Development of an extense atmospheric scene database with the 3-D Monte-Carlo EarthCARE Simulator to build 3 along-track views angular dependence models in the framework of ESA EarthCARE Mission

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One of the main error sources when measuring the Earth Radiation Budget (ERB) is the lack of knowledge of the anisotropy of the observed scene radiance field. Major efforts have been made over the last 25 years to build and improve *Angular Dependence Models* (ADMs) that account for this anisotropy, thus allowing to retrieve flux measurements with the desired accuracy.

ADMs are required to carry out radiance-to-flux conversions; they can be derived directly from satellite data, along the course of a mission, if directional sampling of radiances is sufficient to infer flux estimates. Because the EarthCARE-BBR (Broadband radiometer) instrument lacks sufficient angular sampling, an alternate approach was explored to derive a set of ADMs using TOA radiances and fluxes that were simulated by the Monte-Carlo photon transport algorithm in the EarthCARE Simulator.

To replace the lack of satellite information, more than 200.000 detailed 3-D atmospheric scenes were defined They took into account foreseen specific orbital constraints, five different land surface types, and the ocean surface with four different wind speed conditions, with corresponding atmospheric/surface/cloudy interrelated conditions; including a fine aerosol/cloud classification and discretisation. The simulations were processed on the Grid on-Demand ESA-ESRIN interface (more than 100 CPUs), as well as on their Centre Nazionale di Ricerca (CNR) associated cluster (16 nodes grid cluster with 4 CPUs each).

The EarthCARE-BBR makes measurements at nadir and in the along-track direction at two symmetric off-nadir views of 55º. This configuration is suitable for flux retrieval. Inversions of BBR-like radiances were carried out using the synthetic database and

compared to other inversion approaches. The result was that the best method is always that based on the three along-track BBR views.