The relative impact of satellite observations in the HARMONIE/Norway regional model

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Extended abstract

The HARMONIE assimilation and forecasting system is being implemented at the Norwegian Meteorological Institute (Met.no). For further development and tuning of the system, a better understanding of its functionality is needed. Appropriate assimilation of the observations is important to guarantee good forecasts skill. Performing an observing simulation experiments (OSEs) is the classical ways to study the impact of different observations on data assimilation and forecasts system. The OSE – data denial experiment – is a clean study, but very expensive, since we have to repeat the experiments as many times as many parameters or observation types we want to evaluate. Therefore, a simpler and cheaper scheme for evaluating the sensitivity of the forecast to the assimilated observations is of interest. In this study we were using a relatively cheap technique for sensitivity study, which is based on evaluation of the moist total energy loss while avoiding the observations under test. The technique is described in *Storto and Randriamampianina (2010)*. The use of a domain operator allows us to evaluate the influence of observations related to different regions and atmospheric thicknesses inside the regional domain. Application of the technique to evaluate the impact of the conventional and satellite observations on the HARMONIE forecast can be summarised as follows:

Experiments without IASI radiances showed that conventional observations, mostly radiosondes and aircraft data, are the most important for the short-range forecasts (up to 24 hours) within all the troposphere. On the contrary, microwave radiances from AMSU-A, and, in particular, the channels peaking within the troposphere (5 to 8) have the largest impact after 24 hours of forecast. This is even more evident in the continental area of our limited area model. A detailed study has been conducted on the moisture term of the energy norm, showing that the impact of AMSU-B is particularly seen in the low tropospheric levels. For the middle troposphere region, the impact of SEVIRI channels has also significantly increased. See *Storto and Randriamampianina (2010)* for more details about this study.

In the experiment with the IASI radiances, no Seviri data were used and only the "most prominent observations" – radiosondes, aircraft, AMSU-A, and AMSU-B – were evaluated together with the IASI data. While in the previous study, the impact of each individual radiance channel was evaluated, in this experiment only the IASI channels were divided in three groups and the other radiances were evaluated by instrument. We found that the IASI channel groups, as well as the other radiances, have different impact on different synoptic situations and that the sensitivity of the forecasts to the radiances is higher in unstable or convective synoptic situations. For more details about this experiment see *Randriamampianina and Storto (2010)*.

References

Storto, Andrea and Roger Randriamampianina, 2010, The Relative Impact of Meteorological Observations in the Norwegian Regional Model as determined using an energy norm-based approach, ***Atmos. Sci. Let.*** 11: 51–58.

Randriamampianina, Roger and Andrea Storto, 2010. The sensitivity of the HARMONIE/Norway forecasts to the IASI data. ***2nd IASI Conference***, Sevrier, France, 26th January 2010.

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