Geophysical Research Abstracts
Vol. 12, EGU2010-1642, 2010
EGU General Assembly 2010

Modulation of the extra-tropical flow by the Madden Julian Oscillation

Olivia Martius (1), Richard Moore (2), and Thomas Spengler (3)

(1) ETH Zurich, Institute for Atmospheric and Climate Science, Zurich, Switzerland (olivia@env.ethz.ch), (2) Department of Meteorology, Naval Postgraduate School, Monterey, USA;, (3) Atmospheric and Oceanic Sciences Program, Princeton University, Princeton, USA

The Madden Julian Oscillation (MJO), a large-scale coupled pattern between tropical deep convection and atmospheric circulation, is a dominant source of intraseasonal variability in the tropics. Its impacts, however, are not limited to tropical regions: latent heat release associated with MJO convection can force planetary scale Rossby waves that interact with the subtropical jet and thereby affect intraseasonal variability patterns in the subtropics and extra-tropics.

On the synoptic scale, propagating Rossby wave trains can culminate in Rossby wave breaking, a process that generates so-called potential vorticity (PV) streamers. PV streamers are positive upper-level PV anomalies that can influence surface weather as well as planetary scale patterns of variability.

The primary goal of this study is to investigate the relationship between the MJO and the subtropical and extra-tropical flow in general and PV streamers in particular. Ten MJO indices have been obtained from the Climate Prediction Center for the boreal winter between 1978 and 2001. The data are separated into convectively active and suppressed periods of the MJO and compared with a streamer dataset that is based on ERA-40. The streamers are separated into cyclonically (LC2) and anticyclonically (LC1) breaking waves.

Statistically significant differences are found regarding the amount, location and type of PV streamers during different phases of the MJO. The differences are linked to changes in the subtropical jet and the PNA pattern. A distinct regime shift occurs over an approximately 10-15 day period as the convection approaches the international dateline.