Observation Impact in a Convective-Scale Localized Ensemble Transform Kalman Filter

Matthias Sommer[a], Martin Weissmann[b], and Andreas Rhodin[c]

[a] *Hans Ertel Centre for Weather Research Department, Data Assimilation Branch, LMU Munich, Germany, matthias.sommer@lmu.de,* [b] *Hans Ertel Centre for Weather Research, Data Assimilation Branch, LMU Munich, Germany,* [c] *Deutscher Wetterdienst, Offenbach, Germany.*

In operational weather forecasting, knowledge about the impact of different observations is crucial to refine the observing and data assimilation system. However, assessing this quantity by direct computation (data denial experiments) is usually not feasible because of its high computational cost. This has motivated the derivation of approximated forms of observation impact. If an adjoint model is available, established methods exist that give a reliable estimate of this quantity. In an ensemble-based environment, such an algorithm has been suggested only recently [1, 2]. It uses the ensemble analysis and forecast deviations to approximate forecast error difference and consequently also observation impact of runs initialized with different observations. This has now been implemented for the future limited-area ensemble system of Deutscher Wetterdienst (DWD) and has been thoroughly verified with data-denial experiments. The peculiarities for an application on this scale include a strongly non-linear behavior and a typically small localization length. While the former can be expected to be skillfully treated by the ensemble algorithm, the latter imposes constraints for a reasonable choice of lead time. It could be shown that valuable information, such as the detection of disadvantageous observations can be extracted. This talk shows the feasibility and distinctive features of the method for a convective-scale setup, presents examples from a pre-operational application at Deutscher Wetterdienst, and discusses the sensitivity to lead time, localization and verification norm.

References

[1] Eugenia Kalnay, Yoichiro Ota, Takemasa Miyoshi, and Junjie Liu. "A simpler formulation of forecast sensitivity to observations: application to ensemble Kalman filters," ***Tellus A*****, 64, 18462, 2012.**

[2] Junjie Liu and Eugenia Kalnay. "Estimating observation impact without adjoint model in an ensemble Kalman filter," ***Quarterly Journal of the Royal Meteorological Society*****, 134(634), 1327–1335, 2008.**