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Spatial patterns of tropical OLR intraseasonal anomalies, as revealed by a self-organizing map.

Spatial patterns of tropical OLR intraseasonal anomalies, as revealed by a self-organizing map.

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The Madden-Julian oscillation (MJO) is the dominant mode of the intraseasonal variability in the tropical atmosphere. This mode is characterized by an easterly propagation of moist convection and atmospheric circulation anomalies across the Indian and western Pacific oceans. The most commonly used method to depict the spatio-temporal evolution of the MJO is to perform an empirical orthogonal function (EOF) analysis on filtered outgoing longwave radiation (OLR, used as a proxy of the convection) and zonal wind. This method is efficient, but the first two leading modes, used to depict the MJO activity, are constrained by both linearity and orthogonality.

A non-linear classification method, the self-organizing map (SOM), is introduced, as a supplement to the EOF. The SOM is applied on OLR intraseasonal anomalies (20-100 days band-pass filter) within the tropical region over 1980-2009. A 4x4-node Kohonen map is used to describe intraseasonal convection spatial patterns. The 16 nodes capture the different MJO phases. Using the SOM to describe the MJO is a new approach, and seems to provide more temporal and spatial information on MJO activity and seasonality?.

For each node, the tropical and subtropical convection is analyzed. Results show the delayed effect of the MJO on subtropical atmosphere dynamic and rainfall. They also confirm that both intraseasonal and interannual variability in the tropics influence subtropical climate. This emphasizes the need for a better understanding of the interactions between tropics and subtropics to enhance numerical modeling and forecasting.

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