



Supplement of

A three-dimensional simulation and process analysis of tropospheric ozone depletion events (ODEs) during the springtime in the Arctic using CMAQ (Community Multiscale Air Quality Modeling System)

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Figure S1. The surface analysis provided by Weather Prediction Center (WPC) from 29 March to 31 March, 2019.

Variables	R	RMSEs
Pressure	0.991	3.081 hPa
T2	0.920	3.784 K
U10	0.881	$2.153\ \mathrm{m}{\cdot}\mathrm{s}^{-1}$
V10	0.897	$2.282\ \mathrm{m}{\cdot}\mathrm{s}^{-1}$
Surface ozone	0.802	8.347 ppb

Table S1. Values of statistical parameters for simulations of meteorological parameters and the surface ozone at Barrow.



Figure S2. Satellite measurements of the tropospheric BrO column density (unit: nmol · m⁻²) from 28 March to 29 March, 2019.



Figure S3. Simulated surface ozone (ppb) at Barrow from 28 March to 6 April, 2019 without the modification in the boundary condition at the Chukotka Peninsula, together with the simulated BrO. The correlation coefficient R and the root-mean-square errors RMSE were also presented in the vertical axis.



Figure S4. The tropospheric BrO column density (unit: $mol \cdot m^{-2}$) obtained in satellite observations and simulations at 00 UTC on 30 March 2019.



Figure S5. The spatial distributions of the sea level pressure (hPa, contour lines) and surface temperature ($^{\circ}$ C, contour fills) simulated by WRF from 29 March to 31 March, 2019, with a time resolution of 6 hrs.



Figure S6. The spatial distribution of the emission rate of sea-salt aerosols $(g \cdot s^{-1})$ simulated by CMAQ from 29 March to 31 March, 2019.



Figure S7. The spatial distributions of the surface wind $(m \cdot s^{-1})$ and the streamline simulated by WRF from 29 March to 31 March, 2019, with a time resolution of 6 hrs.



Figure S8. The spatial distributions of the sea level pressure (hPa, contour lines) and surface temperature (°C, contour fills) simulated by WRF from 2 April to 4 April, 2019.



Figure S9. The spatial distributions of surface wind $(m \cdot s^{-1})$ and the streamline simulated by WRF from 2 April to 4 April, 2019.



Figure S10. The spatial distribution of the surface ozone (ppb) simulated by CMAQ from 2 April to 4 April, 2019, with a time resolution of 6 hrs.



Figure S11. Change of surface ozone (ppb) caused by the local chemistry during 20-31 March, 2019, with a time resolution of 2 hrs. The positive value represents a chemical production of ozone, while the negative value denotes a chemical consumption of ozone.