



Mechanism on how the spring Arctic sea ice impacts the East Asian summer monsoon

Dong Guo (1), Yongqi Gao (1,2), Ingo Bethke (3), Daoyi Gong (4), Ola M. Johannessen (2), and Huijun Wang (1)

(1) Institute of Atmospheric Physics, CAS, Beijing, China (guodong@mail.iap.ac.cn), (2) Nansen Environmental and Remote Sensing Center/Bjerknes Center for Climate Research, Bergen, Norway, (3) Bjerknes Center for Climate Research, Bergen, Norway, (4) State Key Laboratory of Earth Surface Processes and Resource Ecology, Beijing Normal University, Beijing 100875, China

Abstract: Observational analysis and purposely designed coupled atmosphere–ocean (AOGCM) and atmosphere only (AGCM) model simulations are used together to investigate a new mechanism describing how spring Arctic sea ice impacts the East Asian summer monsoon (EASM). Consistent with previous studies, analysis of observational data from 1979 to 2009 show that spring Arctic sea ice is significantly linked to the EASM on inter-annual timescales. Results of a multivariate Empirical Orthogonal Function analysis reveal that sea surface temperature (SST) changes in the North Pacific play a mediating role for the interseasonal connection between spring Arctic sea ice and the EASM. Large-scale atmospheric circulation and precipitation changes are consistent with the SST changes. The mechanism found in the observational data is confirmed by the numerical experiments and can be described as follows: spring Arctic sea ice anomalies cause atmospheric circulation anomalies, which, in turn, cause SST anomalies in the North Pacific. The SST anomalies can persist into summer and then impact the summer monsoon circulation and precipitation over East Asia. The mediating role of SST changes is highlighted by the result that only the AOGCM, but not the AGCM, reproduces the observed sea ice-EASM linkage.