Dynamic Predictability of Intraseasonal Variability Associated with the Asian Summer Monsoon

D. E. Waliser[1], W. Stern[2], S. Schubert[3], K. M. Lau[4]

[1]Institute for Terrestrial and Planetary Atmospheres, State University of New York, Stony Brook, NY
[2]Geophysical Fluid Dynamics Laboratory, Princeton University, Princeton, NJ
[3]Data Assimilation Office, Goddard Space Flight Center, NASA, Greenbelt, MD
[4]Climate and Radiation Branch, Goddard Space Flight Center, NASA, Greenbelt, MD

The objective of this study is to estimate the limit of dynamical predictability for the tropical Intraseasonal Oscillation (ISO) associated with the Asian summer monsoon. Ensembles of "twin" predictability experiments were carried out with the National Aeronautics and Space Administration (NASA) Goddard Laboratory for the Atmospheres (GLA) atmospheric general circulation model using specified annual cycle SSTs. Initial conditions were taken from a 10-year control simulation during periods of strong ISO activity identified via extended empirical orthogonal function (EOF) analysis of 30-90 day bandpassed tropical rainfall. From this analysis, 15 cases were chosen for each of four distinct phases of the ISO cycle, making 60 cases in total. Two different sets of small random perturbations were added to these 60 initial states. Simulations were then performed for 90 days from each of these 120 perturbed initial conditions. A measure of potential predictability was constructed based on a ratio of the signal associated with the ISO, in terms of rainfall or 200 hPa velocity potential (VP200), and the mean square difference between sets of twin forecasts. This ratio indicates that useful predictability for this model's ISO extends out to about 25 days for VP200 and to about15 days for rainfall. This is in contrast to the time scales of useful predictability for persistence, which for this model is about 12 days for VP200 and 8 days for rainfall. The predictability measure shows modest dependence on the phase of the ISO, with greater predictability for the convective phase at short (< ~5 days) lead times and for the suppressed phase at longer (> ~15 days) lead times. The implications of these results as well as their associated model and analysis caveats are discussed.

For additional Information, Contact: Duane E. Waliser
Institute for Terrestrial and Planetary Atmospheres, Endeavour Hall #205
State University of New York, Stony Brook, NY 11794-5000
duane.waliser@sunysb.edu; (631) 632-8647; http://terra.msrc.sunysb.edu/

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