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Supplement of

Polar boundary layer bromine explosion and ozone depletion events in the chemistry–climate model EMAC v2.52: implementation and evaluation of AirSnow algorithm

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Supplement

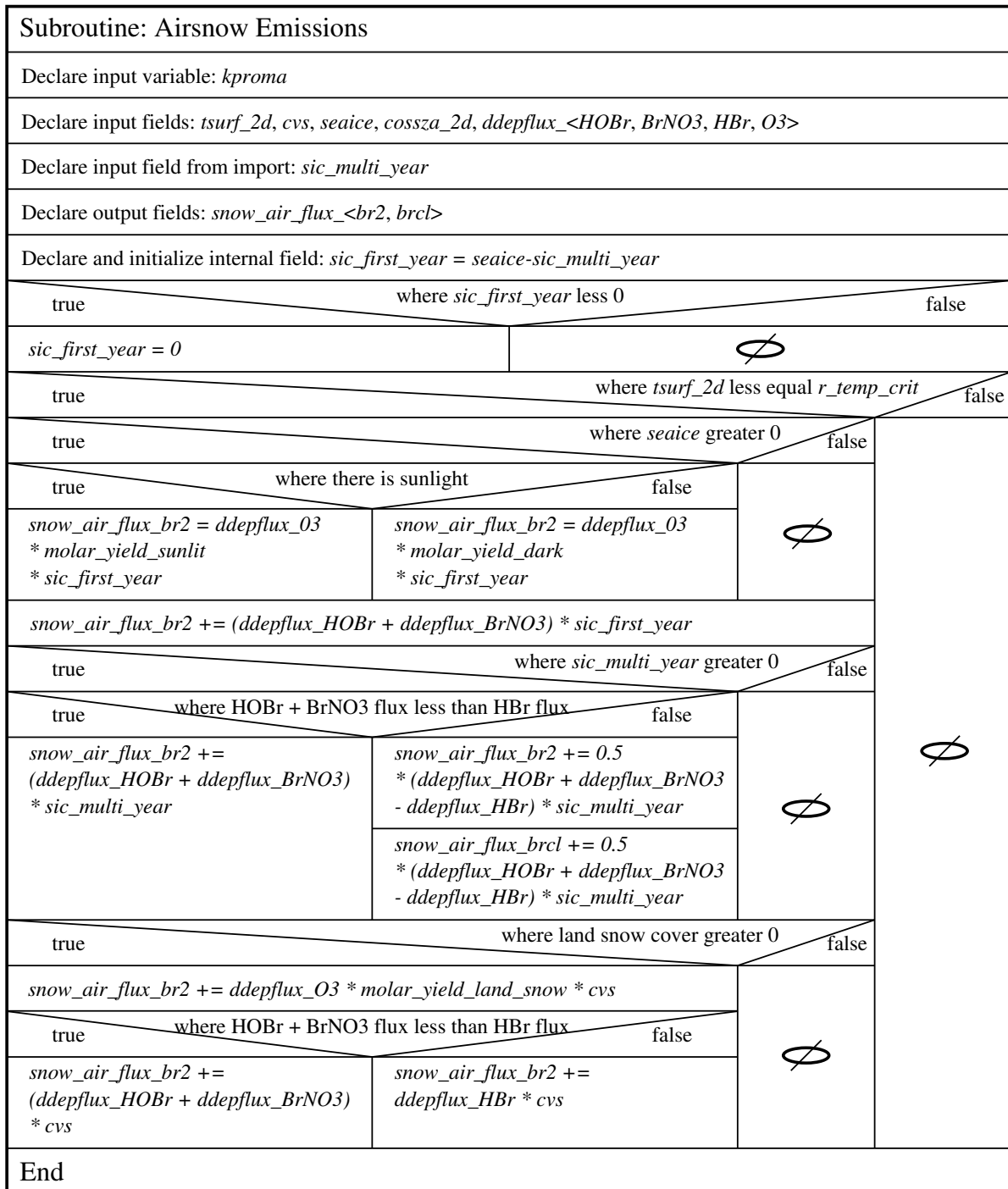
S.1 Heterogeneous reactions involving bromine used in the model



10



S.2 Nassi-Shneiderman diagram

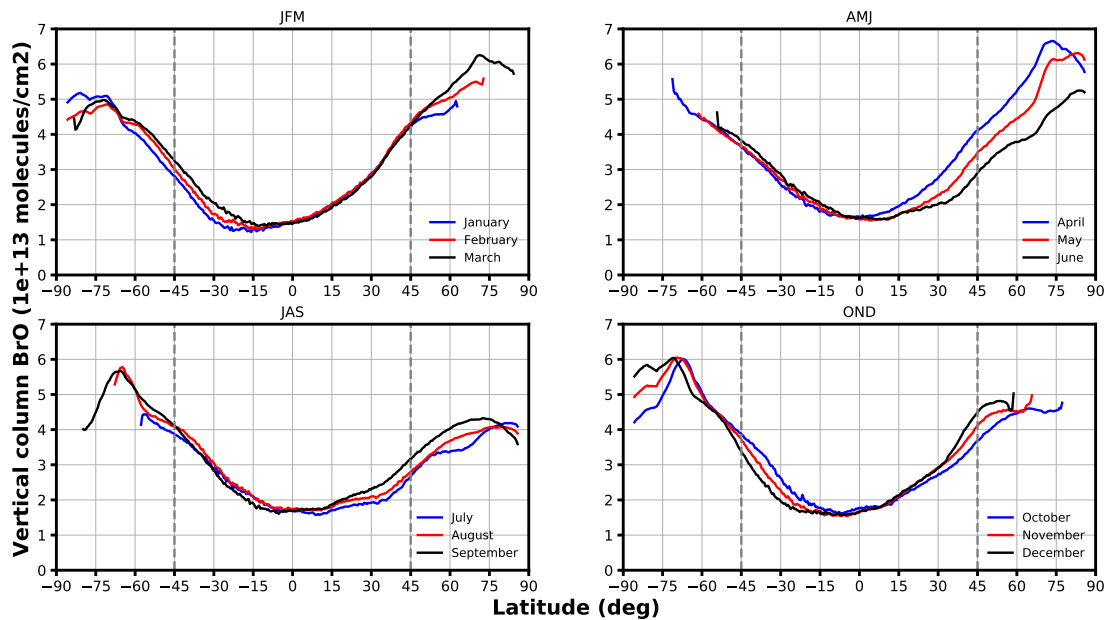


S.3 Excerpt from onemis namelist

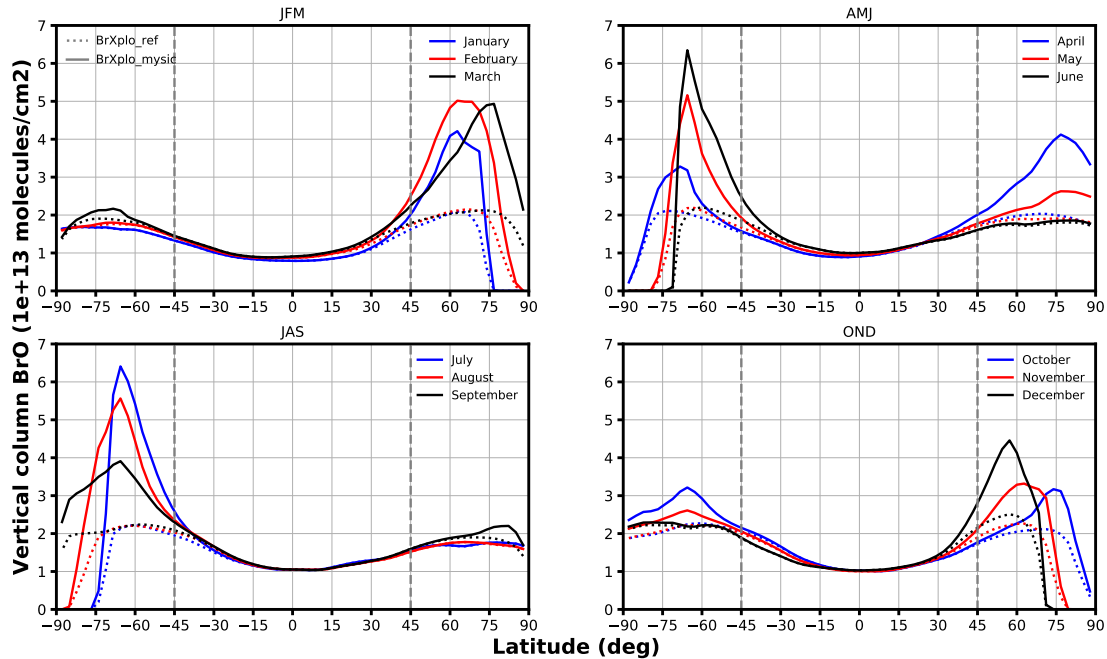
```
&CTRL
! #####
! ### GAS
5 ! #####
<list of gas emissions>
EMIS_TYPE(9) = 'AirSnow'
! #####
! ### AEROSOL
10 ! #####
<list of aerosol emissions>
/
&CPL_IMPORT
<list of import fields>
15 ! ### AirSnow #####
! Dry deposition fluxes
imp_ddepflux_HOBR = 'ddep_gp', 'ddepflux_HOBr'
imp_ddepflux_BrNO3 = 'ddep_gp', 'ddepflux_BrNO3'
imp_ddepflux_HBr = 'ddep_gp', 'ddepflux_HBr'
20 imp_ddepflux_O3 = 'ddep_gp', 'ddepflux_O3'
! Multi-year sea ice fraction
imp_sic_multi_year = 'import_grid', 'airsnow_mysic'
/
&CPL
25 L_LG = F ! EMISSIONS FOR LAGRANGIAN TRACERS
<list of flux to tracer conversion>
! ...Br2 and BrCl from airsnow
F2T(13) = 'snow_air_flux_br2', 'Br2:M=2,SC=1.0', 'Br2:M=2,SC=1.0',
F2T(14) = 'snow_air_flux_brcl', 'BrCl:M=2,SC=1.0', 'BrCl:M=2,SC=1.0',
30 /
&CTRL_AirSnow
! Default values according to Toyota et al. 2011 parametrization
r_crit_temp = -15 ! Critical temperature [deg celsius]
r_sun_theta_crit = 85 ! Critical sun zenith angle [deg]
35 ! Efficiency of bromine release due to ozone deposit ('dark','sunlit','land')
r_trigger_1 = 0.001_dp, 0.075_dp, 0.0_dp
/
```

S.4 BrO total vertical column density zonal mean

S.4.1 GOME

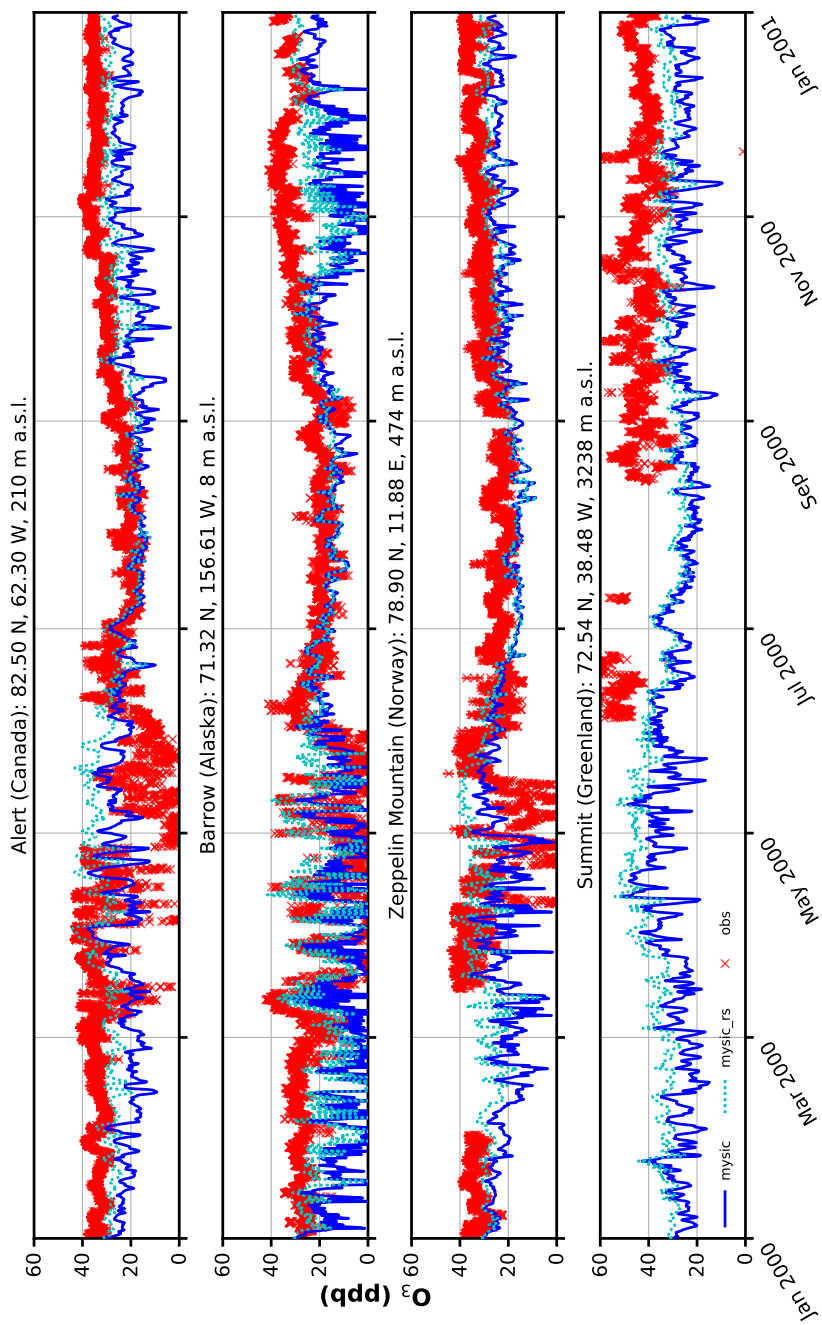


S.4.2 EMAC (BrXplo_mysic)

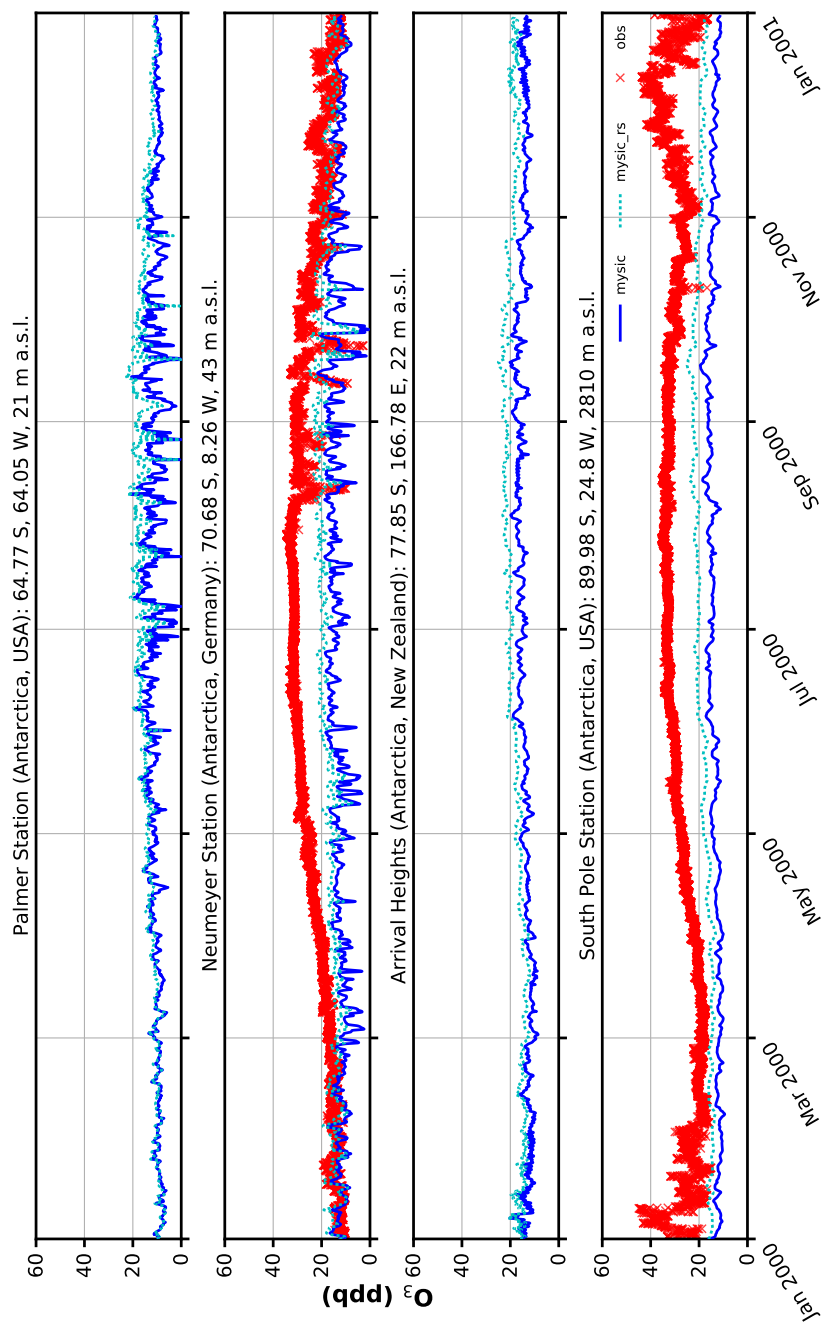


S.5 Sensitivity study with increased surface resistance of O₃

S.5.1 Northern hemisphere

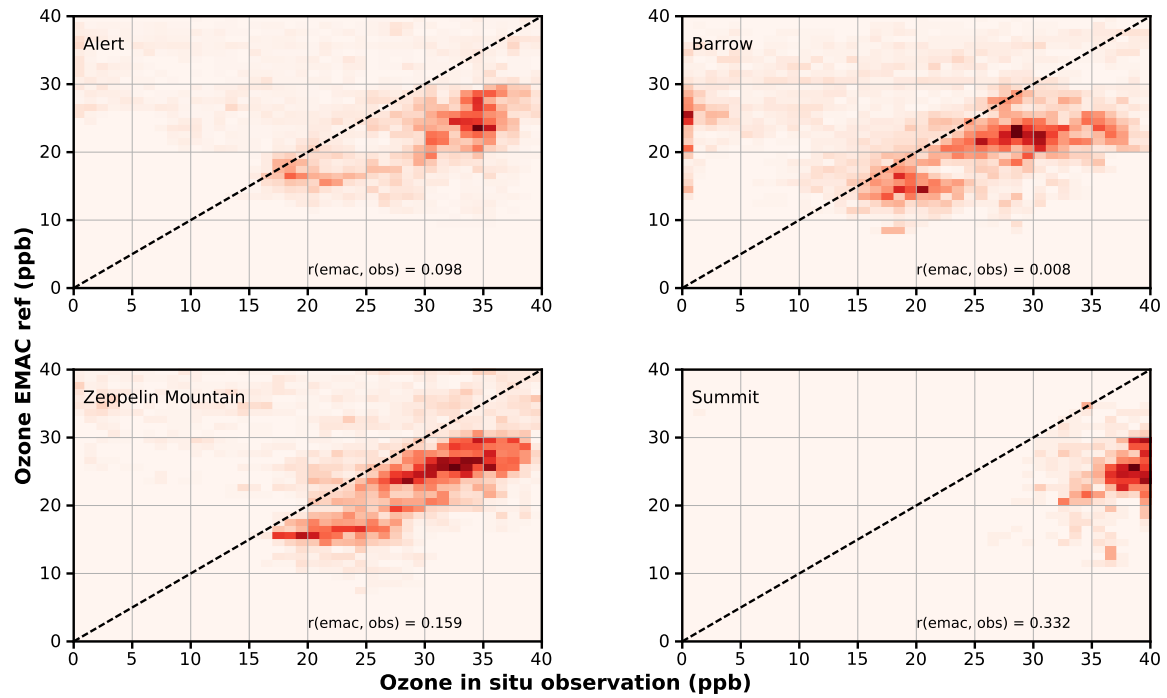


S.5.2 Southern hemisphere

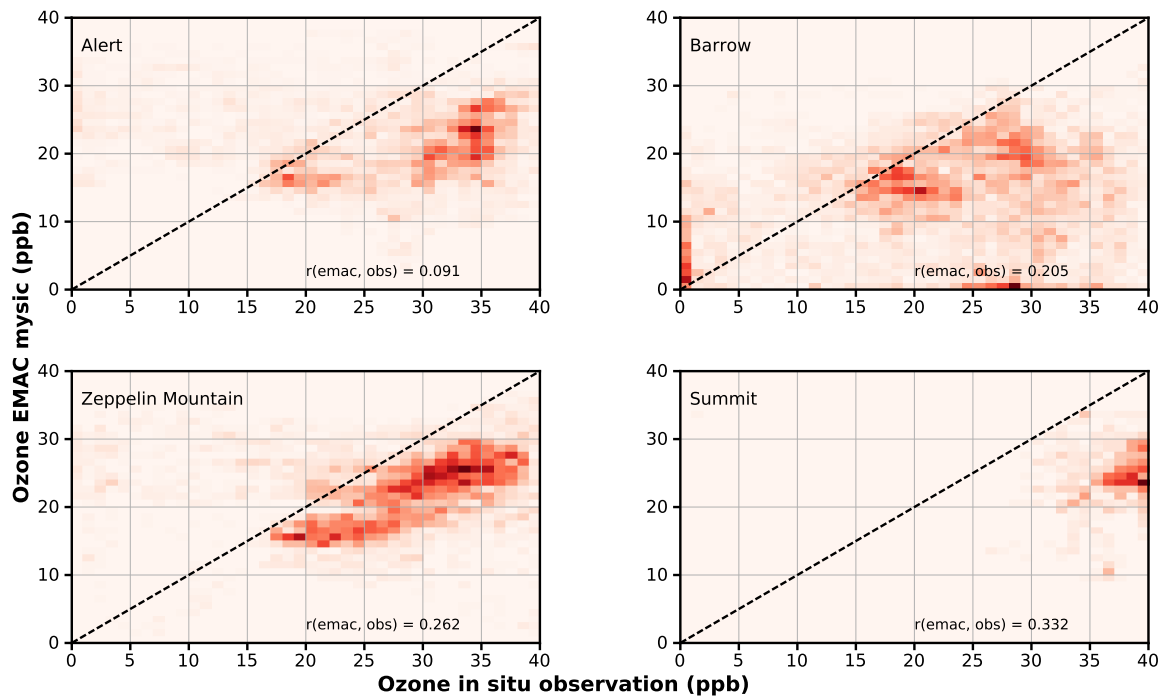


S.6 Temporal correlation of modeled surface O₃ with observation

S.6.1 EMAC (BrXplo_ref)



S.6.2 EMAC (BrXplo_mysic)



S.6.3 EMAC with increased surface resistance

