

An infrared emissivity atlas based on IASI

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ABSTRACT

The infrared surface emissivity within a footprint of a satellite instrument, such as IASI with a footprint size of 12 km at nadir, varies according to the different surface types found within the footprint. It is therefore natural to represent the overall (effective) spectral emissivity of each footprint as a convex combination (a weighted average with all weights between 0 and 1 and summing up to one) of a collection of base emissivity spectra. This representation naturally models the combined emissivity in a field of view composed of several different surface types and excludes unrealistic emissivity spectra from the feasible state-space. The fact that emissivity can be represented as a convex combination of base spectra places emissivity in a unique position among the parameters retrieved from hyper spectral infrared measurements. These natural bounds on the surface emissivity helps disentangle the effects of the surface skin temperature and emissivity. We show how to set up and solve a linear programming (LP) model for simultaneous retrieval of surface skin temperature and emissivity subject to the convex combination constraints. The quality-controlled IASI LP emissivity retrievals, in cloud free footprints, were used for building an infrared emissivity atlas with monthly resolution, taking the IASI point spread function into account. We discuss the generation, validation and use of this atlas, which will be freely available for download from EUMETSAT.