Seasonal Modulation of 30-60 Day Variability in the Global Atmosphere: Tropical and Ext rat ropical Sources

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On intraseasonal (30-60 day) time scales, the global budget of atmospheric angular momentum (AAM) is dominated by the Madden-Julian (MJ) oscillation, which arises as an eastward-propagating, convectively-driven wave in the tropics. The AAM oscillation induces corresponding fluctuations in the Earth's axial rotation rate, evident as 30-60 clay spectral peaks in time series of the length-of-day (I ,OD), which arc caused primaril y by zonal wind variations. Here, wc investigate the seasonality and latitudinal dependence of the intraseasonal oscillation utilizing latitudinally-banded atmospheric angular momentum as calculated by the National Meteorological Center. The time series consists of zonal wind values integrated between the surface and the 100 mb level in 46 equal area bands and begins in 1976.

Pcr unit area, the intraseasonal AAM and zonal kinetic energy (ZKE) variability is generally larger in the extratropics than in the tropics. The dominant A AM signal from the latter region arises because zonal wind variations in adjacent, equal-area latitude bands show higher coherence in the tropics than they do in the extratropics. Intraseasonal oscillations arising in the northern hemisphere (NH) extratropics have been detected in AAM observations and in simulations with the UCLA genera] circulation mode] ((iCM). The GCM oscillation was found to have significant teleconnections with the tropics, indicating that it may bc capable. of interacting with the MJ oscillation on an intermittent basis.

Both the tropical and NH extratropical oscillations arc strongest during boreal winter, indicating that their seasonal modulation]] may have a common origin. The results of our GCM study, in particular, suggest that the observed seasonal modulation of the tropical (and hence the global A AM and LOD) oscillations may in part arise from teleconnections with the NH extratropics during boreal winter, when the stronger thermal wind forcing induces a more robust intraseasonal oscillation in the latter region.

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