

## A Fundamental Climate Data Record of SSM/I, SSMIS, and SMMR

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The satellite based HOAPS (Hamburg Ocean Atmosphere Parameters and Fluxes from Satellite Data; <http://www.hoaps.org/>) climatology provides climate data records of precipitation, evaporation and the resulting freshwater flux over the global ice-free ocean between 1987 and 2008. The latest version of HOAPS has been released by CM SAF and is available from the CM SAFs web user interface (<http://wui.cmsaf.eu/>).

The HOAPS climate data records are primarily based on passive microwave measurements from the SSM/I (Special Sensor Microwave/Imager) sensor family. In order to derive reliable long term trend estimates of the global water and energy cycle parameters it is strictly necessary to carefully correct for all known problems and deficiencies of the SSM/I radiometers as well as to inter-calibrate and homogenise the different instruments. Moreover, all applied corrections need to be clearly documented to provide a complete calibration traceability for a Fundamental Climate Data Record (FCDR). Following these recommendations, CM SAF released in 2013 a FCDR of SSM/I brightness temperatures (DOI:10.5676/EUM\_SAF\_CM/FCDR\_SSMI/V001), freely available from the web user interface (<http://wui.cmsaf.eu/>). This FCDR has already been used in the ESA CCI Sea ice project and will also be used in the upcoming reanalysis ERA5.

In order to further extend the HOAPS dataset in time, the SSM/I successor instrument SSMIS (Special Sensor Microwave Imager Sounder) has to be used from 2009 onwards. CM SAF also reprocessed the SSMIS sensors onboard F16, F17, and F18 to the same standards as the SSM/I data record for the time period 2006 - 2013 and the combined FCDR was released in 2015 (DOI:10.5676/EUM\_SAF\_CM/FCDR\_MWI/V002). Amongst others, known instrument issues like sunlight intrusions, moonlight intrusions, and reflector emissivity have been accounted for and the brightness temperatures have been inter-calibrated to the SSM/I instrument series to allow a seamless continuation of existing TCDRs.

In order to extend the available FCDR to the time period before the SSM/I epoch, CM SAF has now re-processed available brightness temperatures from the SMMR (Scanning Multichannel Microwave Radiometer) on board Nimbus-7 with the main focus on the inter-calibration of the brightness temperatures to the SSM/I series, using ERA20c as a transfer target. The re-processed data record will be available in the same user friendly data format as the existing FCDR. The new FCDR release will also extend the SSMIS data record with two additional years. Altogether, the FCDR will now span the time period from 1978 to 2015 combining observations from SMMR, SSM/I and SSMIS.

This presentation will focus on the inter-calibration of the SMMR and the evaluation of the combined FCDR over the complete time period. A validation of the brightness temperatures is a challenging task as there are no ground-truth reference measurements available for the microwave band. Hence, the homogeneity of the FCDR is evaluated by an analysis of the relative biases between the different instruments before and after the inter-calibration offsets are applied.