# Consistent surface albedo comparison derived from Meteosat-2 and Meteosat -7 observations

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More than two decades of observations have been acquired by six different radiometers onboard the Meteosat First Generation satellite series. The duration of the corresponding historical archive makes these observations attractive for the monitoring of climate processes such as seasonal surface albedo changes based on observations acquired in the VIS band. Geostationary observations are potentially adapted to derive such information as the frequent cycle of acquisition can be used to document the anisotropy of the surface and therefore surface albedo. Such objective is however not straightforward as these observations have been acquired by different radiometers, not originally designed to meet accuracy and precision constrains required by climate monitoring. It is thus not possible anymore to establish retrospectively ideal requirements compatible with climate monitoring purposes. The present study illustrates current efforts undertaken at EUMETSAT to exploit the Meteosat archive for the generation of climate data records. Specifically, the objective is the detection of surface albedo changes at a 20-years interval comparing product derived from Meteosat-2 and -7 observations respectively. As a prerequisite, archived VIS band observations have been systematically calibrated against simulated radiances over stable bright desert targets.

The proposed approach relies on a robust and conservative estimation of the derived product accuracy and reliability. This error estimate accounts for the actual measurement uncertainties. This product error estimation can subsequently be used for assessment of the significance of observed changes with respect to the actual characteristics of the retrieval system. This error estimation is used for a meaningful comparison of surface albedo derived from sensor with different radiometric performances. The benefit of this approach is illustrated trough the identification of significant surface albedo changes from data acquired with two different radiometers at a 20-year interval. Over stable desert areas, where no surface albedo change is expected, Met-2 and -7 surface albedo agrees within 6%. Despite the radiometric differences between the Meteosat-2 and -7 radiometers, it is possible to detect surface albedo relative changes of about 18% or more on the average. This 18% limit is essentially determined by calibration uncertainties resulting from the characterisation of the sensor spectral response. Observed surface albedo changes over the African continent are analysed in the light of the precipitation seasonal variations.