Evaluation of near-surface temperature forecasts against super-site observations

Polly Schmederer¹, Irina Sandu¹, Thomas Haiden¹, Anton Beljaars¹, Martin Leutbecher¹, and Claudia Becker²

¹ECMWF, Reading, United Kingdom (polly.schmederer@ecmwf.int)
²DWD, Lindenberg, Germany

ECMWF’s medium-range forecasts of near-surface weather parameters, such as 2 m temperature, humidity and 10 m wind speed, have become more skilful over the years, following the trend of improvements in the forecast skill of upper-air fields. However, they are still affected by systematic errors which have proved difficult to eliminate. Systematic forecast errors in temperature and humidity near the surface can be better understood by also examining errors higher up in the atmospheric boundary layer and in the soil. Meteorological observatories, also known as super-sites, provide long-term observational records of such vertical profiles. ECMWF started to use data from super-sites more systematically to evaluate the quality of forecasts in the lowest part of the atmosphere (up to 100m) and in the soil, in an attempt to disentangle sources of forecast error in near-surface weather parameters. Findings for 2-metre temperature errors in ECMWF forecasts at European super-sites suggest that the errors are partly the result of the model exchanging too much energy between the atmosphere and the land. However, the influence of other factors, such as errors resulting from the representation of vegetation in semi-arid areas and from small-scale variations in vegetation and soil type near measurement stations, mean that it is difficult to adjust the energy exchange in a way which leads to an overall error reduction on the European scale.