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METEOSAT IR and WV channels Fundamental Climate Data Record

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The detection of climate change and analysis of climate variability at inter-annual scales requires long-term, well calibrated observations that are homogenised in time and space. Observations from EUMETSAT's series of Meteosat First Generation (MFG) and Meteosat Second Generation (MSG) geostationary satellites span a period from 1982 to today. Although these satellites provide data for climate analysis at multi-decadal scales, their applicability for such analysis is hampered by heterogeneities in the time series due to successive radiometers having different filter functions and changes in the calibration methodology. EUMETSAT initiated the activity to improve the quality of these data, and generates a Fundamental Climate Data Record (FCDR) of Water Vapour (WV) and Infrared (IR) channel radiances, i.e., a long-term data record of calibrated and quality-controlled sensor data designed to allow the generation of homogeneous products that are accurate and stable enough for climate monitoring. The generation of this FCDR is part of EUMETSATs activities in the European Re-Analysis of global CLIMate observations 2 (ERA-CLIM2) project.

We present a method to inter-calibrate the complete time series of WV (6.3 μm) and IR (11.8 μm) channel radiances from MFG-MVIRI and MSG-SEVIRI observations. Our method is based on the principles of the Global Space-based Inter-Calibration System (GSICS). A systematic review of spectral conversion functions, which often dominate the errors, indicates that spectral changes of the WV channel from HIRS/2 to HIRS/3 triples the uncertainty of inter-calibrated METEOSAT WV radiances. We will show that these issues can be circumvented by using HIRS/2, AIRS, and IASI as reference instruments, and thus keeping the uncertainties due to spectral conversion similar throughout the time series. Finally we will present an evaluation of 30 years of recalibrated HIRS, MVIRI and /SEVIRI radiances from the IR and WV channels, and demonstrate their improved suitability for climate applications.