Session: C1 Poster: M232A

The Asian monsoon response to ENSO in hindcasts of the Met Office GloSea4 global seasonal prediction system

Andrew Turner[†]; Richard Levine; Gill Martin
[†] NCAS-Climate, University of Reading, United Kingdom
Leading author: a.g.turner@reading.ac.uk

Seasonal forecasting of the Asian summer monsoon and its response to ENSO is of significant importance to the local population, but dynamical models often struggle to reproduce the observed response in particular years. Seasonal forecasting based on the response to ENSO is complicated by variations in the strength of the monsoon-ENSO teleconnection on decadal timescales, and in the type of ENSO event itself. While much has been written about weakening of the teleconnection in recent decades, the correlation between monsoon rainfall and equatorial Pacific SSTs has previously undergone large variations in the observed record. Furthermore, coupled model simulations of the 20th century show changes in the strength of the teleconnection that do not match the phase of those in observations. In addition, long control integrations of coupled models also show large variations, despite the lack of external forcing, and there is some evidence linking changes remote from the Indo-Pacific with modulation of the teleconnection. Characteristics of the ENSO event such as its longitudinal position have also been implicated in variations in the strength of the teleconnection. These ill-understood secular variations, together with biases prevalent in coupled models, make dynamical seasonal prediction very difficult. In this work we examine the seasonal response of the Asian summer monsoon to ENSO forcing in the UK Met Office's GloSea4 seasonal forecasting system over a hindcast period from 1992-2005, focusing on initialisation dates of 25th April and 1st, 9th May in different types of ENSO event. El Niño case studies for 1997 (large amplitude, east Pacific warming) and 2002 (moderate amplitude, central Pacific warming) are examined. While long climate runs of this model show reasonable Asian monsoon-ENSO teleconnections, the model struggles to reproduce the particular response seen in the observations for these two years. In 1997, the Asian summer monsoon featured near normal rainfall in observations, despite the large amplitude of the Pacific sea surface temperature anomalies; however, the hindcast simulates monsoon drought. In 2002, there occurred one of the worst monsoon droughts in recent decades, in spite of the moderate El Niño conditions. In contrast, the hindcast suggested anomalously strong rainfall over central India in some members. In both these cases, the observed anomalous subsidence over the Indian Ocean sector associated with El Niño is situated too far to the west in the hindcast, erroneously impacting or missing India in 1997 and 2002 respectively, with implications also for rainfall variability further afield such as in East Africa. We examine whether errors in the daily evolution of the coupled model SST field subsequent to the initialisation can be implicated in the poor hindcast skill. We hypothesize that systematic model biases in the equatorial west Pacific lead to the incorrect placement of the diabatic heating anomalies associated with El Niño during these years, to the detriment of the monsoon-ENSO teleconnection as found in earlier modelling studies. In addition, we examine the potential improvement to hindcast skill with initialisation date and using higher resolution models.