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Investigating cloud vertical profile using cloud properties retrieved with the synergistic FAME-C algorithm

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A synergistic FAME-C (FUB AATSR-MERIS Cloud Retrieval) algorithm is developed within the frame of the ESA CCI Cloud project. An optimal estimation scheme is used to retrieve a pixel-based error estimate for each retrieved cloud property. For pixels identified as cloudy by a synergistic cloud mask algorithm, a microphysical retrieval is performed to generate cloud optical thickness and effective radius daytime products using several AATSR bands. In turn, a daytime liquid water path/ice water path product can be computed. The microphysical cloud properties are used as input in the cloud height retrieval. A time series of the cloud properties for the years 2006-2008 is being generated and discussed.

Using both AATSR brightness temperatures and the MERIS Oxygen-A band, two cloud height products are generated. The height retrieved from measurements within the MERIS Oxygen-A band is influenced by scattering at and within the cloud and therefore represents some optical height rather than the cloud top height, while the cloud height retrieved from AATSR brightness temperature will be closer to the cloud top height for higher clouds. In cases of multi-layered cloud systems, the cloud top temperature retrieved from AATSR brightness temperatures will be more sensitive to the upper (ice) clouds, while the MERIS cloud top pressure will be more sensitive to the lower level cloud.

The difference in sensitivity of the retrieved cloud height products is being used to derive information about the (inhomogeneous) vertical (extinction) profile of the cloud system. The retrieved cloud heights and derived cloud vertical profiles (e.g. multi-layer cloud detection) are compared to the measurements of the active instruments CloudSat and Calipso.