A new formulation of the Ensemble Forecast Sensitivity to Observations (EFSO, Kalnay et al., Tellus, 2012) is more accurate and efficient than the original ensemble sensitivity formulation of Liu and Kalnay, (2008), and can be applied to the EnSRF used in the NCEP hybrid. Ota et al. (2013, Tellus, under review) applied EFSO to the GFS coupled with the operational EnSRF used at NCEP, and assimilated all the observations used operationally during one month, after one week of spin-up.

In addition to obtaining the average forecast sensitivity to different observing systems, Ota et al. (2013) developed a new approach to identify regional "24hr forecast skill dropouts" rather than the usual 5 days used at NCEP to define “skill dropout”. 24hr forecast skill dropouts were identified regionally when two conditions were satisfied: the 24hr RMS forecast error was at least twice as large as the average RMS error for the region, and the 24hr forecast error was larger than the 36hr error by at least 20%. Seven cases of 24hr regional forecast skill dropout were identified during that month, as well as the observations that had a regional negative impact, and denying these observations reduced the forecast error in every case identified. The case with largest impact corresponded to a problem with MODIS polar winds that occurred in two contiguous regions. The estimated negative impact using this method was shown to be very similar in amplitude and shape to the impact obtained with a repetition of the experiment without using the MODIS winds. Denying these observations reduced the regional forecast error by almost 40%.

We will explore whether this approach can be used to provide a proactive QC tool and will present the results at the WMO DA conference. The method will be used to estimate the occurrence of large “12hr skill dropouts” with the GFS coupled with the LETKF. If successful, this method would have important properties that can improve operational forecasts: a) The data assimilation in the operational system can be repeated without the identified flawed observations soon after real time; b) The detailed diagnostics on the flawed observations obtained with this method can help the developers of the instrument algorithms to identify the origin of the observational flaws and correct them.

References

