Forecasting the number of extreme daily temperature events on seasonal timescales

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Seasonal forecasts will be a vital part of adaptation strategies in a changing climate. However, with the exception of tropical storms, very few attempts have been made to make forecasts of extreme events on seasonal timescales. I will describe an investigation into the potential for skilfully predicting the number of daily temperature extremes over three-month (seasonal) periods. Analysis uses retrospective forecasts from the Met Office seasonal forecasting system, GloSea4. Initially daily extremes are defined to be events outside either the upper or lower deciles of the daily temperature distribution from the relevant season. This definition provides a threshold which is sufficiently 'extreme' to be of direct relevance to society, but moderate enough to allow a sufficient sample for verification and to be of regular use to users.

Correlations of predicted and observed numbers of upper or lower decile extreme days over a season are significantly greater than zero over much of the globe, and the predictions provide better guidance than a persistence forecast. Seasonal-mean forecast skill for temperature is similar to, but generally greater than, the skill of predictions of the number of extreme days. In observations there is a strong relationship between the seasonal mean and the number of extreme days. I will show that the skill in predicting the number of extreme days is a consequence of this relationship, and not a result of the skillful prediction of the distribution of daily data around the seasonal mean. Finally, I will show the role that greenhouse gasses, the El Niño Southern Oscillation and soil moisture have played in the skill.