Geophysical Research Abstracts
Vol. 20, EGU2018-4397, 2018
EGU General Assembly 2018

Analog-Based Postprocessing of Navigation-Related Hydrological Ensemble Forecasts

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Inland waterway transport benefits from probabilistic forecasts of water levels as they allow to optimize the ship load and, hence, to minimize the transport costs. Probabilistic state-of-the-art hydrologic ensemble forecasts inherit biases and dispersion errors from the atmospheric ensemble forecasts they are driven with. The use of statistical postprocessing techniques like ensemble model output statistics (EMOS) allows for a reduction of these systematic errors by fitting a statistical model based on training data. In this study, training periods for EMOS are selected based on forecast analogs, i.e., historical forecasts that are similar to the forecast to be verified. Due to the strong autocorrelation of water levels, forecast analogs have to be selected based on entire forecast hydrographs in order to guarantee similar hydrograph shapes. Custom-tailored measures of similarity for forecast hydrographs comprise hydrological series distance (SD), the hydrological matching algorithm (HMA), and dynamic time warping (DTW). Verification against observations reveals that EMOS forecasts for water level at three gauges along the river Rhine with training periods selected based on SD, HMA, and DTW compare favorably with reference EMOS forecasts, which are based on either seasonal training periods or on training periods obtained by dividing the hydrological forecast trajectories into runoff regimes.

Reference

Hemri, S., & Klein, B. (2017). Analog-based postprocessing of navigation-related hydrological ensemble forecasts. Water Resources Research, 53, 9059–9077. https://doi.org/10.1002/2017WR020684