Multi-year prediction of ENSO

Jing-Jia Luo (1), Harry Hendon (2), and Oscar Alves (2)

(1) Institute for Climate and Application Research (ICAR), Nanjing University of Science Information and Technology, China, (2) Australian Bureau of Meteorology

El Nino and La Nina strongly affect the year-to-year variability of global climate, which exerts intense pressure on water resources and environmental management in a changing climate. Well-known examples include the severe floods in Australia in 2010-11 and 1998-2000 in association with multi-yearly persistent La Nina events, and a strong drought in 2002 in association with El Nino. Growing evidence suggests that some ENSO events may be predictable at lead times beyond one to two years, which is much longer than the forecasts currently issued by most operational forecast centers worldwide. However, it is still unclear how well ENSO can be predicted at multi-year timescales and what essential dynamics underpins such multiyear predictability. Based on a high-resolution coupled model forecast system (60km grid mesh for atmosphere and 25km grid mesh for ocean), we conducted three sets of ensemble hindcast experiments with lead times up to 16, 36, and 66 months, respectively. Results suggest that, despite considerable model bias in simulating the annual mean states and seasonal cycle of the Indo-Pacific climate, ENSO over the past 35 years can be skillfully predicted out to at least 16 months ahead. Some ENSO events can be well predicted at a multi-year lead. In addition, the results also show good skill in predicting global warming related signals at multi-year timescales.