Geophysical Research Abstracts
Vol. 14, EGU2012-6412, 2012
EGU General Assembly 2012

Midlatitude Storms in a Moister World: Lessons from Idealized Baroclinic Life Cycle Experiments

J. Booth (1,2), S. Wang (2), L. Polvani (2,3)

(1) NASA GISS, New York City, United States, (2) Department of Applied Physics and Applied Mathematics, Columbia University in the City of New York, United States, (3) Department of Earth and Environmental Sciences, Columbia University in the City of New York, United States

In global warming projections, the response of midlatitude storms has varied, depending on model resolution and storm metric analyzed. One point of contention regarding the varied response relates to the impact of moisture, because Global Climate Models parameterize some portion of the moist physics of midlatitude storms. Therefore, this study examines the sensitivity of midlatitude storms to moisture using a baroclinic wave in a weather forecasting model. Additionally, this study focuses on multiple storm metrics: eddy kinetic energy (EKE), storm central pressure, and the extremes in precipitation and surface winds.

We take two approaches to vary the model's moisture: (1) we vary the relative humidity in the initial conditions, and (2) we fix the initial relative humidity and alter the definition of the saturation vapor pressure. The second approach allows us to increase moisture content above the current levels, which is something that is expected in a warmer climate.

In both of our experiments, the storm central pressure minimum and the extremes in surface winds and precipitation strengthen monotonically as moisture increases. However, the response is quite small for moisture levels equal to those projected for the 21st century in GCMs. The behavior of the storm EKE is more complicated: for moisture content values near and above current levels, EKE responds non-monotonically. This behavior is caused by a change in the storm's circulation: increasing moisture content increases the vertical slope of the storm warm conveyor belt, which decreases the meridional extent of the storm. This decrease in meridional scale weakens the EKE.