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# Performance of the new ECMWF seasonal forecast model SEAS5 in South American catchments with hydropower plants

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Sub-seasonal to seasonal hydrometeorological forecasting systems can provide crucial information for major energy services when trading freely negotiated, long-term (1 to 5 years) power purchase contracts with customers allowed to purchase energy directly from suppliers in a competitive energy market.
This study evaluates the performance of precipitation forecasts from the ECMWF seasonal forecast model SEAS5 in South America in order to assess its potential usefulness for inflow forecasting in the hydropower sector. We first developed a proxy observed precipitation dataset based on a weighted combination of two gridded daily precipitation datasets: the TRMM-MERGE (INPE) and the CPC (NCEP-NOAA). We then used the Delft-FEWS system, previously set up over 41 catchments and covering over 31 of the main hydropower plants in the Brazilian electricity production, to extract areal precipitation forecasts of the new ECMWF SEAS5 model (25 ensemble members) for the period 1981-2016. Daily precipitation forecasts were aggregated into monthly totals to evaluate the performance of the raw SEAS5 model over the catchments. The EVS – Ensemble Verification System was used to calculate the performance metrics. Skill scores were computed using climatology (based on the proxy observed precipitation dataset) as a benchmark.
Results show a clear spatial behavior of the quality of the forecasts, with the skillful lead time varying between catchments. The CRPSS skill score shows that ECMWF SEAS5 performs better than climatology over all seven months of lead time for the majority of the studied catchments. At catchments located in the southern part of the study region (i.e. below 25°S latitude), ECMWF SEAS5 forecasts are skillful only for lead times up to two months ahead. While there is a clear underestimation tendency of monthly precipitation totals at some catchments at the extreme Northern area (left bank of the Amazon River), results from other catchments located in the Madeira River, at the border between Brazil and Bolivia, indicate a tendency of SEAS5 towards precipitation overestimation. Performance according to other criteria and seasonal dependence of forecast quality were also analyzed. The synthesis of our study results sheds light on how forecast quality can be further improved by using bias correction techniques as postprocessors of the precipitation forecasts, before using the forecasts as input to river inflow models.