AGCM Simulations of Intraseasonal Variability Associated with the Asian Summer Monsoon

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Abstract

The intraseasonal variability associated with the Asian summer monsoon as simulated by a number of GCMs are analyzed and assessed against observations. The model data comes from the Monsoon GCM Intercomparison project initiated by the CLIVAR/Asian-Australian Monsoon Panel. Ten GCM groups, including COLA, DNM, GEOS, GFDL, IAP, IITM, MRI, NCAR, NECP, SNU, and SUNY/GLA, participated in the intraseasonal component of the project. Each participating GCM group performed a set of 10 ensemble simulations for 1 September 1996 – 31 August 1998 using the same observed weekly SST values but with different initial conditions. The analysis focuses on the spatial and seasonal variations associated with intraseasonal variability (ISV) of rainfall, the structure of each model's principal mode of spatial-temporal variation of rainfall [i.e. their depiction of the Intraseasonal Oscillation (ISO)], the teleconnection patterns associated with each model's ISO, and the implications of the models' ISV on seasonal monsoon predictability.

The results show that several of the models exhibit ISV levels at or above that found in observations with spatial patterns of ISV that resemble the observed pattern. This includes a number of rather detailed features, including the relative distribution of variability between ocean and land regions. It is found that the fidelity of a model to represent N.H. summer versus winter ISV appears to be strongly linked. In addition, most models' ISO patterns do exhibit some form of northeastward propagation. However, the model ISO patterns are typically less coherent, lack sufficient eastward propagation, and have smaller zonal and meridional spatial scales than the observed patterns, and are often limited to one side or the other of the maritime continent. The most pervasive and problematic feature of the models' depiction of ISV and/or their ISO patterns is the overall lack of variability in the equatorial Indian Ocean. In some cases, this characteristic appears to result due to the propensity of a number of models to form double convergence zones about the equator rather than one region of strong convergence on the equator. This shortcoming not only results in a poor representation of the local rainfall pattern but is also found to significantly influence the models' representations of the global-scale teleconnection patterns associated with the ISO. Finally, analysis of the model ensemble shows a positive relationship between the strength of a model's ISV of rainfall and its intra-ensemble variability of seasonal monsoon rainfall. The implications of this latter relation are discussed in the context of seasonal monsoon predictability.

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