The SCIEF project: first results of water vapor and temperature retrieval accuracy from the EE9 selected mission FORUM FIR measurements

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The main goal of the SCIEF ("Development of Italian Competences for the FORUM Experiment") project is to support the Far-infrared-Outgoing-Radiation Understanding and Monitoring (FORUM) mission concept, selected by ESA for the feasibility study of the Earth Explorer 9 (EE9), in the evaluation of water vapor and temperature profile precision and accuracy from FORUM observations in the wavelength range of 7 - 100 micrometers. These observations are important because Earth's infrared emission to space is affected by water vapour and cirrus clouds, which, in turn, play key roles in Earth's temperature. The characterization of the radiative effects of the main atmospheric components in this spectral range is a new measure from space, as it fills the observational gap in the far-infrared (FIR) region from space.

In the framework of the FORUM mission, the Kyoto protocoL Informed Management of the Adaptation (KLIMA) algorithm has been used to simulate the FORUM wideband spectral radiance measurements, with the aim to assess the water vapor and temperature profile precision and accuracy obtained using the FTS observations and to evaluate the quality of the retrieval. The algorithm consists of two distinct modules, the Forward Model (FM) and the Retrieval Model (RM). The FM is a line-by-line radiative transfer model, with capability to simulate wideband spectral radiances from 100 to 1600 cm-1 (i.e. the FORUM spectral range requirement); the RM uses a constrained Nonlinear Least Square Fit (NLSF) approach and the cost function to be minimized takes into account the a priori information (optimal estimation method) and the Marquardt parameter.

We performed several tests to retrieve temperature and water vapor profile, using different quantifiers to assess the quality of the retrieval. In this work, we describe the strategy adopted for the analysis and we show first results of these evaluation activities.