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EarthCARE Mission Preparation Status: Performance and Science Processing

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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 Cloud Profiling Radar (CPR), provided by JAXA, 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) has a 150km wide swath and seven channels in the visible, near-IR, short-wave IR, and thermal IR. The Broad-Band Radiometer (BBR) observes broad-band solar and thermal radiation reflected and emitted from the Earth, with three fixed fields of view: forward, nadir and backward.

In preparation for the science exploitation of the mission, 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 presentation will provide an overview of the mission, main performances of the three ESA instruments and expected science data products.