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The emission sensitivity of the black carbon during the Siberian forest fire event in September 2016 simulated with the NICAM-SPRINTARS

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In low human activity area such as Arctic and ocean, even a small inflow of aerosols originated in anthropogenic and forest fire emissions can be an influence on radiation, cloud, and precipitation via direct and indirect effects of aerosol. Hence it is important to understand the aerosol transport to the low human activity area. The large and continuous forest fire emission occurred around Lake Baikal of Siberia in September 2016. The maximum surface concentration of black carbon (BC) was observed by Arctic cruise of R/V Mirai (MR16-06) in 25–26 September around Aleutian Islands. We successfully reproduce the maximum of carbon concentration in 25–26 September around Aleutian Islands with the aerosol transport simulation of the Nonhydrostatic Icosahedral Atmospheric Model (NICAM) – SPRINTARS with horizontal resolution of 56 km. These results imply the long-range transport of BC from Lake Baikal to Aleutian Islands, however, the aerosol transport simulation possibly involves in uncertainties related to the injection levels of emission, emission dataset, and horizontal resolution of the model. Thus, the sensitivity of emission should be addressed to validate the uncertainty ranges of the aerosol transport impact on the low human activity area. To estimate the BC emission impact, we performed the sensitivity simulations of the NICAM-SPRINTARS using the multiple schemes of emission, the multiple emission dataset (GFAS, GFED, and FINN), and the multiple horizontal resolutions (220 km and 56 km). One noticeable impact of emission scheme change was achieved by replacing the model's injection height of forest fire events by the observational injection height, and the BC concentration in remote area is relatively large with the emission scheme of constant injection height (about 3 km). The horizontal resolution with 56 km is capable of simulating fine scales transport processes of BC.