



EarthCARE BBR LW Baseline Flux Retrieval Algorithm

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The Broadband Radiometer (BBR) instrument on EarthCARE will provide accurate measurements of the outgoing shortwave (SW) and longwave (LW) radiances at the Top of the Atmosphere (TOA) in an along-track configuration at three different viewing zenith angles (fore, aft and nadir observations). Radiative fluxes at the TOA are estimated from the BBR directional measurements through a radiance-to-flux conversion algorithm. This algorithm with accounts for the angular variation of the radiation field of the scene observed should provide observation geometry independent fluxes. In this study, the methodology to develop the Level 2 LW Baseline Flux Retrieval algorithms from BBR LW unfiltered radiances is presented.

The Anisotropic emission models constructed are based on regressions with the multispectral imager (MSI) narrowband thermal channels, i.e. 8.8, 10.8 and 12 μm , using a large database of LibRadtran and SBDART radiative transfer simulations. Specific regressions are used for high and semi-transparent clouds scenes, in which flux inter-comparisons between GERB and CERES have indicated differences consistent with a certain underestimation of the LW limb-darkening.

Since the Earth's emitted longwave radiation has a high variability, a large spectral database of LibRadtran and SBDART radiative transfer simulations of thermal radiances with a total of 12096 scenes, is used for the development of the LW Anisotropy models. This database aims to cover a wide range of physical situations and for this purpose, the scene definition has been done using ancillary models/data, such as, surface emissivities derived from the Aster Spectral Library data (Baldrige et al., 2009) as regards to surface optical properties and OPAC Software (Hess et al., 1998) for the computation of the aerosol optical properties and Yang parametrization for water and cloud optical properties. It has also been done a careful selection of the atmospheric profiles and surface temperatures for the simulations. This large spectral database has been completed with a clear sky SBDART database of 2311 scenes in which atmospheric profiles had been adapted from TIGER-3 database.

Results obtained are validated using a database of collocated CERES and GERB-like data of 121 millions of pairs over the SEVIRI disk and an analysis of the residual angular dependence is performed in bins of retrieved fluxes.

The developed ADMs can be of interest for other missions that estimate the Outgoing Longwave Radiation (OLR) such as the High Resolution Infrared Radiation Sounder (HIRS), the Advanced Very High Resolution Radiometer (AVHRR), SEVIRI (GERB-like) and the not yet launched Advanced Baseline Imager (ABI) on GOES-R.