Assimilation of IASI surface-sensitive channels over land at convective scale AROME Model

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The current high-spectral resolution advanced infrared sounder generation includes in particular IASI (Infrared Atmospheric Sounding Interferometer, developed by CNES / EUMETSAT) onboard polar orbiting METOP satellites. These sounders provide a large amount of information allowing to describe accurately surface parameters (such as land surface temperature 'LST' and emissivity on a wide range of wavelengths). However, the forecast of continental surface temperature is not realistic enough to use the infrared information in the lower troposphere and close to the surface over continents because radiances sensitive to this region are strongly affected by the variation of surface parameters (e.g. LST, emissivity and humidity) and cloud cover. The assimilation of IASI in the AROME model is already well developed as it benefits from the assimilation of IASI in the global ARPEGE model (Guidard et al., 2011). More research is still needed to allow an increase of its use. By pursuing the approach developed by Vincensini (2013) to find the LST from a combination of channels, a new selection of channels over land was built, to better analyse the lower layers of the atmosphere, in particular in term of temperature. This work evaluates the improvement of assimilation and forecasts using these IASI channels in the regional numerical weather prediction AROME-France model.

Assessing The Impact of Aerosol on the Accuracy of IASI SST

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ABSTRACT

Space-borne observations of Sea Surface Temperature (SST) play a key role in oceanography, numerical weather prediction (NWP) and climate monitoring. The Infrared Atmospheric Sounding Interferometer (IASI) series of instruments present the opportunity for the creation of an independent Climate Data Record (CDR) of SST spanning (nominally) over 2 decades. While IASI has a lower spatial resolution than its broad-band radiometer counterparts; e.g. the Advanced Very High Resolution Radiometer (AVHRR), the high radiometric stability of the instrument allows for a stable and well characterised SST record to be produced. One possible application of this new data record would be to help gap fill the SST time series between the Along Track Scanning Radiometer (ATSR) and the Sea and land Surface Temperature Radiometer (SLSTR). With ATSR SST considered a Fundamental Climate Data Record (FCDR) it is vital to characterise the absolute performance of SST observations from IASI.

In this study we demonstrate the impact of aerosol on the observed SST from IASI. We first describe a new multi-year collocated data set of (A)ATSR SST and aerosol information with IASI that has been created explicitly for this task. Next we show how the accuracy of IASI SST changes in the presence of aerosol, and using the 10 ORAC classifications, discuss the sensitivity to different aerosol mixing states. Finally we present the relationship between the Aerosol Optical Depth (AOD) measured by ATSR and the detection of aerosol directly by IASI. This relationship is then used to help contextualise the aerosol effect on IASI SST, such that a first order empirical correction could be applied operationally.