

Vertical wind profile: Assessment of regional reanalyses.

Christopher W. Frank^{1,2}, Sabrina Wahl^{1,3}, Jan D. Keller^{1,4}, Bernhard Pospichal², Andreas Hense³, Susanne Crewell²

¹*Hans-Ertel-Centre for Weather Research, Climate Monitoring and Diagnostics, Germany*, ²*Institute of Geophysics and Meteorology, University of Cologne, Germany*, ³*Meteorological Institute, University Bonn, Germany*, ⁴*Deutscher Wetterdienst, Offenbach, Germany*

Public safety, renewable energy, aeronautical meteorology: For a variety of applications the vertical wind profile needs to be known as accurately as possible at any time and for any location. Knowing the true vertical wind profile would improve numerical weather prediction, would enhance renewable energy production estimates, and reduce aviation risks. Unfortunately, wind profile measurements provided by weather masts or wind profiler systems are spatially rare and limited to the lower atmosphere. Another source of vertical wind profiles are reanalyses. Reanalyses combine numerical weather prediction models and observations to provide a best estimate of the atmospheric flow in the past. Reanalyses have the advantage to provide the wind speed on a homogeneous grid in space and time. Recently new high resolution regional reanalyses have been developed to better address the local scale, however, their quality still needs to be quantified.

Here we investigate the capabilities of regional reanalyses developed within the Hans-Ertel Centre for Weather Research to reproduce realistic wind profiles. The high resolution reanalyses COSMO-REA6 (6 km horizontal resolution, 40 vertical layer) and COSMO-REA2 (2 km horizontal resolution, 50 vertical layer) are both based on the NWP model COSMO. REA6 covers the EURO-CORDEX region and REA2 an extended COSMO-DE domain over central Europe. The coarser reanalysis is available from 1995 to 2015 and the finer from 2007 to 2013.

The central part of this contribution is to quantify the uncertainty of wind profiles provided by regional reanalyses. Therefore, reanalyses profiles of the horizontal wind speed are compared to weather mast measurements. A first assessment considers annual and daily cycle comparisons. Since wind profiles depend primarily on atmospheric stability, the performance is quantified for selected stability conditions. For a realistic assessment of the results, the local conditions around the weather masts are taken into account.

Session preference: Evaluation and intercomparison

Presentation preference: No preference

Corresponding author email: cfrank@meteo.uni-koeln.de