



Retrieval of minor atmospheric constituents from far-infrared FORUM measurements

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In November 2017 the European Space Agency selected FORUM (Far-infrared Outgoing Radiation Understanding and Monitoring) as one of the two instrument concepts to be developed further and to compete to be the ninth Earth Explorer mission. FORUM will be a Fourier Transform Spectrometer measuring the entire far-infrared part of the Earth upwelling spectral radiance. In particular, the instrument will measure the spectral range from 100 to 1600 cm^{-1} (from 100 to 6.25 microns in wavelength), covering the Far InfraRed (FIR), between 100 and 667 cm^{-1} , which has never been measured from space before. The infrared radiation emitted by the Earth to space is affected by water vapor and cirrus clouds, which, in turn, play key roles in driving the Earth’s temperature. FORUM measurements will provide new insight not only on the outgoing longwave radiation but also on the water vapor and cirrus clouds distribution over the globe. Therefore FORUM will improve our understanding of the greenhouse effect and will significantly contribute to the accuracy of climate change assessments that are the basis for political decisions.

Although the main foci of the mission are water vapor and cirrus clouds, FORUM FIR measurements will also provide information on the vertical distribution of some additional minor atmospheric constituents, such as O_3 , HNO_3 , CH_4 and N_2O . Based on simulated observations, in this paper we analyze the accuracy and the spatial resolution of these additional FORUM products. Moreover, the possibility to infer the total column of further gases that contribute to the spectrum with features significantly below the measurement noise level will be analyzed.