Synergistic aerosol and cloud properties from EarthCARE's imager and atmospheric lidar

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ESA's mission EarthCARE will provide measurements from active sounder and passive imager from one platform. Vertical profiles of cloud and aerosol parameters will be retrieved with an active backscatter lidar (ATLID). MSI observations will provide the information to extend the spatial limited information of cloud and aerosol properties obtained from active sensors into the cross-track direction, which is required to perform a radiative closure with the broad band radiometer data.

State of the art algorithms have been developed to retrieve MSI cloud and aerosol products, e.g. cloud mask, ISCCP cloud types, cloud phase, cloud optical thickness, cloud effective radius and cloud top height, aerosol optical thickness and Ångström parameter. The synergistic use of both ATLID and MSI is providing additional information about the cloud top height, spectral aerosol optical thickness, Ångström paramter and aerosol types.

There are two different cloud top heights retrieved. The infrared effective radiating height is retrieved by the MSI and is located somewhere in the cloud while the ATLID retrieved cloud top height stands for the physical boundaries of the clouds along-track. Both the MSI and ATLID cloud top height are used to study the relationships between the effective and true cloud top height.

Further the synergistic use of ATLID and MSI to identify aerosol types has been studied based on the information of the retrieved spectral aerosol optical thickness, which consists of measurements at 355 nm (ATLID), 670 nm (MSI) and 865 (MSI, only ocean).

We have used a combination of MODIS and Calipso observations and specific test scenes, generated with the EarthCARE Simulator (ECSIM), which have been created from model output data, as a test bed to develop a combined synergistic retrieval which uses the cloud and aerosol information from both ATLID at the track and MSI over the entire swath.