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From global forecasts towards regional decision support: development of a full-fledged seasonal forecasting framework for semi-arid regions

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Seasonal hydrometeorological forecasts have the potential to significantly improve the regional water management, disaster preparedness and climate proofing, particularly in water-scarce regions. They also allow for the development of forecast-based action plans for extreme climatic events like droughts and anomalous wet conditions. However, raw global products from data providers like the European Centre for Medium Range Weather Forecasts (ECMWF) cannot be directly used for regional applications due to model biases and drifts as well as a coarse spatial resolution of 35km and more. Furthermore, for transferring the information from ensemble-based forecasts into practice, we have to provide derived and tailor-made forecast quantities for the water management in a user-friendly way. In this study, we hence present an operational post-processing and online decision support system with which we a) regionalize ECMWF's latest seasonal forecast system SEAS5 through a Bias-Correction and Spatial Disaggregation (BCSD) technique, b) compute tailored forecast measures like categorical forecast and drought indicators and c) visualize this information through an online platform. As reference, we are using the offline re-run of ERA5's land surface component, namely ERA5-Land. Our final forecast product comprises daily ensemble forecasts for precipitation, temperature, and radiation, has a spatial resolution of 0.1°, covers the whole period from 1981 to the present and is provided for several climate-sensitive river-basins including the Rio São Francisco (Brazil), the Blue Nile (Sudan / Ethiopia) and the Karun (Iran). Derived forecast quantities are operationally computed and visualized through an online decision support system, that was jointly developed with water experts from the different study regions. As both the forecast repository and the online decision support system are publicly available, they provide a comprehensive framework for demonstrating how seasonal forecasts can be post-processed and tailored for the day-to-day water management. They further allow for the training and education of local stakeholders and water experts how to deal with seasonal forecasts. Our forecasting system is already used by several authorities and weather services in Iran, Sudan and Brazil. It thereby constitutes a large step towards an improved disaster preparedness and, hence, the climate proofing of the water sector particularly in these semi-arid regions.

