

# **FORUM: a mission to characterise the far-infrared spectrum of the Earth outgoing long-wave radiation**

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One of the major limitations in climatic change predictions is the lack of an accurate modelling of the radiative processes related to atmospheric water vapour and clouds, and surface emissivity. Whilst the broadband mid-infrared spectrum is currently measured from space, our ability to unequivocally link the outgoing radiation to the underlying atmospheric processes is under-constrained because of the lack of spectrally resolved measurements over a significant portion of the thermal emission, the far infrared (FIR) between approximately 100 and 667  $\text{cm}^{-1}$  (100-15 microns). Observations in the FIR can reduce the existing uncertainties about the role of water vapour, clouds, and the surface in climate models because of the strong sensitivity of the FIR region to these parameters.

FORUM (Far-infrared-Outgoing-Radiation Understanding and Monitoring) has been selected to be the Earth Explorer 9 mission of ESA. FORUM aims to fill the long-standing gap in FIR spectral observations from space. The mission will measure the spectrum of the Earth outgoing long-wave radiation (OLR) and provide an accurate basis for the detection of the spectroscopic fingerprints (due to water vapour, clouds, methane, carbon dioxide, and the snow surface emission) associated with processes relevant to climate change estimations. FORUM will measure the OLR from 100 to 1600  $\text{cm}^{-1}$  with a nominal resolution of 0.5  $\text{cm}^{-1}$  and an absolute accuracy of 0.1 K. By flying in tandem with the Meteorological Operational Satellite - Second Generation (Metop-SG), FORUM measurement will complement mid-infrared spectral measurements performed by the Infrared Atmospheric Sounding Instrument Next Generation (IASI-NG). In this way the complete characterisation of the Earth's OLR spectrum from 100 to 2760  $\text{cm}^{-1}$  (3.62-100  $\mu\text{m}$ ) will be provided for the first time.

The proposed satellite payload is composed of two main units: a Fourier transform spectrometer, operated with uncooled detectors, for the FIR spectral measurement and an infrared imager, observing the same scene in the 10.5-12 microns atmospheric window with a high spatial resolution, to provide cloud scenes identification. In this presentation, a description of the FORUM mission and the current development status will be discussed.