,• . . •

The Role of' Extratropical Oscillations in Driving the Intraseasonal Variability of the Global Atmosphere

S 1. Marcus and J O Dickey (Both at: Space Geodetic Science and Applications Group, Jet Propulsion Laboratory, Pasadena, CA 91 109; tel 818-354-3477; e-mail:slm@logos.jpl.nasa.gov)

The dominant intraseasonal signal in the Earth's atmosphere is the Madden-Julian (MJ) oscillation, which appears as an eastwar - propagating convective disturbance in the tropics. While the convective signal is strongest over the Eastern hemisphere, kinematic features of the oscillation appear 10 propagate eastward from the dateline to the western Indian ocean (W](）), where II ew convective disturbances experience their largest growth rates. Thus, the near periodicity of the MJ oscillation may be related to the propagation time for these convectively-driven disturbances to complete a circuit of the equator. Recently, however, intraseasonal oscillations with a purel y dynamical origin have been found in simplified models of barotropic flow over topography in the extratropics. Subsequent studies showed that similar extratropical oscillations occur in a version of the UCLA Genera] Circulation Model (GCM) which fails to produce a robust MJ oscillation, and in a 12-year data set of atmospheric angular momentum variations in 46 equal-area latitude belts derived from the NMC operational analysis.

Both the GCM and observational studies produced evidence for a possible triggering effect of the extratropical oscillation on intraseasonal oscillations in the tropics, In the GCM study, the passage of a trough associated with the leading EO1' of the 500" mb height field in the NH extratropics was followed by enhanced cumulus convection in the WIO, which showed a significant periodicity of 39 days. Thus this version of the GCM appears to contain an "incipient" MJ oscillation, which fails to propagate eastward and intensify as observed in 01.1< data for convective systems in the W( ). The 1 argest intraseasonal oscillations in global atmospheric angu ar momentum were observed during the winter of 1987-88, with the strongest variations occurring in the tropics. The tropical oscillations, however, were found to have been directly preceded by intense oscillations which arose in the NH extratropics during the autumn of 1987. Thus, both the modelling and observational studies indicate that the intraseasonal periodicity of the tropical MJ oscillation may ar isc, at least in part, from the remote effects of dynamical oscillations in the extratropics.