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# A CCM experiment on the effects of solar proton events on HNO3 and O3 in the polar middle and lower atmosphere

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Changes in nitric acid concentration and ozone concentration in the polar atmosphere due to solar proton events are investigated using a chemistry-climate model (CCM). The CCM used in this study is the MIROC3.2-CCM that has been developed in NIES, incorporating stratospheric chemical module into the MIROC3.2-GCM, which was used for the future projection of climate by IPCC. The CCM experiments assume ten times NOx concentration of the climate value in the polar region of 60-90N and 60-90S and at the altitudes of 35-55km for the initial condition. Then the calculation is performed for three years in the atmospheric composition for the year 1900. The results are compared with those from the run without the NOx increase. The results indicate that the sedimentation of polar stratospheric clouds (PSCs) is a key process for the increase in nitric acid in the polar troposphere. For a more realistic simulation, we are developing a chemical box model which includes ion reactions in the atmosphere as well as neutral chemical reactions. The estimation of the NOx and Ox increases after solar proton events will be used for the initial condition of CCM calculation.

Keywords: solar proton event, ozone, nitric acid, polar region, chemistry-climate model