JOHNS HOPKINS
Center for Environmental
& Applied Fluid Mechanics

Weekly CEAFM Seminar: Spring 2013

Date: **Friday, February 8, 2013**

Time: 11:00 AM

Location: Gilman 50 (Marjorie M. Fisher Hall)

Speaker: **DR. ELIZABETH A. BARNES** (Lamont-Doherty Earth Observatory, Columbia University)

Title: ***"MERIDIONAL CONSTRAINTS ON MIDLATITUDE ATMOSPHERIC VARIABILITY AND ITS RESPONSE TO CLIMATE CHANGE"***

Abstract

The eddy-driven jet is located in the midlatitudes and its movement is strongly coupled to regional weather, local air temperature, extreme event frequency and wind-driven ocean circulations. In both hemispheres, this jet is bounded on one side by the pole and often bounded on the opposite side by strong, Hadley-driven winds. This work explores how the eddy-driven jet and its variability exist within these limits and how eddy and jet variability may change as the jets shift poleward with climate change.

We find that the structure of jet variability is a strong function of the jet position in three sectors of the globe using data from observations and comprehensive global circulation models (CMIP5 archive). For the Southern Hemisphere and the North Atlantic jets, the variability becomes less of a north-south wobbling and more of an increase/decrease of the jet speed (pulsing) as the jets shift poleward with climate warming. In contrast, for the North Pacific jet, the variability becomes less of a pulsing and more of a north-south shifting. In spite of these differences, we are able find a mechanism (based on wave propagation and breaking) that can explain many of the changes in jet variability within a single theoretical framework. This mechanism is supported by simulations of a stirred barotropic model on the sphere. Additional results from the barotropic model demonstrate that cyclonic wave breaking decreases as the jet shifts poleward, and this decrease in high-latitude wave breaking is also found in the CMIP5 21st Century simulations.

Our results highlight that relatively small biases in jet latitude can cause differences in tropospheric variability between models and observations as well as among models. In addition, some models project the jet will shift up to 5 degrees poleward over the next century, and so it is possible that the present-day "annular mode" patterns of jet variability could change in the future.

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