

Application of Objective Diagnostics to Madden-Julian Oscillation Initiation

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Objective diagnostics are derived from combined EOF (CEOF) analysis of 200/850 mb zonal wind and OLR, by decomposition of the MJO magnitude vector into individual field component vectors in PC1/PC2 vector space. This allows for the utilization of previously overlooked information in the construction of a framework for the assessment of the MJO. These diagnostics include a measure of the contribution of each field, at each grid-point, to the overall MJO magnitude, measures of the convective and suppressed phase contributions to the overall MJO magnitude, and measures of the synergistic interactions between these fields in determining overall MJO magnitude. One such diagnostic allows the geographic location of convective initiation associated with the MJO to be isolated precisely for each MJO event, providing an excellent framework for assessing the physical processes associated with MJO convective initiation.

These diagnostics are then applied in an attempt to delineate the zonal variation of processes driving moist static energy (MSE) changes associated with the MJO. 33 years of ERA-interim data are used to calculate column integrated MSE budgets, spanning from east Africa to the western Pacific Ocean, in both summer and winter seasons. Particular attention is paid to the DYNAMO domain, with the DYNAMO time period serving as an observed case study for comparison to the results of the composite analysis. Application of the diagnostic framework is then used to gain further insight into the DYNAMO period, as well as the relationship between the RMM index and the observed MJO events.