Impacts of Variability and Projected Change in Midlatitude Cyclone Activity on the Hydroclimate of the U.S. Midwest

Edmund K.M. Chang
School of Marine and Atmospheric Sciences
Stony Brook University, SUNY

With contributions from Yanjuan Guo, Xiaoming Xia, Albert Yau, and Chen-Geng Ma

Stony Brook University

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- # Abstract:

Midlatitude cyclones and their associated fronts and baroclinic waves provide much of the precipitation over the continental U.S. Shifts in the storm track or changes in cyclone activity, such as those associated with the El Nino Southern Oscillation and global climate change, can have significant impacts on the hydroclimate of the US Midwest and Southwest. It is important to quantifiy and understand the relationship between storm track and precipitation variability, and assess how future projected changes in storm track activity may impact water resources over these regions.

In this study, projected changes in storm track activity and precipitation over US made by models participating in phases 3 and 5 of the Coupled Model Intercomparsion Project (CMIP3 and CMIP5) have been examined. Each model's ability to simulate the relationship between storm track and precipitation variability during the historical period has been assessed based on comparisons with similar relationships derived using observed precipitation and storm track variability based on satellite and rain gauge measurements and reanalysis data. Projected changes in precipitation and storm tracks made by these models under increasing greenhouse gas forcing are then assessed based on these relationships.

In this presentation, we will highlight results for summer over the Midwest. Overall, our results suggest that during summer, CMIP5 models project a significant decrease of storm track activity over the US Midwest, and this projected decrease is significantly larger than that projected by CMIP3 models. Correspondingly, compared to CMIP3, CMIP5 ensemble mean suggests a more northward intrusion of summer drying that extends north of the Great Lakes. Model to model variations in projected changes in storm track activity also correlates significantly with model to model variations in projected precipitation changes, with those models projecting larger decrease in storm track activity also generally projecting larger decrease in precipition, as well as more extensive northward intrusion of the area of decrease towards Hudson Bay. These results suggest that storm track variability and changes can have significant impacts on the hydroclimate of the U.S. Midwest duirng the growing season, and more effort should be made to better understand and quantify these impacts.

- For More Information:

Edmund K.M. Chang
School of Marine and Atmospheric Sciences
Stony Brook University, SUNY
kar.chang@stonybrook.edu