

Satellite based climate data record HOAPS version 4.0 including uncertainty characterization

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Reliable and high-quality long term climate data records (CDRs) are of fundamental importance for the analysis of climate variability and change. To enhance the availability of high-quality long term CDRs the EUMETSAT Satellite Application Facility on Climate Monitoring (CM SAF) provides satellite-derived geophysical parameter data records of currently nearly 30 years suitable for climate monitoring. Parameters based on remote sensing offer global scale and continuous coverage. To analyze climate variability and change the measured satellite data need to be homogeneous over several decades and should not contain artificial heterogeneities masking natural trends.

The recent fundamental climate data record (FCDR) provided by CM SAF contains carefully inter-calibrated brightness temperatures (TBs) from the instruments SMMR, SSM/I and SSMIS aboard various satellites of the Defense Meteorological Satellite Program (DMSP). This FCDR facilitates the derivation of essential climate variables (ECVs) eligible for the analysis of climate variability in a homogeneous way (see abstract of K. Fennig for more details).

The Hamburg Ocean Atmosphere Parameters and Fluxes from Satellite Data (HOAPS) set is a thematic climate data record (TCDR) providing global ocean surface fluxes and atmospheric water cycle parameters with the utilization of the fore mentioned FCDR. The global water cycle is a key component of the global climate system as it describes and links many important processes such as evaporation, convection, cloud formation and precipitation. Through latent heat release, it is also closely connected to the global energy cycle and its changes. The difference between precipitation and evaporation yields the freshwater flux, which indicates if a particular region of the earth receives more water through precipitation than it loses through evaporation or vice versa. On global scale and long time periods, however, the amounts of evaporation and precipitation are balanced. A profound understanding of the water cycle is therefore a key prerequisite for successful climate modelling.

HOAPS is a fully satellite based climatology of precipitation, evaporation and freshwater flux as well as related turbulent heat fluxes and atmospheric state variables over the global ice free oceans. Originally HOAPS was developed at the Max-Planck-Institute for Meteorology (MPI-M) and the University of Hamburg (UHH), with a first release of the HOAPS 1 in 1998. HOAPS has been successfully transferred into the operational environment at CM SAF. With the release of HOAPS 3.1 in 2009 the processing is carried out at CM SAF while scientific improvements are developed jointly at MPI-M, UHH and CM SAF. A subset of the HOAPS parameters is released by CM SAF HOAPS version 4.0 (https://doi.org/10.5676/EUM_SAF_CM/HOAPS/V002). The HOAPS data products are available as monthly averages and 6-hourly composites on a regular latitude/longitude grid with a spatial resolution of $0.5^\circ \times 0.5^\circ$ from July 1987 to December 2014.

The presentation will cover details on the latest HOAPS 4.0 release as well as future plans for further developments of HOAPS. Currently the vertically integrated water vapour and the near surface wind speed have been inferred with a 1D-Var retrieval. For future releases the 1D-Var retrieval is being developed for additional parameters, in particular for the precipitation and the liquid water path. A second focus in this presentation will be on the uncertainty characterization of HOAPS 4.0 latent heat fluxes and related parameters.