Observed extratropical circulation response to Fast and Slow MJO episodes

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Previous work on the extratropical response to the MJO has considered all MJO epsiodes without consideration of their phase speed. In the current work we distinguish Fast versus Slow MJO episodes, and study the extratropical response as seen from composites and frequencies of occurrence of circulation regimes.

MJO episodes have been identified from the standard multi-variate EOF framework for 32 boreal winters 1980-2011. For 26 Fast cases the OLR took no more than 10 days to propagate from phase 3 to phase 6. For 8 Slow cases the propagation took at least 20 days. Fast episode composite anomalies of 500hPa height show a developing Rossby wave in the mid-Pacific with downstream propagation through MJO phases 2- 4. Changes in the frequency of occurrence of the NAO+ weather regime are modest. This Rossby wave is forced by anomalous cooling over the Maritime continent during phases 2 and 3. The upper-level anticyclonic response to phase 3 heating is a secondary source of wave activity.

Previous results find an increase in occurrence of the NAO+ circulation regime following phase 3 and of the NAO- regime following phase 6. *We find that much of this behavior is due to the slow episodes,* which show a far more dramatic dependence of regime occurrence on MJO phases. Following phase 4 the development of an NAO+ like pattern is seen in Slow episode composites, transitioning to a strong NAO- composite by phase 8. Cluster analysis shows a dramatic increase in frequency of the NAO+ weather regime follows phases 4 and 5, while a strong increase in NAO- regime follows phases 6 and 7. The subtropical responses to MJO over the Indian and Pacific Oceans in phases 1- 4 provide a source for wave activity propagating to North America, augmented by storm track anomalies.

Reference: Yadav, P. and D. M. Straus, 2017:Circulation Response to Fast and Slow MJO Episodes, *Mon. Wea. Rev.*, accepted