Climate Data Records and User Service of the EUMETSAT SAF on Climate Monitoring

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In recent decades, climate variability and change have caused impacts on natural and human systems on all continents. Observations are needed to understand and document these changes in the climate system. They are increasingly based on remote sensing from satellites which offer global scale and continuous coverage. Only long term and consistent observations of the Earth system allow to quantify impacts of climate variability and change on the natural and human dimension. From this understanding one can estimate and eventually predict future changes of the Earth system and quantify its vulnerability to continuing anthropogenic forcing. In addition, these observations can be used in the evaluation and assessment of reanalysis data records and climate models.

Definition of the different Climate Data Records (CDRs)

A Fundamental Climate Data Records (FCDR) is a long-term satellite data record of calibrated and quality-controlled data designed to allow the generation of homogeneous products that are accurate and stable enough for climate monitoring. FCDRs include the ancillary data used to calibrate them.

Thematic Climate Data Records (TCDR) are geophysical variables derived from the FCDRs, specific to various disciplines, and often generated by blending satellite observations, in situ data, and model output. Interim Climate Data Records (ICDR) denote a regularly updated TCDR in shorter time latency with an algorithm and processing system as consistent as possible to the generation of reference TCDR. An ICDR is usually based on the latest available inter-calibration and requires a different validation approach.

Climate Data Records (CDRs) of EUMETSAT’s CM SAF

Since 2012 CM SAF is operationally delivering high-quality satellite based Climate Data Records (CDR) for climate monitoring and model evaluation.

CM SAF’s CDRs are based on carefully (inter-)calibrated satellite data using the latest versions of the respective algorithms. All CM SAF data records undergo a rigorous technical and scientific external review process, while still being flexible enough to incorporate the latest developments.

To support the emerging European operational climate monitoring services, ICDRs for selected TCDRs (CLAAS-2, SARAH-2.1, and CLARA-A2) are generated additionally. The ICDRs are based on the respective algorithms of the previously released TCDR and allow the continuation of the time series with shorter time latency. ICDR products based on CLAAS-2 and SARAH-2.1 are already available. CM SAF is currently preparing the implementation of the ICDR based on algorithms used in CLARA-A2.

During the current project phase (CDOP 3, 2017-2022) CM SAF will update several already re-leasable CDRs and will provide CDRs of additional parameters after careful validation and review of the data records. Information on the CM SAF CDRs can be found via the respective DOIs which are available via https://www.cmsaf.eu/doi.

User Help Desk and services

Data can be ordered through the CM SAF webpage www.cmsaf.eu and is provided free of charge to any interested user (user registration required). A selection of sub-regions and re-projection of data is possible during the ordering process. Add-on products and ancillary data (e.g. lat/lon, land/sea mask, etc.) as well as example files are available on the webpage.

To support the processing and visualisation of the products a R-toolbox with ready to use functions for processing and visualisation of the CM SAF data records is provided, too. The toolbox can be downloaded from https://www.cmsaf.eu/tools.

Additionally, service messages, information on changes in processing, known product disruptions as well as newsletters and documentation on the products are being provided.

Table 1: Details for released (black) and planned (until 2022, red) CM SAF CDRs. Further information can be found via the corresponding Digital Object Identifiers (DOI) available at www.cmsaf.eu/tools.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>TCDR period</th>
<th>Area</th>
<th>ICDR start year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microwave Radiances (SSMI)</td>
<td>1987-2008</td>
<td>global</td>
<td>2008</td>
</tr>
<tr>
<td>Microwave Radiances (SSMI, SSMIS)</td>
<td>1987-2013</td>
<td>global</td>
<td>2013</td>
</tr>
<tr>
<td>Microwave Radiances (SMMR, SMI, SSMIS)</td>
<td>1979-2015</td>
<td>global</td>
<td>2015</td>
</tr>
<tr>
<td>Microwave Radiances (SMMR, SSMIS)</td>
<td>1979-2020</td>
<td>global</td>
<td>2020</td>
</tr>
<tr>
<td>Total column water vapour, evaporation, precipitation, freshwater flux, latent heat flux, near surface wind speed and humidity (HOAPS 3.2)</td>
<td>1987-2008</td>
<td>global</td>
<td>2008</td>
</tr>
<tr>
<td>As HOAPS-3.2 (HOAPS-4)</td>
<td>2014-2020</td>
<td>global</td>
<td>2020</td>
</tr>
<tr>
<td>As HOAPS-4 + liquid water path (HOAPS-5)</td>
<td>1987-2020</td>
<td>global</td>
<td>2020</td>
</tr>
<tr>
<td>Cloud properties, surface radiation, surface albedo (CLAAR A1)</td>
<td>1982-2009</td>
<td>global</td>
<td>2009</td>
</tr>
<tr>
<td>As CLARA A1 (CLAAR A2)</td>
<td>1982-2015</td>
<td>global</td>
<td>2015</td>
</tr>
<tr>
<td>As CLARA A2 (CLAAR A2.1)</td>
<td>1982-2018</td>
<td>global</td>
<td>2018</td>
</tr>
<tr>
<td>As CLARA A2.1 + top of the atmosphere radiation (CLAAR AA)</td>
<td>1978-2020</td>
<td>global</td>
<td>2020</td>
</tr>
<tr>
<td>Cloud parameters, surface radiation (CLAAS-1)</td>
<td>2004-2012</td>
<td>European &amp; Africa</td>
<td>2012</td>
</tr>
<tr>
<td>Cloud parameters (CLAAS-2.1)</td>
<td>2004-2017</td>
<td>European &amp; Africa</td>
<td>2017</td>
</tr>
<tr>
<td>Cloud parameters (CLAAS-3)</td>
<td>2004-2020</td>
<td>European &amp; Africa</td>
<td>2020</td>
</tr>
<tr>
<td>Aerosol optical depth (AOD)</td>
<td>2004-2012</td>
<td>European &amp; Africa</td>
<td>2012</td>
</tr>
<tr>
<td>Land fluxes, free tropospheric humidity, land surface temperature</td>
<td>1983-2020</td>
<td>European &amp; Africa</td>
<td>2020</td>
</tr>
<tr>
<td>Solar radiation parameters (SARAH-3)</td>
<td>1983-2020</td>
<td>European &amp; Africa</td>
<td>2020</td>
</tr>
</tbody>
</table>

*selected parameters only