Assimilation of IASI retrieved LST in the surface analysis system of ARPEGE NWP global model

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ABSTRACT

Surface temperature is an essential parameter in the radiative balance simulation for numerical weather prediction (NWP). At Météo-France, the current land surface assimilation system uses screen-level parameters as proxies to initialize land surface variables (temperature and water content) which determine surface fluxes. However, at a global scale, we recognize geographical disparities in surface stations cover over land. The satellite derived products such as retrieved land surface temperature (LST) help to better represent surface parameters. The infrared hyperspectral instrument IASI, developed by CNES, provides a global coverage of land surface temperature which is more directly related to the model control variables that have to be initialized. The IASI LST is used operationally for the atmospheric assimilation at Météo-France. It is retrieved from a single surface channel and is used for brightness temperature simulation of other channels but is not assimilated in the surface scheme. The aim of this work is to investigate the benefits of IASI infrared sensor LST assimilation in the surface analysis system of ARPEGE global numerical weather prediction model. In this study an additional step is implemented in order to assimilate IASI LST in the surface analysis system in addition to 2~m temperature and 2~m relative humidity. A first assimilation experiment has been run over three months from June to September 2023. The experimental set-up is based on previous work assimilating SEVIRI infrared sensor retrieved LST in AROME-France limited area NWP model (Sassi et al, 2023). A global improvement of the ARPEGE model forecasts has been found especially in tropics and northern hemisphere. Moreover, sensitivity studies have been conducted in order to improve the assimilation configuration. Further improvements related to the assimilation method and the use of observations will be investigated.