



PREMIER - A Candidate ESA Earth Explorer Mission for space-based observations in the UTLS

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PREMIER (PRocess Exploration through Measurements of Infrared and millimetre-wave Emitted Radiation) is one of three candidate missions under Phase A study for ESA's 7th Earth Explorer. The mission aims to quantify processes controlling global atmospheric composition in the mid-troposphere to lower stratosphere (5-25 km), a region of particular sensitivity for surface climate, by resolving 3-D structures in atmospheric constituents and temperature on finer scales than have previously been accessible from space. In addition, through combination with co-located observations by EPS/EPS-SG, the mission aims to quantify links with surface emissions and air pollution. To achieve these aims, PREMIER comprises a limb imaging IR spectrometer and a millimetre-wave limb sounder flying in formation with EPS/EPS-SG.

A number of scientific activities have been undertaken in parallel with Phase A studies of the system concept by industry. These include simulations with state-of-the-art schemes to refine sensor specifications and to demonstrate retrieval performance for individual profiles and detailed structure associated with phenomena such as the SE Asian monsoon circulation, pyroconvective and volcanic plumes and exchange between the troposphere and stratosphere. They also include studies to quantify the impact of the retrieved PREMIER data in scientific exploitation studies and assimilation into operational systems and field campaigns of airborne precursors to demonstrate the new observing capabilities.

In this paper, we will show the relevance of PREMIER for atmospheric science and present simulations of its unique capabilities.