Assessment of the Assimilation of AMSU-A and IASI Radiance Data with GSI Based 3D-var Data Assimilation system in WRF-ARW model over UAE

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The impact of direct Data Assimilation (DA) of brightness temperatures from the Advanced Microwave Sounding Unit-A (AMSU-A) and Infrared Atmospheric Sounding Interferometer (IASI) over the UAE, using the Community Radiative Transfer Model (CRTM) embedded in GSI system, was evaluated using the Advanced Research WRF-v 3.8.1 (WRF ARW) model from the national Center for Atmospheric Research (NCAR).

In this study, we have performed one control simulation and three Data Assimilation simulations with microwave, AMSU-A data (AMSU), infrared, IASI data (IASI) and, combination of AMSU and IASI data for June 2017.

The impacts of DA on temperature and moisture forecasts up to 30 hours at the surface have been investigated in seven major airport locations over UAE: Abu Dhabi, Dubai, Sharjah, Alain, Al Maktum, Fujairah and Ras al Khaimah airports. Similarly the impacts over four vertical layers were investigated using the Abu Dhabi airport Radiosonde Data. The four vertical layers were lower troposphere (LT, 800 to 1000 hpa), middle troposphere (MT, 400 to 800 hpa), upper troposphere (UT, 200 to 400 hpa) and lower stratosphere (LS, 50 to 200 hpa). Results from the WRF runs showed that the forecasts were in better agreement with ground observations when assimilation performed using IASI radiance data the surface. Although IASI DA showed improvement in the forecasts, its impact is was somewhat limited and not observed in all the seven locations. Compared to the control simulation, the IASI DA simulations improved the forecasts of temperature, relative humidity and dew-point in the measure of about 29%, 22%, and 29%, respectively. On the other hand, the WRF profiles obtained from IASI DA performed slightly better than control simulations when compared with Radiosonde data from Abu Dhabi airport for the lower troposphere and lower stratosphere. Whereas, none of the DA simulations showed any improvement for the middle and upper troposphere.