Assimilation of IASI & CrIS radiances in the MOCAGE transport chemistry model at Météo-France to improve ozone and carbon monoxide fields

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ABSTRACT

The science of chemistry transport models (CTM) and forecasts of atmospheric composition and aerosols is constantly evolving. A profound improvement in these simulations results from data assimilation. This work is relatively recent, due to the complexity of data assimilation for gases and aerosols, and the small quantity of observations compared with the large number of measurements required for numerical weather prediction. In general, CTMs assimilate chemical measurements from ground stations, lidars or geophysical products retrieved from satellite observations. Currently, the global MOCAGE CTM (0.5°) at Météo-France assimilates the AOD products from MODIS and VIIRS for aerosols and the TROPOMI product for SO_2.

Since the advent of hyperspectral infrared sounders on board satellites (IASI, CrIS, ...) and soon (IASI-NG, IRS, ...), research on observations from these instruments has shown their sensitivity to a large number of atmospheric gases and aerosols. The aim of this research work is to evaluate the direct assimilation of IASI and CrIS radiances on ozone and carbon monoxide forecasts in the MOCAGE CTM and thus prepare for the use of future IASI-NG and IRS observations. This presentation looks at the tools needed to use these observations (3D-Var assimilation system, observation and background error diagnostics), but also at the limitations of operational channel selections and variational bias correction. The results of this study demonstrate a significant improvement in O_3 and CO fields thanks to the assimilation of these radiances. These new developments are due to be switched to operations end of 2024.