4.220 Regional model analysis of the source and transport pathways of black carbon aerosols over the Arctic Ocean on September 2016.

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Abstract:

Black carbon (BC) aerosols emitted from incomplete combustion processes such as fossil fuel and biomass burning is recognized as one of factors affecting the climate change. However, since the information of atmospheric BC behavior is still limited, their influence on the climate change has large uncertainty. Furthermore, it is suggested that the impact of BC on the climate change at high-latitude is large. Therefore, the information of atmospheric BC such as transport pathway, source, and removal process etc. is required. In this study, we investigated the sources and pathways of BC at the arctic and Pan-arctic regions using a regional chemical transport model. Also, we compared with the model simulation results with ship-based observation data by R/V Mirai at the Arctic Ocean and Bering Sea cruise on 2016.
We conducted model simulations for the BC mass concentration over the Pan-Arctic region using a regional chemical transport model (WRF-Chem version 3.8.1). The initial and lateral boundary conditions for the meteorology and chemical species were taken from NCEP-GFS and MOZART-4, respectively. RACM and GOCART modules were used for the gaseous and aerosol chemistry, with a slightly modification to include OH dependency for the aging and in-cloud wet deposition of BC process based on Liu et al. (2011). To estimate the impact of BC from Siberian forest fire emission on the arctic BC concentration, we have conducted sensitivity experiment of biomass burning emission over Siberia from August to October in 2016.
The model generally captured the variation of BC mass concentrations by ship-based

observation data.. High contribution of Siberian forest fire emission for BC was suggested especially in late September through the sensitivity analyses.