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Supplement of

Ocean mediation of tropospheric response to reflecting and absorbing aerosols

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Table S1. (a) TOA forcing (W/m$^2$, shortwave and longwave) due to BC (direct radiative forcing from pre-industrial to present-day; not including snow albedo effect), SO4 (direct and indirect forcing from pre-industrial to present-day, so called “adjusted forcing”) and CO2 (from pre-industrial to present-day at 400 ppm). The radiative forcing is diagnosed by contrasting two sets of five-year atmospheric-only simulations with pre-industrial and present-day emissions/concentrations, respectively. (b) Surface temperature change (°C) in response to different forcings in (a). These are calculated from the 60-year average of coupled model simulation. (c) Cumulative precipitation (cm) change in response to different forcings in (a). The relative changes in percentage are shown in parenthesis next to the absolute changes.

<table>
<thead>
<tr>
<th></th>
<th>BC</th>
<th>SO4</th>
<th>CO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) TOA net forcing (W/m$^2$)</td>
<td>0.5</td>
<td>-0.9</td>
<td>1.7</td>
</tr>
<tr>
<td>(b) Surface temperature change (°C)</td>
<td>0.21</td>
<td>-0.49</td>
<td>1.15</td>
</tr>
<tr>
<td>(c) Cumulative precipitation (cm)</td>
<td>-0.01 (0%)</td>
<td>-2.09 (-2%)</td>
<td>1.73 (2%)</td>
</tr>
</tbody>
</table>
Fig. S1: Sea Surface temperature change (°C) change in response to BC, SO4 and CO2 forcings. These are calculated from the 60-year average of coupled model simulation. Color scale for SO4 is reversed.
Fig. S2: Refractive index in the climatology (left panel) and its change due to SO4-induced SST perturbation (right panel). The contour plot is limited to 0–400, following Figure 8 of Limpasuvan and Hartmann (2000), to highlight the contours in the mid-latitude regions where the wave activities are strongest.
Fig. S3: Similar to the 2nd row of Figure 1, but showing the trend of temperature changes (°C/decade) during 1940-1970 in the 20th century transient climate simulation using the same model (CESM1) with time-evolving aerosol-only forcing. During this period, SO$_2$ emissions rapidly increased. Color scale is reversed to be consistent with Fig. 1. GHG forcing is fixed in this simulation. An ensemble of three simulations was conducted.