Climate Theme Seminar Series 2009
Next seminar: Friday 27th February

Mid-latitudinal response to stationary and non-stationary tropical forcing

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The study is built around two linked aspects. First that events of intense localized convective activity in the sub-tropics (such as the MJO) can constitute a large-amplitude coherent flow feature in an otherwise comparatively quiescent ambient environment. Second that such sub-tropical synoptic-scale perturbations can play a major role in the initiation of Rossby wave trains in the extratropics, and in particular trigger downstream development along the PV wave-guide. Theoretical considerations indicate the sensitive dependence of latitudinal wave-transmission to the ambient atmospheric state and zonal structure of the forcing. Lateral propagability is drastically reduced in stronger shear flow. For realistic atmospheric settings meridional propagation is expected to be highly evanescent.

Two different setups for numerical simulations, performed with the ECMWF Integrated Forecast System (IFS CY31R2), pinpoint further dynamical aspects of lateral wave propagation. First, the model was initialized with an idealized zonally symmetric, barotropic jet with variable strength. A mountain located at different, tropical and subtropical latitudes was used as a trigger for stationary waves. The impact on the extra-tropical flow can be separated into two regimes: Downstream development along the jet-steam (wave-guide) and Rossby wave propagation along great circles. First is evident for all experiments, whereas latter is highly dependent on jet-strength, location of forcing and time. Second, idealized simulations are conducted with local specified stationary and non-stationary tropical heating distributions of different amplitude, scale and location to examine the nature and sensitivity of the response. The IFS for this study was run in the Held-Suarez setting. The experiments help to enlighten some aspects of the stationary and transient influence of tropical synoptic-scale forcing upon the extra-tropical flow. We find indications of significant poleward flow propagation with subsequent downstream development.

Seminars held in Room 345, Building 28, Fridays 1pm-2pm
All Welcome!
For more information, contact Laura Davies or Jo Brown (room 216, x20110)