Impact of the future IASI-NG hyperspectral infrared sounder in the ARPEGE Numerical Weather Prediction model

Nadia Fourrié [1], Robin Marty [1], Thomas Carrel-Billiard [1], Louis Rivoire [1], Philippe Chambon[1] and Olivier Audouin[1]

CNRM, Météo-France and CNRS, Toulouse, France

42 av Coriolis, 31057 Toulouse Cedex 1 , FRANCE
Email: Nadia.Fourrie@meteo.fr

ABSTRACT

IASI-NG is a hyperspectral infrared sounder developped by the CNES and AIRBUS meant to replace the successful IASI instrument on MetOp satellites (Bermudo et al., 2014, 2022). It features double the spectral resolution, and half the noise levels of IASI leading to an overall better vertical resolution. IASI-NG data will be used for global and regional forecasting, atmospheric composition studies and climatology. In order to prepare the assimilation of IASI-NG data within the operational Numerical Weather Prediction (NWP) system and to evaluate the value of a new observing system when actual observational data are not yet available, the Centre National de Recherches Météorologiques (CNRM) sets up an Observing System Simulation Experiment (OSSE) using the ARPEGE 4D-Var system of Meteo-France. It allowed to fine tune IASI-NG data assimilation parameters and measure the impact IASI-NG will have on the quality of weather predictions.

An OSSE consists of a long, uninterrupted forecast called the nature run. It provides a realistic evolution of the atmosphere considered as the truth, "observations" simulated from the nature run with realistic observation errors and a 4D-Var NWP data assimilation system used to compute the best estimation of the variables of the atmosphere from the simulated observations and to produce a realistic weather forecast. An OSSE framework had thus been built to evaluate the impact of IASI-NG observations on the forecast quality (Rivoire et al, 2024).

This paper will describe this framework and the preparation of experiments with assimilated of IASI-NG instrument which merely based on the current operationnal IASI assimilation. An experiment assimilating observations without IASI-NG will be used as the reference, and another one with IASI-NG assimilation will be compared to it. The initial set up for IASI-NG assimilation will consist in using the channel selection performed by Vittorioso et al. (2021), a tuned cloud detection from McNally and Watts (2003) scheme as well as a dedicated observation error covariance error matrix taking into account interchannel correlations. Lastly, the simulated observations are assimilated in a numerical experiment reproducing the operational forecast system. Finally the positive impact of adding IASI-NG and replacing IASI with IASI-NG in the global ARPEGE model will be shown.