CGD SEMINAR

NCAR

DATE: Tuesday, 4 April 2017

TIME: 11 a.m.

LOCATION: NCAR, 1850 Table Mesa Drive
Mesa Lab, Main Seminar Room

TITLE: The influence of the Rocky Mountains on the ocean's Meridional Overturning Circulation

SPEAKER: Elizabeth Maroon, CIRES

ABSTRACT:

The general circulation of the ocean features a strong Meridional Overturning Circulation (MOC) in the North Atlantic that has no equivalent in the North Pacific. Several hypotheses have been suggested for this asymmetry, including differences in ocean basin width, the southern extent of Africa, and the poleward extent of the Atlantic. In this study, we test Warren's (1983) hypothesis that a vigorous MOC exists in the North Atlantic and not the North Pacific because the gyre circulation in the North Atlantic is more efficient in transporting salty water northward poleward than is the gyre circulation in the North Pacific; these gyre circulation differences were hypothesized to stem from wind stress differences that are due to a stationary wave, generated by the Rocky Mountain Cordillera. We first perform a control integration of a modified version of the coarse resolution coupled climate model from GFDL (CM2Mc see Galbraith et al., 2011), which features reasonably realistic circulation in the North Pacific and Atlantic. Branching off the control simulation, we then flatten the Rocky Mountains. Within a few decades of flattening, deep convection and a MOC appear in the North Pacific, and the Atlantic MOC is reduced. After a few centuries, the new equilibrium has a 25 Sv MOC in the Pacific, deep convection in the northwest Pacific, and a reduced Atlantic MOC. We then perform a second simulation to examine whether these ocean circulation changes are due to changes in the wind stress or due to changes in river runoff from flattening the Rockies. In this simulation, we retain the Rockies orography but artificially re-route North American runoff that would have flowed to the Pacific to instead flow to the Atlantic. The resulting MOC changes are very similar to those in the flattened Rockies experiment. The results from these simulations suggest that the impact of the Rockies on the global ocean MOC is primarily through their impact on hydrology rather than on surface winds.

Live webcast: http://www.fin.ucar.edu/it/mms/ml-live.htm

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