Angular Dependency Model for the Meteosat Longwave Radiation

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Accurate measurement of the outgoing longwave radiation (OLR) is of prime importance to improve the modelization of the climate system. Indeed, this radiative flux is a component of the Earth radiation budget, together with the incoming solar flux and the reflected solar flux. For the Meteosat field of view, accurate measurements of the longwave broadband radiance are now available either directly from the Geostationary Earth radiation Budget (GERB) instrument or indirectly from the narrowband measurements of the SEVIRI or the Meteosat-7 imager. Nevertheless, angular modelisation of the radiation field is needed to estimate the flux from the directional measurement. At this level the geostationary orbit is known to be an inconvenient as error in the angular modeling are introducing regional biases in the OLR (a same place on Earth is always observed at the same viewing geometry).

In this poster we present the longwave angular modeling which has been developped, implemented and is currently applied to the GERB instrument data. The method is quite standard and has been widely used: the limb-darkening is assessed using regression on the SEVIRI narrowband measurements, the regression parameters being derived from radiative transfer computation. In the frame of the GERB project, an extensive validation of the thermal flux has been carried out and some limitations of the angular modeling have been identified. There remain 2 main sources of angular conversion error: (i) the inaccurate modeling of the semitransparent high clouds (cirrus) anisotropy and (ii) the 3-dimensional effects on the cloud edges (broken cloud field). To avoid that these errors propagate as biases in the GERB fluxes, a correction scheme has been set up. The correction is based on the analysis of simultaneous OLR estimated from Meteosat-7 (located at 0°) and Meteosat-5 (located at 63° for Indoex). This correction scheme can be applied after any angular modeling based on plane-parallel radiative transfer computation. Finally, a validation of the method is presented by applying the correction to the GERB longwave flux and a regional comparison with OLR derived from CERES in RAP mode.