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Validation of summer monsoon intraseasonal variability in the DEMETER hindcasts

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The intraseasonal variability associated with the Asian summer monsoon as simulated by a number of coupled general circulation models (CGCMs) are analyzed and validated against observations. The model hindcasts are produced by the DEMETER (acronym of the European Union funded project entitled "Development of a European Multimodel Ensemble system for seasonal to inTERannual prediction") system. Seven comprehensive European global coupled atmosphere-ocean models are used to produce hindcasts at the European Centre for Medium-Range Weather Forecasts (ECMWF). Each hindcast is an integration of six months starting from 1 February, 1 May, 1 August and 1 November and comprises an ensemble of nine members. All seven models have been run for a common period of 1980-2001.

The focus is on the spatial and seasonal variations associated with the intraseasonal oscillations (ISO) of outgoing longwave radiation (OLR), their large-scale organization, propagation characteristics, the air-sea coupling and implications on seasonal predictability. A multi-variate local mode analysis (LMA, essentially a complex EOF analysis over a window of 90 days moving over the 180 days of hindcasts) has been extensively utilized in order to validate many of the above characteristics of ISOs in the hindcasts against observations. Most models have large biases in simulating the average large scale organized patterns of ISOs in OLR and the ISO patterns are more variable from one event to another. They often underestimate the amplitude of variability over the Indian Ocean, nevertheless most models ISO patterns do exhibit some form of northeastward propagation. Realistic periods of the modes (35-40 days) are produced in a few models, while most models produce shorter periods (20-30 days). The seasonality in the organization and amplitude of the modes are examined and it is found that the strength of the seasonal cycle and the intraseasonal amplitude are

related. Models with poor seasonal cycle (most often due to the formation of double convergence zones about the equator or as a result of a narrow convergence zone in the northen hemisphere throughout the summer season) tends to have larger biases in the northeastward propagation and organization. The analysis of the nature of coupling in the hindcasts shows that most models simulate too systematic relationship between OLR and SST, indicative of the systematic phase quadrature between SST and surface flux perturbations typical of a slab ocean like response. The nature of the link between the convective activity and SST in the different coupled models will help to trace the physical source of the large model biases. These large inconsistancies in simulating the properties of ISOs among the models cautions the generalization of results of ISO simulations using a single model.