Geophysical Research Abstracts
Vol. 21, EGU2019-10740, 2019
EGU General Assembly 2019

EarthCARE – Towards the Understanding of the Impact of Cloud and Aerosol on Radiation

Tobias Wehr, Michael Eisinger, Rob Koopman, Damien Maeusli, Kotska Wallace, and Alain Lefebvre
European Space Agency, ESTEC, Noordwijk, The Netherlands

The influence of clouds on the incoming solar and reflected thermal radiation remains one of the most important climate uncertainties. The global observation of vertical profiles of cloud ice and liquid water with simultaneous and collocated solar and thermal flux observation will provide crucial data to address this uncertainty. Furthermore, collocated global observation of vertical profiles of aerosol types are required to address the direct and indirect effects of aerosol.

In response to these needs, the European Space Agency (ESA), in cooperation with the Japan Aerospace Exploration Agency (JAXA), is implementing the Earth Cloud, Aerosol and Radiation Explorer Mission, EarthCARE.

Vertical profiles of cloud ice and liquid water, aerosol type, precipitation, heating rates, solar and thermal top-of-atmosphere radiances and flux profiles will be synergistically derived from the observations of the satellite's four instruments.

Two active instruments are embarked, a cloud-aerosol lidar and a cloud Doppler radar. The Atmospheric Lidar (ATLID) operates at 355nm and is equipped with a high-spectral resolution receiver and depolarisation channel that separates molecular from particulate backscatter and distinguishes cloud and aerosol types. The Japanese Cloud Profiling Radar (CPR) is a highly sensitive W-band Doppler radar (94GHz) that measures cloud profiles, precipitation and vertical motion within clouds. The Doppler observation will measure vertical motion in clouds providing novel information on convection, precipitating ice particles and raindrop fall speed.

Two passive instruments provide cloud and aerosol swath information and solar and thermal radiances and top-of-atmosphere fluxes. The Multi-Spectral Imager (MSI) with a 150km wide swath and seven channels in the visible, near-IR, short-wave IR, and thermal IR, will provide scene context information and allow the reconstruction of three-dimensional atmospheric scenes when combined with lidar and radar retrievals. A Broad-Band Radiometer (BBR) observing broad-band solar and thermal radiation reflected and emitted from the Earth, with three fixed field of view looking forward, nadir and backward, will make measurements of the outgoing reflected solar and emitted thermal radiation, which are collocated with the aerosol and cloud profile observations.

Complex data retrieval algorithms in the Ground Segment will exploit the synergy of the four instruments and deliver a range of cloud, aerosol and radiation related data products, including three-dimensional cloud-aerosol-precipitation scenes, with collocated broad-band heating rate and radiation data, over a mission lifetime of three years. The satellite development is presently in Phase C/D.

This presentation will provide an overview of the mission and its expected science data products.