climate change initiative

→ CLIMATE MODELLING USER GROUP

CCI+ CMUG Phase 2 Proposals
ESMValTool development

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Motivation

• Innovative and comprehensive model evaluation and analysis approaches are needed to assess the performance of the increasingly complex and high-resolution models.

• The community tool ESMValTool makes use of observational datasets such as ESA CCI and develops and applies new evaluation and analysis methods.

• This is an important contribution to improve our understanding of present-day climate, reduce uncertainties in future climate projections and support model development.
Aim

• Exploit ESA CCI and CCI+ data in the context of Earth system model (ESM) evaluation with ESMValTool

• Enhance the ESMValTool with additional diagnostics and metrics enabling analysis of models with ESA CCI and CCI+ data

• Implementation of new CCI datasets and corresponding diagnostics into the ESMValTool and updating existing datasets where needed

• Explore possibilities to take advantage of the uncertainty information provided with the CCI datasets for model evaluation
Proposed work packages

WP1: Implementation of CCIs SNOW and PERMAFROST into ESMValTool and update of existing datasets

WP2: Implementation of uncertainty estimates into ESMValTool

WP3 (optional): Implementation of CCI BIOMASS and diagnostic for evaluation of the role of vegetation on hydrometeorological processes

WP4 (optional): Extension of ESMValTool to process output from IFS (ECMWF) and MONARCH system (BSC)
WP1 Implementation/update of CCI datasets

- **aerosol**: update to Swansea ATSR (v4.33) and SLSTR / 3A (v1.12) OR ensemble (ATSR v3.0 and SLSTR / 3A v2.2) v6.1

- **biomass**: implement L4-AGB-MERGED-100m-2018-fv3.0

- **cloud**: v3.0 AVHRR AM+PM add L3U data (daily)

- **land cover**: update to v2.0.7/v2.1.1

- **land surface temperature**: v3.00, MODIS EOS Aqua add daily values

- **permafrost**: implement MODISLST_CRYOGGRID-AREA4_PP-fv03.0

- **snow**: implement multi-sensor.multi-platform.MERGED.2-0.r1

- **soil moisture**: update to version v7.1

- **sst**: add daily values update v3.0 once available

- **water vapour**: v3.1 TCWV-global (COMBI) add daily values
Implementation of CCI datasets

SNOW, PERMAFROST

- Implementation of diagnostic for deriving permafrost (temperature at the depth of zero annual amplitude < 0°C) in the CMIP models (e.g. Burke et al., 2020)
- Implementation of diagnostic for effective snow depth (mean snow depth weighted by duration) (Slater et al., 2017)
- Application to CMIP6 model ensemble

BIOMASS (optional)

- AGB for evaluation of the role of vegetation on hydrometeorological processes in CMIP6 models
Update of CCI datasets

CLOUD, LANDCOVER, LAND SURFACE TEMPERATURE, SOIL MOISTURE, SST, WATER VAPOUR

- Update to recent version
- Adding daily values
- Enhancing observational products for climate model evaluation with machine learning (process-oriented model evaluation based on cloud classes)
- Causal model evaluation for cloud regimes and land cover types

AEROSOL (optional)

- Evaluation of dust aerosol and clouds (Aerosol/Cloud Reanalysis)
Uncertainty estimates

- Available **uncertainty information** will be implemented into the ESMValTool alongside already existing ECVs from ESA CCI datasets.

- In order to make **scientific use** of this uncertainty information, possibilities to propagate uncertainty information to the spatial and temporal scales used by the models will be investigated.

- As a **starting point**, work done on implementing uncertainty information for the CCI LAND SURFACE TEMPERATURE will be used and extended on a case-by-case study for selected other ECVs.
Optional

- Extension of ESMValTool to process output from IFS (ECMWF) and MONARCH system (BSC)
- Evaluation of dust aerosol and clouds (Aerosol/Cloud Reanalysis)