Title: 'Distinguishing Forced and Internal Multi-Decadal Variability in the North Atlantic and their Climate Impacts'

Author: Mingfang Ting, Lamont-Doherty Earth Observatory, Columbia University

Abstract: Atlantic Multidecadal Variability (AMV), a basin-wide North Atlantic sea surface temperature warming or cooling pattern varying on decadal and longer time scales, is one of the most important climate variations in the Atlantic basin. The AMV has shown to be associated with significant climate impacts regionally and globally, from Atlantic hurricane activities, frequency and severity of droughts across North America, as well as rainfall anomalies across the African Sahel and northeast Brazil. The decadal oscillations in U.S. West hydroclimate, for example, reach extreme severity during the warm and neutral phases of AMV, such as in the 1930s and the 1950s when the U.S. Great Plains and the Southwest experienced extremely dry conditions of the Dust Bowl and the persistent Texas drought, respectively. While when AMV was in its cold phase in the early 1900s and from 1965 to 1995 droughts were less frequent or severe. The Atlantic hurricane activities also tend to increase during warm phase of AMV and decrease during the cold phase as observations and climate models suggest.

Despite the important impact of the AMV, its mechanisms are not completely understood. In particular, whether the historical Atlantic SST fluctuation is forced by the combination of greenhouse warming and aerosol cooling, or driven primarily internally through changes in the Atlantic Ocean circulation. Using climate models such as the NCAR large ensemble simulations and some of the CMIP5 models, we found that the forced and internally generated North Atlantic sea surface temperature anomalies can be successfully separated and their climate impacts further distinguished. The implications and challenges for decadal climate prediction will also be discussed.