Geophysical Research Abstracts
Vol. 14, EGU2012-3241, 2012
EGU General Assembly 2012

The role of stationary eddies in shaping mid-latitude storm track dynamics.

Y. Kaspi (1) and T. Schneider (2)

(1) Weizmann Institute of Science, Rehovot, Israel (yohai.kaspi@weizmann.ac.il), (2) California Institute of Technology, Pasadena, CA, USA (tapio@gps.caltech.edu)

Transient eddies in storm tracks dominate the extratropical transport of heat, momentum, and water vapor. Yet it is unclear what controls properties such as the kinetic energy of storm track eddies, or the spatial distribution of this eddy kinetic energy (EKE). In a changing climate, even small shifts in the EKE distribution can have a significant effect on the extratropical climate. Here we use an idealized aquaplanet general circulation model (GCM) to show that stationary eddies play a fundamental role in shaping transient storm track dynamics. A local zonally asymmetric surface heat flux in the extratropics initiates storm tracks and stationary waves in the GCM. We show that on the one hand, stationary eddies lead to heat fluxes enhancing the meridional temperature gradients near the storm track entrance regions; thus, they contribute to the maintenance of the baroclinicity there, which transient eddies tend to erode. On the other hand, stationary eddies destroy baroclinicity in the storm track exit regions and thus lead to the downstream self-destruction of storm tracks; the eddy kinetic energy downstream is reduced to values lower than it would have without the zonal asymmetries that cause localized storm tracks. Water vapor fluxes by stationary eddies plays a key role in both cases. Our results demonstrate an important nonlinear baroclinic coupling of stationary and transient eddy dynamics. We study this mechanism for a changing climate with systematic experiments over a wide range of climates.