

Early warning of climate variability and change from seasonal forecasts

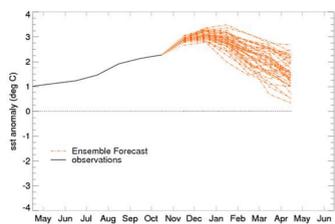
Met Office

Sarah Ineson, on behalf of Met Office Monthly to Decadal Prediction

Introduction

Projections of future climate change suggest that extreme events such as drought, floods, storms, cold spells and heat waves will all change their regional frequency of occurrence. On planning timescales of months to years in advance, the timing and occurrence of extreme and unprecedented events is determined by climate variability. To advise on the risk of imminent extremes we use climate predictions which accurately take into account current climate variability by initialising the current state of the climate. Here we show near term climate predictions up to seasonal lead times from the Met Office Hadley Centre which would allow for warning and adaptation of imminent extreme events. The Met Office seasonal forecast system is GloSea5 (MacLachlan et al. 2015).

ENSO

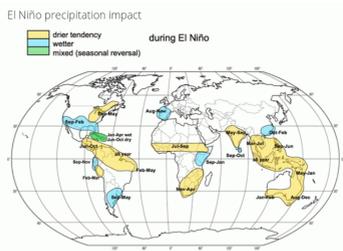


GloSea5 forecast plume of Niño3.4 SST anomalies, issued November 2015

A strong El Niño event is currently taking place in the tropical Pacific. GloSea5 indicates this event is likely to strengthen slightly, reaching a maximum in early boreal winter.

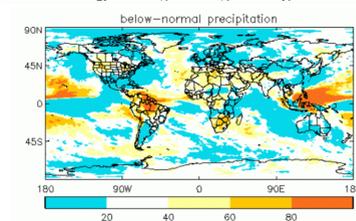
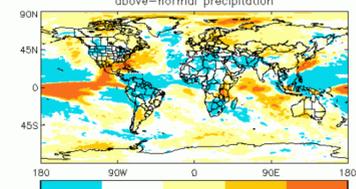
Many of the typical impacts associated with El Niño have enhanced probabilities in the boreal winter (December to February) outlook.

Latest forecasts are available from <http://www.metoffice.gov.uk/research/climate/seasonal-to-decadal/gpc-outlooks>



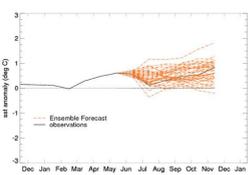
Schematic map of the typical precipitation effects over land favoured during El Niño events. From Davey et al. 2014

Probability of tercile categories Dec/Jan/Feb Issued Nov 2015 above-normal precipitation

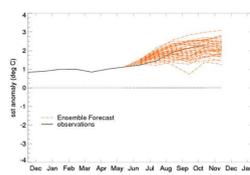


Probability of tercile categories for above-normal and below-normal precipitation for December to February, issued November 2015

Different ENSO outlooks in 2014 and 2015

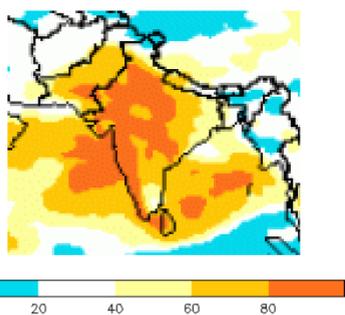


Forecasts plumes and observations of Niño3.4 SST anomalies from June 2014 (left) and June 2015 (right). As GloSea5 indicated, an El Niño did not develop in 2014, although models from several other forecast centres did favour strong El Niño development.

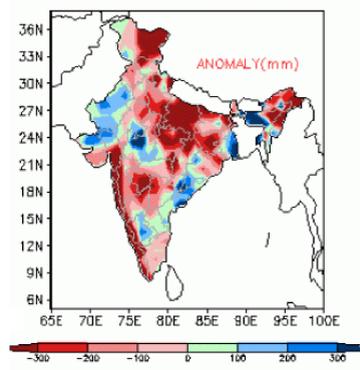


India summer monsoon rainfall

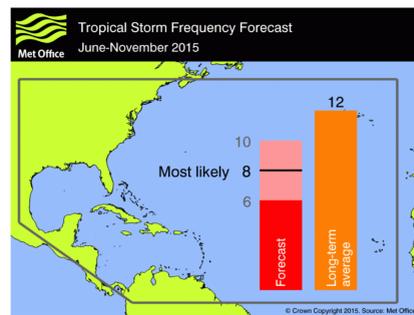
The GloSea5 forecast for rainfall for India favoured enhanced probabilities for the below-normal tercile category for June to September 2015 (forecast for July to September, issued June 2015 shown below).



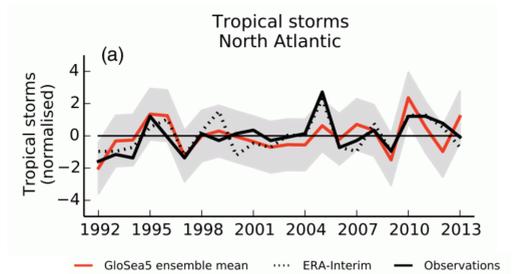
For the country as a whole, rainfall for June to September 2015 was at a deficit of 14%. Source: <http://www.imd.gov.in>



Atlantic Tropical Storm Forecasts



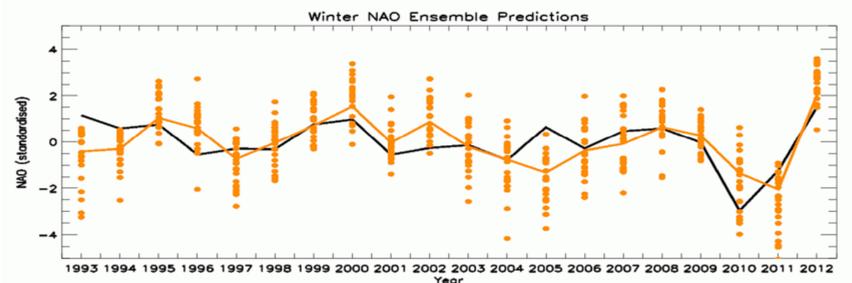
The 2015 forecast for number of tropical storms in the North Atlantic. <http://www.metoffice.gov.uk/weather/tropicalcyclone/seasonal/northatlantic2015>



GloSea5 tropical storm counts for the North Atlantic basin over the period June-November 1992-2013. Correlation is 0.51. Camp et al. 2015

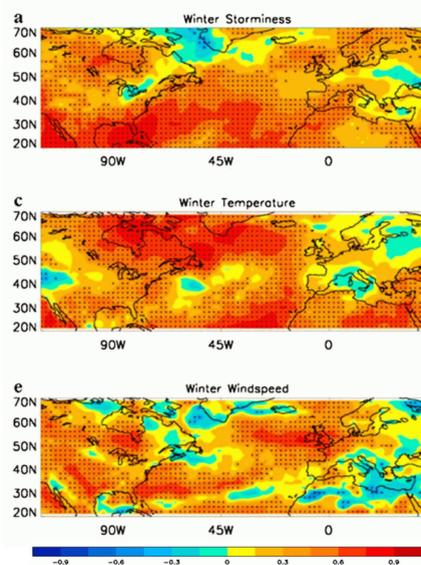
Extra Tropical Forecasting – North Atlantic Oscillation

North Atlantic Oscillation (NAO)



Observed winter NAO (black) and hindcasts (orange) between 1992/93 and 2011/12. Correlation is 0.6. Scaife et al. 2014

Surface conditions



Correlation between hindcasts and observations for the frequency of (top) winter storms, (middle) winter mean temperature, and (bottom) winter mean wind speed (10m)

Winter forecast 2014/15

GloSea5 gave a clear indication of the likelihood of enhanced westerly flow over the north Atlantic with near normal European temperatures

Ensemble mean anomaly : mean sea level pressure : Dec/Jan/Feb Issued November 2014

