# Abstract

Accurate measurements are needed to improve our understanding of the Earth Radiation Budget (ERB). Despite continuous efforts to improve the observation systems, modeling processes remain necessary to convert the original measurements in a form usable by the scientific community. These modelings concern the spectral, the angular, the spatial, and the temporal properties of the radiation leaving the Earth at the top of the atmosphere.

For instruments on low Earth orbit satellites, the temporal modeling is always an important issue. Indeed, most locations on Earth are observed only a limited number of time per day. On the other hand, the geostationary orbit allows to resolve the full diurnal cycle and therefore to do not need any temporal modeling. This is the main motivation to include the Geostationary Earth Radiation Budget (GERB) instrument on the Meteosat Second Generation satellites. However, the geostationary orbit exacerbates the need of spectral, angular, and spatial modelings. Due to the distance, some assumptions of the spectral signature of the observed scene is necessary to compensate the telescope spectral response. Spatial modeling allows to improve the spatial resolution of the large GERB footprints and to compensate for the point spread function of the instrument. Finally, angular modeling of the radiation field is needed to convert the directional measurement in hemispheric flux. These modeling steps should be done and validated carefully. Indeed, any modeling error is likely to introduce biases in the GERB products.

In this PhD work we address these modeling problems in the case of the GERB instrument. We discuss the rationale of what is implemented for the Edition-1 GERB data processing. The errors that these modelings introduce in the final GERB products are quantified. Recommendations for a future Edition-2 processing are suggested in the text and summarized in the conclusions.