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WRF model forecasts and their use for hydroclimate monitoring over southern South America

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Weather forecasting and monitoring systems based on regional models are becoming increasingly relevant for decision support in agriculture and water management. This work evaluates the predictive and monitoring capabilities of a system based on WRF model simulations at 15 km grid spacing over a domain that encompasses La Plata Basin (LPB) in southern South America, where agriculture and water resources are essential. The model's skill up to a lead-time of 7 days is evaluated with daily precipitation and 2m temperature in-situ observations. Results show high prediction performance with 7 days lead-time throughout the domain and particularly over LPB, where about 70% of rain and no-rain days are correctly predicted. The scores tend to be better over humid climates than over arid-to-semiarid climates. Compared to the arid-semiarid climate, the humid climate has a higher probability of detection and less false alarms. The ranges of the skill scores are similar to those found over the United States, suggesting that proper choice of parameterizations lead to no loss of performance of the model. Daily mean, minimum and maximum forecast temperatures are highly correlated with observations up to 7 day lead time. The best performance is for daily mean temperature, followed by minimum temperature and a slightly weaker performance for maximum temperature over arid regions. The usefulness of WRF products for hydroclimate monitoring was tested for an unprecedented drought in southern Brazil and for a slightly above normal precipitation season in northeastern Argentina. In both cases the model products reproduce the observed precipitation conditions with consistent impacts on soil moisture, evapotranspiration and runoff. This evaluation validates the model's usefulness to fore-cast weather up to one week and to monitor climate conditions in real time. The scores suggest that the forecast lead-time can be extended into week two, while bias correction methods can reduce part of the systematic errors.