MLS-Related Scientific Publication

Scientific Theme: Climate Research

Influence of the Madden-Julian Oscillation on upper tropospheric humidity. Fabrizio Sassi, Murry Salby, Hugh C. Pumphrey, William G. Read, *J. Geophys. Res.*, 107, No. D32, doi:10.1029/2001JD001331, 2002.

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Summary

This paper examines the interrelationship of upper tropospheric humidity (UTH), cloud, and motion on intraseasonal timescales, using measurements of water vapor in the upper troposphere and lower stratosphere from UARS MLS, supported by contemporaneous observations of cold cloud in synoptic Global Cloud Imagry and dynamical structure in reanalyses from the European Centre for Medium-Range Weather Forecasts. The collective signature of cloud, motion, and UTH is used to composite a life cycle of the Madden Julian Oscillation (a major feature of the low-frequency variability in the tropical troposphere that plays a key role in intraseasonal changes of the tropical atmosphere).

Variations of UTH and cold cloud in the tropics reveal coherent changes that propagate eastward from the Indian Ocean into the Pacific. Coherence of UTH is high at periods of 30-90 days along the equator, and over the equator above the Indian Ocean and the subtropics in the central Pacific. The composite life cycle shows that enhanced UTH in the subtropics coincides with two anticyclonic gyres, which straddle anomalous cold cloud propagating eastward over the equator. Upon reaching the dateline, anomalous convection over the equator then collapses along with the subtropical gyres and enhanced UTH accompanying it.

This work benefits society by improving our understanding of processes affecting climate variability and, consequently, may help improve forecasts of short-term (and perhaps long-term) climate changes.

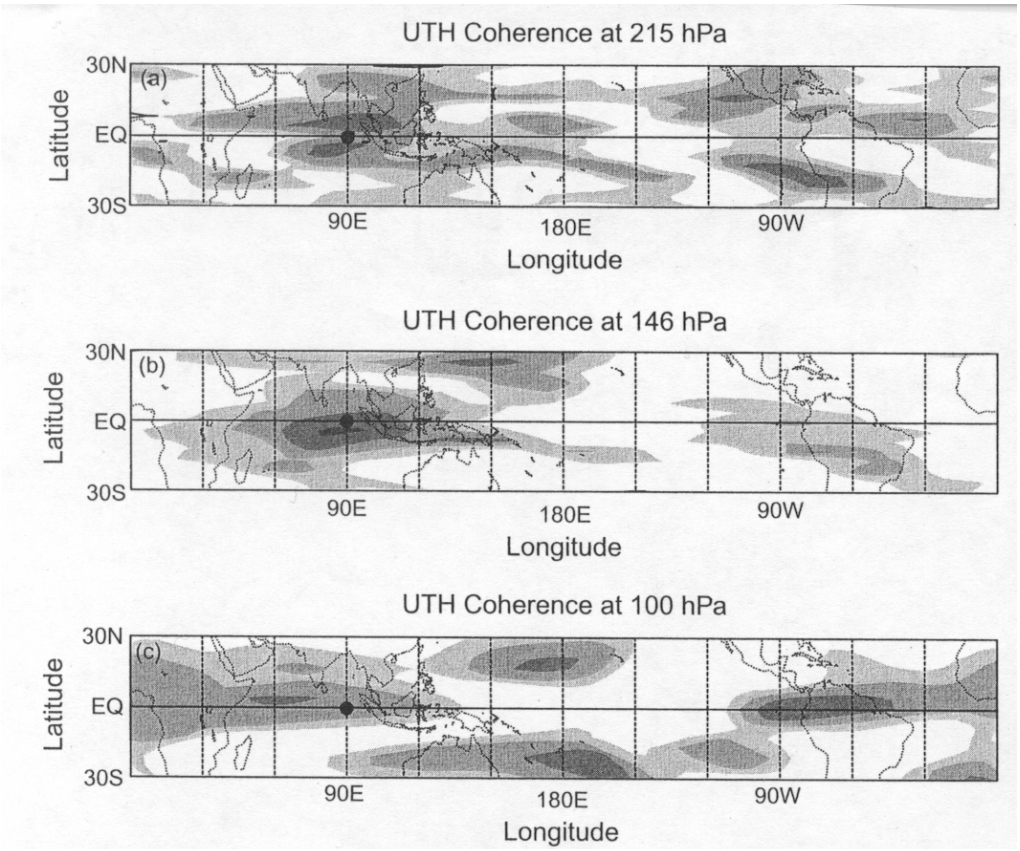

Figure 5. Coherence maps of UTH with cold cloud at 90°E on the equator.