RT simulations to assess cloud effects in solar and thermal radiative flux estimation for the EarthCARE BBR instrument

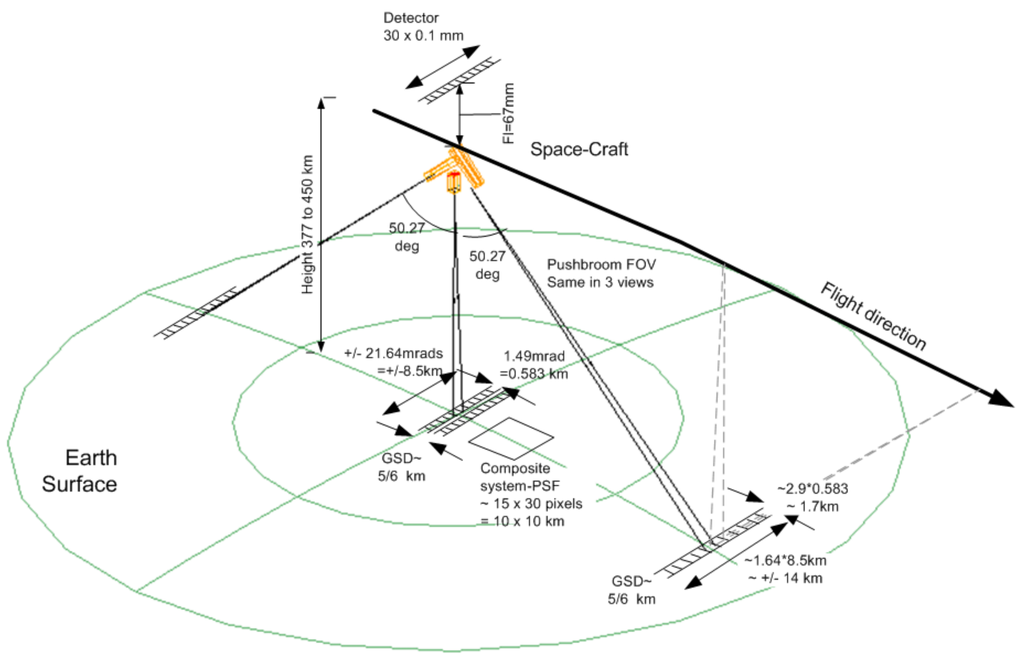
Carlos Domenech (1) (1) GMV, Spain
Almudena Velázquez-Blázquez (2) (2) Royal Meteorological
Edward Baudrez (2) Institute of Belgium
Nicolas Clerbaux (2) (RMIB)

DESCRIPTION

EarthCARE's top-of-Atmosphere radiative fluxes (**BMA-FLX**) are obtained by applying a radiance-to-flux conversion algorithm to the unfiltered radiances from the Broad-Band Radiometer (BBR). Algorithms for retrieval of solar and thermal fluxes are based in angular dependence models (**ADMs**). The ADMs model the **anisotropy of the atmosphere-Earth system** providing an anisotropic correction factor to the Lambertian assumption when integrating the exiting radiance field. A geophysical dataset mimicking EarthCARE data is constructed for training the algorithms and build the ADMs.

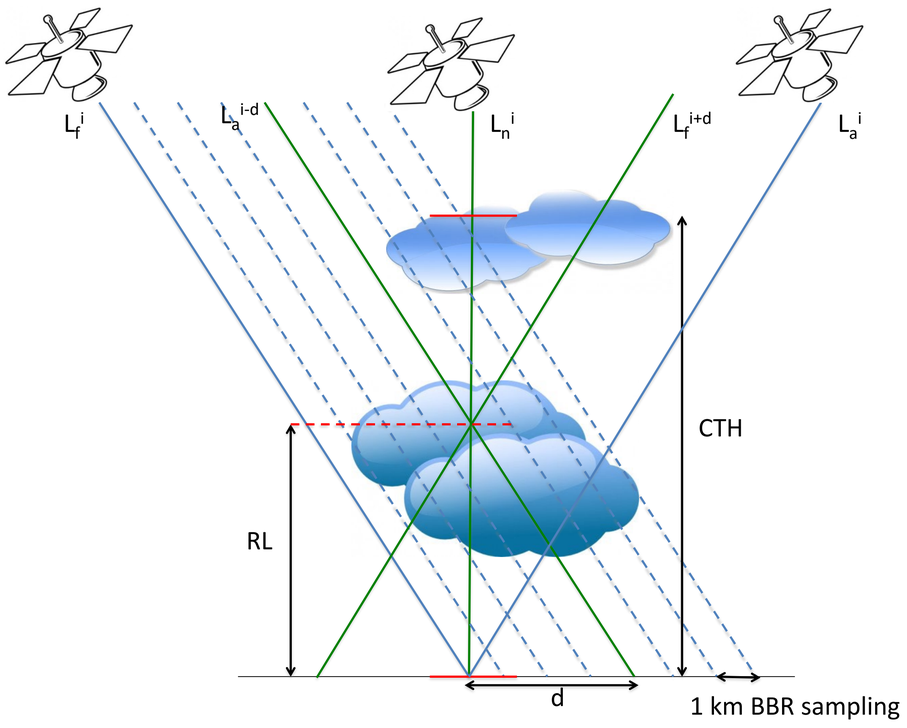
ALGORITHMS

- **Shortwave** (SW) models are created per scene type and per angular geometry, and constructed from **CERES** and MODIS flux and radiance data, and auxiliary surface and atmosphere information, using a **feed-forward back-propagation artificial neural network**
- **Longwave** (LW) models are based on **correlations** between **BBR** radiance anisotropy and the spectral information provided by the EarthCARE's Multi-spectral Imager (**MSI**) radiances derived from **radiative transfer calculations**

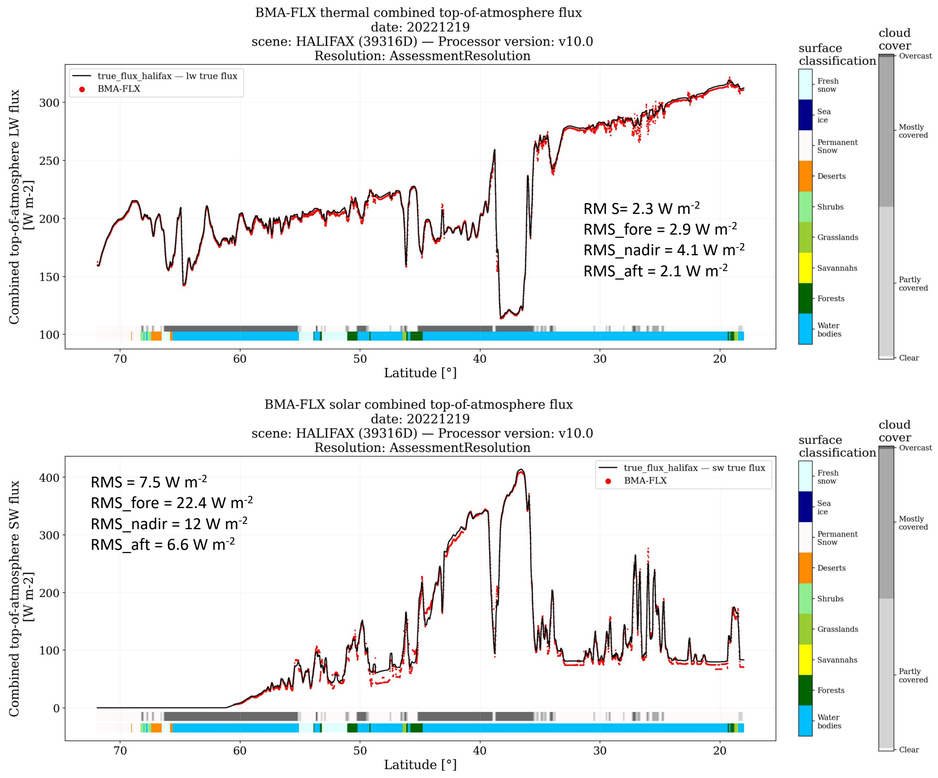


CO-REGISTRATION AT REFERENCE LEVEL

- Optimizing radiance co-registration at the **reference level** (RL), the most **radiatively significant atmospheric layer**, is essential for harnessing the multi-pointing capabilities of BBR
- **MSI CTH** is a good estimator to co-register the **LW** BBR radiances. RL is defined as the p90th of the altitude of the highest cloud in the BBR domain
- Co-registration errors at **SW** are higher when employing CTH compared to the surface. Oblique radiances crossing the optical path between surface and MSI CTH in the BBR nadir observation are selected for flux processing. **RL** is defined as the atmospheric layer **minimizing differences among nadir, aft, and fore flux retrievals**



FLUX COMBINATION



A **combined flux** is **derived** from the **aft, fore and nadir fluxes** derived at the **RL**. The algorithm to merge fluxes considers the **scene type errors**, the **unfiltering errors** and the **3D effects** of the **clouds** present in the scene

SIMULATED EARTHCARE SCENE