



The Joint ESA-JAXA Cloud-Aerosol-Radiation Mission EarthCARE

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The EarthCARE satellite mission was selected for implementation as the third Earth Explorer Core Mission of the European Space Agency (ESA) in cooperation with the Japanese Aerospace Exploration Agency (JAXA). The mission objective is to improve the understanding of the interactions of cloud and aerosols with radiation by providing vertical profiles of clouds and radiation with simultaneously measured top-of-atmosphere fluxes.

The EarthCARE payload comprises two active and two passive instruments. The Atmospheric Lidar (ATLID) operates at 355 nm and is equipped with a high-spectral resolution receiver that will separate the back-scattered Mie and Rayleigh signals. The Cloud Profiling Radar (CPR) is a highly sensitive 94GHz cloud radar with Doppler capability. Lidar and radar will in synergy provide profiles of ice and liquid water content throughout the cloud. Vertical motion within clouds will be measured using the Doppler capability of the CPR. A Multi-Spectral Imager (MSI) will support the active instruments and consists of a push-broom imager with 7 channels in the visible, near-IR, short-wave IR and thermal IR, with a 500 m spatial resolution and a 150 km swath. Finally, a Broad-Band Radiometer (BBR) with three simultaneous fixed field-of-views will measure the outgoing top-of-atmosphere radiances in a short wave channel and a total wave channel, from which the long wave contribution can be deduced.

Following its launch foreseen in 2015, EarthCARE will provide synergistically retrieved cloud, aerosol and radiation data over a mission life time of three years. The envisaged science data products include cloud and aerosol profiles retrieved from the individual instruments as well as synergistically retrieved from combination of lidar, radar and imager data. Three-dimensional cloud and aerosol scenes will be constructed by making use of the imager swath. Calculated radiative properties of these scenes will be compared to top-of-atmosphere broad-band radiances and fluxes derived from the radiometer. These data will support cloud-aerosol-radiation process studies and the improvement of cloud parameterisation in global circulation models used in climate research and numerical weather prediction.

This paper gives an overview and status of the EarthCARE mission, including the satellite, instruments and envisaged data products.