**Anticyclonic Wavebreaking Modulated by the MJO**

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The Madden Julian Oscillation (MJO) is the dominant atmospheric circulation in the tropics on intraseasonal timescales. The MJO often couples with convection as it moves over the Indian Ocean and decouples as it leaves the west Pacific Ocean. The association between convection coupled to the MJO and the midlatitude flow pattern has been the primary focus of numerous recent studies. In particular, it has been shown that there is a statistical relationship between the position and strength of the MJO and anticyclonic wavebreaking (AWB). This study expands on this statistical relationship and examines the physical mechanisms by which the MJO is able to induce AWB.

We have constructed a climatology of AWB events during the boreal cold season from 1979 through 2010 over the North Pacific. The subset of the AWB events which are associated with the MJO is used as the basis of this study. First, a composite analysis will be shown to highlight the large-scale, high amplitude features associated with the MJO and AWB. Then, a representative case study will be shown to illustrate the details of the full relationship.

It will be shown that convection associated with the MJO over the Indian Ocean creates middle tropospheric heating anomalies near the equator which reduce upper-tropospheric PV across the low latitudes by poleward advection by the divergent component of the wind. This advection tightens the pre-existing climatologically located meridional PV gradient at the periphery of the tropics. The meridional PV gradient is proportional to the Rossby wave restoring force, and as Rossby waves propagate eastward from the region of stronger to the region of weaker meridional PV gradient, they encounter an insufficient restoring force, causing them to break. The location of the breaking point depends on the strength and zonal extent of the meridional PV gradient as well as the strength and location of the MJO.