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Seamless probabilistic analysis and forecasting: from minutes to days ahead

Yong Wang, Alexander Kann, Aitor Atencia, Nauman Awan, Markus Dabernig, Josef Kemetmüller, Florian Meier, Irene Schicker, Lukas Tüchler, Clemens Wastl, and Christoph Wittmann

Central Institute for Meteorology and Geodynamics, Numerical Weather Prediction, Vienna, Austria (alexander.kann@zamg.ac.at)

During the last years, a seamless probabilistic forecasting system (Seamless probabilistic Analysis and Prediction in very HIgh Resolution (SAPHIR)) has continuously been developed at the Central Institute for Meteorology and Geodynamics (ZAMG). The system is designed to provide the best possible and most accurate deterministic weather information as well as probabilistic, reliable forecasts on very high resolution in space (1km) and time. The system has a variable update frequency, depending on parameter and requirements (e.g. 10 minutes for precipitation, hourly for temperature) and spans the forecast horizons from the current state of the atmosphere, minutes to hours ahead, up to the short range of +72 hours. The system integrates and blends various kinds of observation data (i.e. data from automatic weather stations, radar and satellite data) and combines observation-based analysis and nowcasting methods, ensemble nowcasting techniques, a convection-permitting rapid update cycle (RUC) model, a convection-permitting ensemble prediction system, ensemble calibration techniques, and other regional and global deterministic and probabilistic NWP models.
The design of the system and results of the individual system components will be presented and discussed. Special emphasize will be on the methodology of ensemble nowcasting through stochastic perturbations and ensemble blending of observation-based nowcasting and the convection-permitting ensemble which takes into account local correlations and skill-dependent local weights. Further core components of SAPHIR, the implementation of the AROME RUC system and the perturbation techniques of the convection-permitting C-LAEF ensemble system will be discussed. Finally, statistical calibration methods to optimize the probabilistic NWP model output will complement the presentation.