

## Impact of Spectroscopy on IASI and FORUM Clear-Sky Simulations

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### ABSTRACT

Infrared sounding data play a key role in Numerical Weather Prediction (NWP) models and, among them, the Infrared Atmospheric Sounding Interferometer (IASI) stands out as the most assimilated hyperspectral instrument. With the upcoming IASI-NG promising enhanced capabilities and doubled spectral resolution, accurate forward calculations become crucial to ensure the quality of products and NWP outputs.

This study investigates how infrared spectroscopy impacts on clear-sky simulations generated by fast radiative transfer models. Utilizing different spectroscopic databases, specifically HITRAN for RTTOV and GEISA for 4AOP, IASI simulations are compared against satellite observations. To conduct this analysis, a new version of the ARSA database is employed, comprising 19706 atmospheres categorized into five airmass types (Tropical, Midlat1, Midlat2, Polar1, Polar2), all observed over sea surface during nighttime. The database includes vertical profiles of pressure, temperature, H<sub>2</sub>O and O<sub>3</sub> from ERA5 reanalysis, as well as CO<sub>2</sub> and CH<sub>4</sub> obtained from CAMS datasets.

Additionally, a parallel evaluation is conducted for FORUM (Far-infrared Outgoing Radiation Understanding and Monitoring), comparing simulated spectra from RTTOV and 4AOP to assess the role of spectroscopy in the far-infrared spectral domain.