Geophysical Research Abstracts
Vol. 20, EGU2018-10526, 2018
EGU General Assembly 2018

The influences of Arctic troposphere on the winter Eurasian climate variability as revealed by relaxation experiments

kunhui Ye (1), Thomas Jung (1,2), Tido Semmler (1), and Felix Pithan (1)
(1) Alfred Wegener Institute, Climate Dynamics, Germany (kunhui.ye@awi.de), (2) University of Bremen

The decreases in Arctic sea ice have been observed for several decades and an ice-free Arctic ocean (with extremely small ice extent) may become a reality within this century. At the same time, the Arctic has warmed at a speed that is twice as large as that in other parts of the world. The coincidence of these two important Arctic phenomena has stimulated intense scientific discussion on how changing Arctic climate can impact the climate variability in the mid-low latitudes. The warm Arctic-cold continent temperature pattern has exemplified the linkage between Arctic and the mid-latitude, and its scientific robustness and dynamic origin are still subjected to debate. To further understand the Arctic influence on the climate variability over mid-latitude and its dynamic processes, several sets of experiments with and without relaxing Arctic troposphere towards reanalysis are performed. We find that the winter cooling over the Eurasian continent is coincident with the warming over eastern Arctic and east Canada in the experiment with the relaxation of Arctic troposphere, and the year-to-year variations of the surface air temperature in the Eurasian continent are well reproduced in the same relaxation experiment. Further analysis shows that the Arctic troposphere exerts important impacts on some surface atmospheric systems such as the Siberian High. The significant mid-high level atmospheric circulation response to the Arctic influence is found well beyond the Arctic areas, well extending to the subtropics. These atmospheric responses may also have important implications for the East Asian winter monsoon. Further insights into the dynamic pathways of the Arctic influence are gained and the associated processes are revealed. In contrast to the strong Arctic impacts on the winter mean temperature and climate in Eurasia, the possibility of the occurrence of extreme daily-mean temperature in the continent appears to be reduced in association with the Arctic influence. Compared to the tropical troposphere as suggested by the comparison between different experiments, the Arctic troposphere exerts stronger impacts on the surface climate in midlatitude over the Eurasian continent. The results from our analysis have significant implications for the understanding of Arctic-midlatitude linkage and for the seasonal prediction in Eurasia.