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A novel method for vicarious re-characterisation of the MVIRI VIS spectral response to facilitate climate monitoring

Ralf Quast (1), Yves Govaerts (2), Frank Rüthrich (3), and Ralf Giering (1)
(1) FastOpt GmbH, Hamburg, Germany, (2) Rayference, Brussels, Belgium, (3) EUMETSAT, Darmstadt, Germany

The Meteosat Visible and Infrared (MVIRI) sensors on board Meteosat First Generation (MFG) geostationary satellites (1982 - today) acquire radiance every 30 minutes in a broad spectral band, ranging approximately from 0.4 to 1.1 μm and referred to as the visible (VIS) band.

The original objective of the MFG programme was the acquisition of Earth images to provide the meteorological community with information on atmospheric circulation and weather. One of the objectives of the H2020 Fidelity and Uncertainty in Climate Data Records from Earth Observation (FIDUCEO) project is to re-evaluate the VIS acquisitions in a metrological rigorous way to generate new fundamental and thematic climate data records with traceable uncertainty and stability estimates. The clue to this re-evaluation is an accurate characterisation of the VIS spectral response functions, which were characterised poorly pre-launch and had apparently been degrading stronger in the blue than the near-infrared part of the VIS band.

In consequence, a novel practice for a vicarious re-characterisation of the MVIRI VIS spectral response function has been developed. The so termed reverse engineering method applies advanced algorithmic differentiation techniques to calculate daily maximum posterior probability estimates of the sensor spectral response and accurate and traceable measures of its uncertainty and spectral error covariance.

This presentation explains the key concepts of the method and imparts new findings and results of its application to the Meteosat Second Generation (MSG) Meteosat-10 and MFG Meteosat-7 visible bands.

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