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Regional downscaling of the global analysis with a WRF model

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High resolution meteorological fields simulated with a regional Weather Research and Forecast model (WRF) are widely used for air pollution simulations and modeling of the atmospheric tracer transport. The techniques commonly applied for a regional scale WRF simulation include combinations of using boundary conditions from global reanalysis or forecast model, assimilation of observed data, nudging and spectral nudging to wind and temperature by global model. In our downscaling approach WRF model state is cyclically (every 6 hours) corrected to reduce misfit with global model by applying tools normally used in a data assimilation system. To estimate correction fields the WRF model state is interpolated to constant pressure levels. By smoothing the correction fields we avoid excessive damping of high resolution features generated by WRF forecast while being able to attract the solution to the large scale circulation pattern estimated by global analyses. The model was applied over Siberia and East Asia domains for short term verification runs. The comparison with observed wind profiles suggests that the proposed approach's performance is close to the case of using a spectral nudging while it is achieved at a lower computational cost.