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Validation of System2 seasonal forecasts using an interval-based method

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The predictability found over the tropical Pacific at interannual time scales has increased the interest in seasonal forecasts due to their potential economic benefits. Thus, general circulation models should be analyzed and validated in order to provide end-users from different socio-economic sectors with accurate information about the value of the seasonal predictions.

In this study, seasonal ensemble forecasts are verified by means of a new interval-based method. The method considers the forecast interval given by the lower and upper quartiles of the ensemble. Thus, the spread/uncertainty of the ensemble is naturally included in the process enabling the separate validation of forecasts with different uncertainty levels. The method allows to remove systematic errors using order statistics (e.g. quintiles) instead of real anomalies. Thus, if the forecast belongs to the first quintile (of the model climatology) and so does the observation (in the observation climatology), then the prediction can be considered skillful. This type of validation captures the relative signal of the forecast system and compares it to the observed signal, allowing for an estimation of the statistical significance of the resulting skill in an unbiased framework.

The interval-based method is applied to quantify the skill of a state-of-the-art seasonal ensemble forecast system, the ECMWF System2, and analyze the skill of precipitation forecasts in winter (December-February) over two regions located at different latitudes (Peru in the tropics and Spain at mid-latitudes). The method is applied both to the direct output from System2 and to the downscaled values obtained using a statistical method based on the search of analogs (see Gutierrez et al 2005 for more details). Thus, we also analize the need to provide regional information over those areas in

order to improve the seasonal forecast.

The method shows high predictability over Peru during El Niño periods associated with the predictions with the lowest spread. Here, the use of a downscaling method clearly improves the forecast skill. As expected, the predictability is lower at higher latitudes where in general the ensemble spread is higher. However, the interval-based method is able to unveil some winter precipitation predictability over Spain associated to drought episodes. This fact is explained by a known teleconnection between these negative extreme episodes and La Niña events. This teleconnection is captured by the seasonal forecast system. This study enables the forecast end-users to evaluate the skill of these predictions in different regions of the world, and to understand their value from a statistical point of view with a given significance level.

Finally, several sensitivity experiments are reported showing the effect of the observation data (comparing interpolated observations in a regular grid and raw observations) and the temporal aggregation (daily, weekly and mothly) in the obtained results.

Bibliography

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