



Generation of Reliable Climate Data Records From Satellite Data: The Calibration and Inter-Calibration Challenge

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Earth observations constitute a critical input for monitoring and advancing understanding of the Earth climate system including its variability and change. From observations taken by satellites or ground-based systems so-called Climate Data Records (CDRs) also known as time series of Essential Climate Variables (ECV) can be created. In particular long records of satellite data have a high potential for being utilised for assimilation into Numerical Weather Prediction (NWP) models to create a physically consistent model-based reanalysis, for the assessment of climate model performance and climate studies directly targeting an improved understanding of the mechanisms of climate change and variability. However, the requirements concerning long-term stability and uncertainty for CDRs are challenging. This is because many long-term satellite observations are provided by operational satellite systems build for the purpose of weather and not climate monitoring. Thus, a high demand for satellite radiance data records with quality analysed and corrected observations as well as a homogenisation over time facilitating the use of multiple satellites carrying similar and different instruments exists.

The improvement of the quality of a multi-satellite data record is clearly an international challenge. For instance the creation of a CDR from all past and current geostationary satellite instruments needs a collaboration of space agencies worldwide. The WMO Space Program has initialised two relevant activities leading to improved CDRs. The Global Space-based Inter-Calibration System (GSICS) aims at the development of techniques to ensure comparability of satellite measurements taken at different times and locations by different instruments operated by different satellite agencies, and ties all measurements to SI units. The Sustained Coordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM) initiative is a major activity to establish a sustained international capability to generate CDRs utilising methodology developed by GSICS.

This presentation discusses this challenge along the example of EUMETSAT's activities related to CDR generation. It gives examples of currently produced CDRs for the use in climate analysis and NWP model based reanalysis. At the core of the activities are the long existing data records of the EUMETSAT Meteosat and Eumetsat Polar System program satellites. In particular the usage of the Meteosat data presents a challenge because the instruments were originally not designed to be used for climate monitoring. The presentation outlines how inter-satellite calibration for the Meteosat data record spanning a period from 1982 to today can be achieved applying GSICS methodology, e.g., by tying observations to reference instruments in space and on ground and how the associated uncertainties might be quantified.