Preparing to assimilate the future IRS infrared sounder into the MOCAGE chemistry transport model for ozone and carbon monoxide

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ABSTRACT

IRS (InfraRed Sounder) is an infrared Fourier transform spectrometer that will be on board the Meteosat Third Generation series of the future EUMETSAT geostationary satellites. After its launch planned in 2024, it will be able of measuring the radiance emitted by the Earth at the top of the atmosphere using 1960 channels in two spectral bands between 680 – 1210 cm^{-1} (long-wave infrared) and 1600 – 2250 cm^{-1} (mid-wave infrared). It will perform measurements over the full Earth disk with a particular spatial and temporal resolution of 4 km at nadir and 30 minutes over Europe respectively. The assimilation of these new high spatial and temporal frequency observations represents a major challenge for improving forecasts in numerical weather prediction models and also in chemistry-transport models for the representation of atmospheric composition and aerosols.

The aim of this work is to assess the impact of the use of IRS in the MOCAGE global chemistry transport model at Météo-France on forecasts of ozone and carbon monoxide fields. Part of the work consisted in selecting the IRS channels sensitive to ozone and carbon monoxide using the previous sensitivity studies carried out in Coopmann, O. (2022), and then using the OSSE (Observing System Simulation Experiment) experimental framework set up in Vittorioso, F. (2023) thesis and enabling IRS to be assimilated into the MOCAGE model. In this first part of the study, we analysed the impact of IRS observations compared with an experiment without assimilation in terms of forecast scores over a 3-month summer period.