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*Supplement of*

## **Ocean mediation of tropospheric response to reflecting and absorbing aerosols**

**Y. Xu and S.-P. Xie**

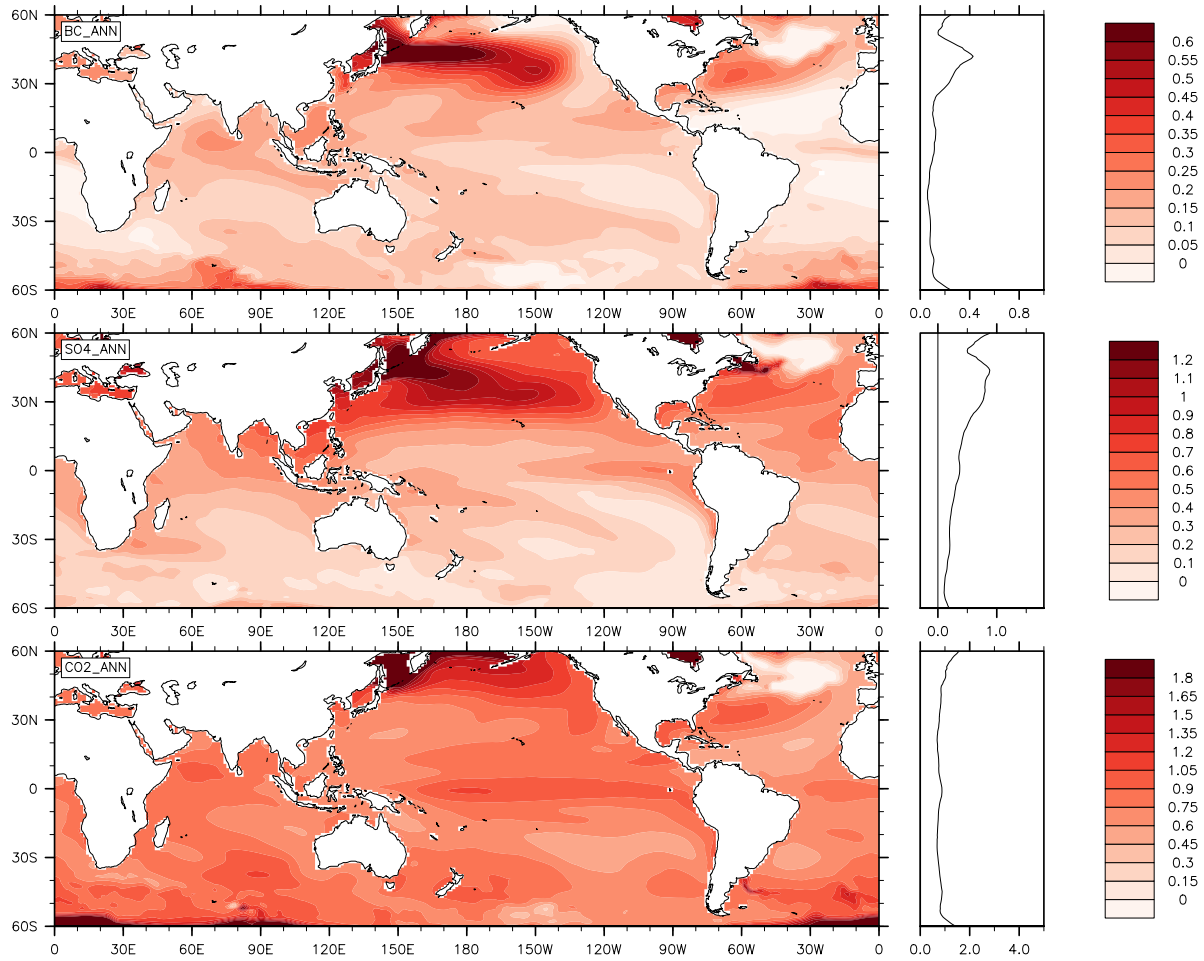
*Correspondence to:* Y. Xu (yangyang@ucar.edu)

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10 Table S1. (a) TOA forcing ( $\text{W}/\text{m}^2$ , shortwave and longwave) due to BC (direct radiative forcing  
 11 from pre-industrial to present-day; not including snow albedo effect), SO<sub>4</sub> (direct and indirect  
 12 forcing from pre-industrial to present-day, so called “adjusted forcing”) and CO<sub>2</sub> (from pre-  
 13 industrial to present-day at 400 ppm). The radiative forcing is diagnosed by contrasting two sets  
 14 of five-year atmospheric-only simulations with pre-industrial and present-day  
 15 emissions/concentrations, respectively. (b) Surface temperature change ( $^{\circ}\text{C}$ ) in response to  
 16 different forcings in (a). These are calculated from the 60-year average of coupled model  
 17 simulation. (c) Cumulative precipitation (cm) change in response to different forcings in (a). The  
 18 relative changes in percentage are shown in parenthesis next to the absolute changes.  
 19

	BC	SO <sub>4</sub>	CO <sub>2</sub>
(a) TOA net forcing ( $\text{W}/\text{m}^2$ )	0.5	-0.9	1.7
(b) Surface temperature change ( $^{\circ}\text{C}$ )	0.21	-0.49	1.15
(c) Cumulative precipitation (cm)	-0.01 (0%)	-2.09 (-2%)	1.73 (2%)

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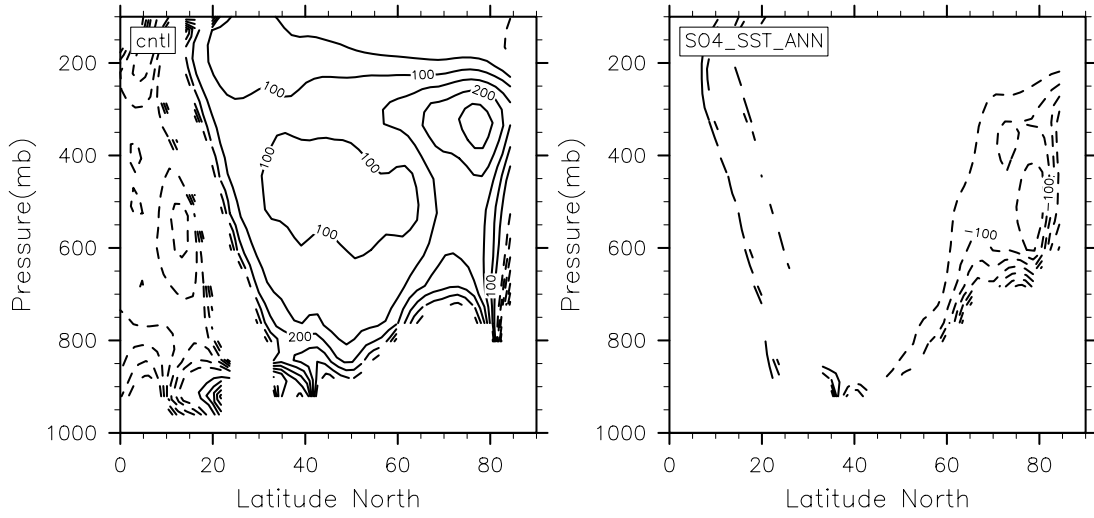
22 Fig. S1: Sea Surface temperature change (°C) change in response to BC, SO4 and CO2 forcings.

23 These are calculated from the 60-year average of coupled model simulation. Color scale for SO4

24 is reversed.

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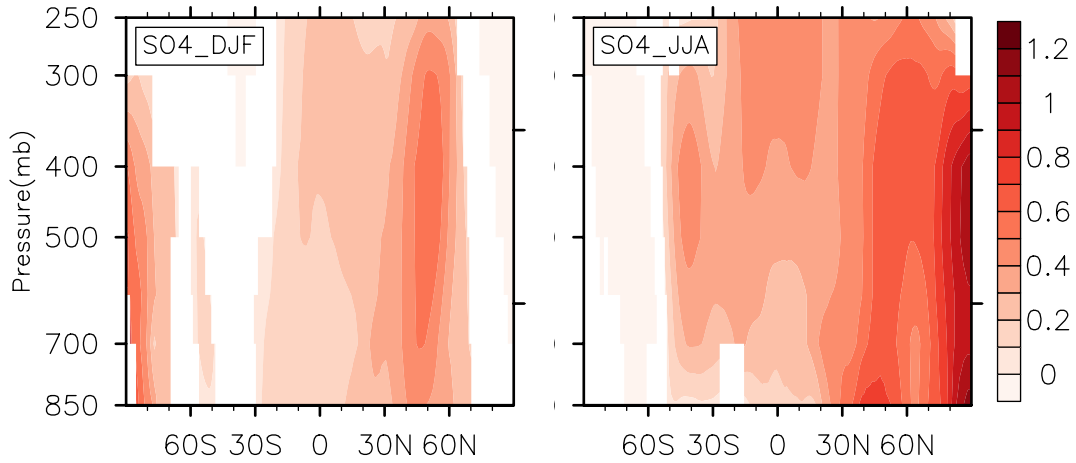
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29 Fig. S2: Refractive index in the climatology (left panel) and its change due to SO4-induced SST  
30 perturbation (right panel). The contour plot is limited to 0–400, following Figure 8 of  
31 Limpasuvan and Hartmann (2000), to highlight the contours in the mid-latitude regions where  
32 the wave activities are strongest.

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38 Fig. S3: Similar to the 2nd row of Figure 1, but showing the trend of temperature changes  
39 ( $^{\circ}\text{C}/\text{decade}$ ) during 1940-1970 in the 20<sup>th</sup> century transient climate simulation using the same  
40 model (CESM1) with time-evolving aerosol-only forcing. During this period,  $\text{SO}_2$  emissions  
41 rapidly increased. Color scale is reversed to be consistent with Fig. 1. GHG forcing is fixed in  
42 this simulation. An ensemble of three simulations was conducted.

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