A novel approach to surface reanalysis

Sabrina Wahl*†[1,2], Clarissa Figura[1,2], and Jan D. Keller[2,3]

[1]Institute for Geoscience, Meteorology Department, University of Bonn – Auf dem Hügel 20, 53121 Bonn, Germany
[2]Hans Ertel Center for Weather Research - Climate Monitoring Branch – Bonn/Cologne, Germany
[3]Deutscher Wetterdienst [Offenbach] – Frankfurter Str.135, 63067 Offenbach, Germany

Abstract

An alternative to running an NWP model and data assimilation scheme for generating reanalysis is a so-called surface reanalysis. Here, an existing reanalysis is used as prior information (for the near-surface state). This first guess is then corrected in a DA step, often performed only for a single parameter at at time and employing simple DA methods, e.g., optimal interpolation. In such a scheme, an additional downscaling is often performed to enhance the spatial representation. The aim of a surface reanalysis is to provide enhanced climate data of surface parameters relevant to a large number of users and downstream applications.

Here, we show results from a more complex approach to surface reanalysis. As background data, we use COSMO-REA6, the operational regional reanalysis at the German Meteorological Service (DWD) with a horizontal resolution of about 6km. The target resolution is 1km with the DA step being performed using DWD's LETKF scheme. As COSMO-REA6 is a deterministic reanalysis, we generate a synthetic ensemble as input by employing the analog ensemble technique.

The aim of this approach is that the generated data set is still consistent among its parameters as in a full reanalysis. Thus, the approach requires a multivariate DA step in contrast to previous surface reanalysis efforts. We start with temperature and humidity and successively extent the set of parameters. In addition, the approach is not restricted to the surface but allows the estimation of multiple layers. Therefore, it provides a reanalysis for the lower boundary layer which is of potential interest to application such as renewable energy. Further, the approach provides uncertainty information which can also benefit downstream applications.

Keywords: surface reanalysis, LETKF, downscaling, analog ensemble, boundary layer

*Speaker
†Corresponding author: wahl@uni-bonn.de