haze or pixels that fell below the quality thresholds of the algorithm.'

number_of_patches
Size: 1440x720x1
Dimensions: lon,lat,time
Datatype: single
Attributes:
units = '1'
long_name = 'number of burn patches'
comment = 'Number of contiguous groups of burned pixels.'

burned_area_in_vegetation_class
Size: 1440x720x18x1
Dimensions: lon,lat,vegetation_class,time
Datatype: single
Attributes:
units = 'm2'
long_name = 'burned area in vegetation class'
cell_methods = 'time: sum'
comment = 'Burned area by land cover classes; land cover classes are from CCI Land Cover, http://www.esa-landcover-cci.org/'

Annex 3: Land cover categories (extracted from LC_cci)

LC number	Class name	Fire_cci number
0	No data	0
10	Cropland, rainfed	10
11	*Herbaceous cover*	*10*
12	*Tree or shrub cover*	*10*
20	Cropland, irrigated or post-flooding	20
30	Mosaic cropland (>50%) / natural vegetation (tree, shrub, herbaceous cover) (<50%)	30
40	Mosaic natural vegetation (tree, shrub, herbaceous cover) (>50%) / cropland (<50%)	40
50	Tree cover, broadleaved, evergreen, closed to open (>15%)	50
60	Tree cover, broadleaved, deciduous, closed to open (>15%)	60
61	*Tree cover, broadleaved, deciduous, closed (>40%)*	60
62	*Tree cover, broadleaved, deciduous, open (15-40%)*	60
70	Tree cover, needleleaved, evergreen, closed to open (>15%)	70
71	*Tree cover, needleleaved, evergreen, closed (>40%)*	*70*
72	*Tree cover, needleleaved, evergreen, open (15-40%)*	*70*
80	Tree cover, needleleaved, deciduous, closed to open (>15%)	80
81	*Tree cover, needleleaved, deciduous, closed (>40%)*	*80*
82	*Tree cover, needleleaved, deciduous, open (15-40%)*	*80*
90	Tree cover, mixed leaf type (broadleaved and needleleaved)	90
100	Mosaic tree and shrub (>50%) / herbaceous cover (<50%)	100
110	Mosaic herbaceous cover (>50%) / tree and shrub (<50%)	110
120	Shrubland	120
121	*Evergreen shrubland*	*120*
122	*Deciduous shrubland*	*120*
130	Grassland	130
140	Lichens and mosses	140
150	Sparse vegetation (tree, shrub, herbaceous cover) (<15%)	150
151	*Sparse tree (<15%)*	*150*
152	*Sparse shrub (<15%)*	*150*
153	*Sparse herbaceous cover (<15%)*	*150*
160	Tree cover, flooded, fresh or brackish water	160
170	Tree cover, flooded, saline water	170
180	Shrub or herbaceous cover, flooded, fresh/saline/brackish water	180

Note: Only the level 1 classes are considered, so the subdivisions have the number of broader categories. Only vegetated LC classes have been considered.

Annex 4: Acronyms and abbreviations

AD	Applicable Document
ASCII	American Standard Code for Information Interchange
ATBD	Algorithm Theoretical Basis Document
AVHRR	Advanced Very High Resolution Radiometer
BA	Burned Area
CCI	Climate Change Initiative
CMUG	Climate Modellers User Group
CRG	Climate Research Group
CRS	Coordinate Reference System
ENVISAT	ENVIronmental SATellite
EO	Earth Observation
ESA	European Space Agency
ECV	Essential Climate Variables
FR	Full Resolution
FTP	File Transfer Protocol
GCOS	Global Climate Observing System
GCS	Geographic Coordinate System
GHG	Green House Gases
GHRSST	Group for High Resolution Sea Surface Temperature
GIO-GL1-BA	Copernicus Global Land Service burned area product
HDF	Hierarchical Data Format
IGOS	Integrated Global Observing Strategy
IPCC	Intergovernmental Panel on Climate Change
LC	Land Cover
LC_cci	CCI Land Cover project
LTDR	Long Term Data Record
MERIS	Medium Resolution Imaging Spectrometer
MODIS	Moderate Resolution Imaging Spectroradiometer
MSI	MultiSpectral Instrument
NetCDF	NETwork Common Data Format
OLCI	Ocean and Land Colour Instrument on board Sentinel-3
Proba-V	Proba Vegetation
PSD	Product Specification Document
URD	User Requirements Document
S-1	Sentinel-1
S-2	Sentinel-2
S-3	Sentinel-3
SAR	Synthetic Aperture Radar
VNIR	Visible and Near InfraRed