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Uncertainty Propagation in a Fundamental Climate Data Record derived from Meteosat Visible Band Data

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The series of Meteosat First Generation (MFG) Satellites provides a unique opportunity for the monitoring of climate variability and of possible changes. 6 Satellites were operationally employed; all equipped with identical MVIRI radiometers. The time series now covers, for some parts of the globe, more than 34 years with a high temporal (30 minutes) and spatial (2.5 x 2.5 km^2) resolution for the visible band. However, subtle differences between the radiometers in terms of the silicon photodiodes, sensor spectral ageing and variability due to other sources of uncertainties have limited the thorough exploitation of this unique time series so far. For instance upper level wind fields and surface albedo data records could be derived and used for the assimilation into Numerical Weather Prediction models for re-analysis and climate studies, respectively. However, the derivation of aerosol depth with high quality has not been possible so far. In order to enhance the quality of MVIRI reflectances for enabling an aerosol and improved surface albedo data record it is necessary to perform a re-calibration of the MVIRI instruments visible bands that corrects for above mentioned effects and results in an improved Fundamental Climate Data Record (FCDR) of Meteosat/MVIRI radiance data. This re-calibration has to be consistent over the entire period, to consider the ageing of the sensor's spectral response functions and to add accurate information about the combined uncertainty of the radiances. Therefore the uncertainties from all different sources have to be thoroughly investigated and propagated into the final product. This presentation aims to introduce all sources of uncertainty present in MVIRI visible data and points on the major mechanisms of uncertainty propagation. An outlook will be given on the enhancements of the calibration procedure as it will be carried out at EUMETSAT in the course of the EU Horizon 2020 FIDUCEO project (FIDelity and Uncertainty in Climate data records from Earth Observations). The re-calibration procedures will also benefit from the calibration methodologies developed by the Global Space-based Inter-Calibration System (GSICS).