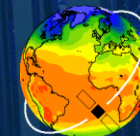


climate change initiative

→ CLIMATE MODELLING USER GROUP

CCI+ CMUG Phase 2 Proposals ESMValTool development

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ESMValTool
Earth System Model Evaluation Tool



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
cci

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



biomass
cci

implement L4-AGB-MERGED-100m-2018-fv3.0



cloud
cci

v3.0 AVHRR AM+PM
add L3U data (daily)



land cover
cci

update to v2.0.7/v2.1.1



land surface temperature
cci

v3.00, MODIS EOS Aqua
add daily values



permafrost
cci

implement MODISLST_CRYOGRID-AREA4_PP-fv03.0



snow
cci

implement multi-sensor.multi-platform.MERGED.2-0.r1



soil moisture
cci

update to version v7.1



sst
cci

add daily values
update v3.0 once available



water vapour
cci

v3.1 TCWV-global (COMBI)
add daily values



SNOW, PERMAFROST



- Implementation of diagnostic for deriving permafrost (temperature at the depth of zero annual amplitude $< 0^{\circ}\text{C}$) 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



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)



- 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)