Overview of the French activities in support of the FORUM space mission

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ABSTRACT

The Earth system reflects and absorbs solar radiation, and emits infrared (IR) radiation to space. The balance between absorbed and radiated energy, known as the Earth's radiative budget, drives the Earth's climate. From the early ages of satellite observations, monitoring these radiative fluxes from space has been a priority. Most observations were initially broadband, but in the early 2000's the rise of IR sounders shed a new light on the Earth's spectral signature. Yet to date these IR spectrally-resolved observations, such as those from IASI or its upcoming successor IASI-NG, only cover the mid-IR spectral range (essentially below 667 cm^{-1}). In particular the far-IR (FIR) region (100 – 667 cm^{-1}), from which roughly 50 % of the energy radiated to space by the Earth comes from, is currently not observed at high spectral resolution. The aim of the FORUM mission, which will fly in tandem with IASI-NG and is scheduled for launch in 2027, is to fill this observational gap by measuring the whole infrared spectrum of the Earth (100 – 1600 cm^{-1}) at about 0.5 cm^{-1} spectral resolution.

This presentation will first give a brief overview of the FORUM mission and other upcoming FIR missions. Then we will review the ongoing activities carried out by the French community interested in FORUM, gathered within the framework of a project funded by CNES. These activities cover gas spectroscopy studies, aerosol and cloud optical properties investigation, radiative transfer modelling and climate related studies. They combine laboratory experiments (at SOLEIL Synchrotron, in simulation chambers and in standard laboratory facilities), satellite data analysis (mostly from IASI so far), remote sensing algorithms development (for aerosols and ice cloud microphysical properties) and numerical modelling (mostly radiative transfer), to improve our understanding of the FIR spectral signature of the Earth system, and to prepare the community to future FORUM observations.