

The FIT-FORUM project: status and perspectives

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ABSTRACT

FIT-FORUM (Forward and Inverse Tool for FORUM) is an Italian Space Agency (ASI) project involving the Univ. Of Bologna (PI), Univ. Of Basilicata (co-PI), IAC-CNR, ISAC-CNR, IFAC-CNR and INO-CNR, funded in the context of the 2022 ASI Call for Ideas “Scientific activities in support of the development of Earth Observation missions”. The project aims at implementing an innovative series of codes dealing with any aspects of the radiative transfer at longwave, from 100 to 3000 cm⁻¹, with focus on the future observations which will be performed by the Far-infrared Outgoing Radiation Understanding and Monitoring (FORUM) mission, the 9th Earth Explorer of the European Space Agency (ESA). The FIT-FORUM consortium benefits from the results of the FORUM-Scienza project (also funded by ASI) during which the sigma-FORUM code has been updated (<https://zenodo.org/record/7019991#.YzliVS0RpB2> doi: 10.5281/zenodo.7019991).

During the FIT-FORUM project, a modular structure to simulate, interpret and analyze the future FORUM measurements in all weather conditions is assembled. Specific efforts are devoted to the implementation of state-of-the-art reference spectroscopy and cloud/aerosol optical properties, to the retrieval of the L2 products from stand-alone FORUM observations or in synergy with IASI-NG, and to the generation of L3 products.

In this work we describe the main features of the radiative forward model which provides fast and accurate simulations of pseudo-monochromatic radiances for multiple observational angles and platforms. The adopted solution of the radiative transfer equation in the presence of multiple scattering layers will be illustrated in detail. The analytical scaling methodology, together with the parameterization of the scattering properties in terms of the particle effective sizes, allows obtaining analytical Jacobians of the radiance with respect to the cloud and aerosols microphysics and mass concentration which improves the accuracy and speed of the inverse solution.