Supplement of

An updated aerosol simulation in the Community Earth System Model (v2.1.3): dust and marine aerosol emissions and secondary organic aerosol formation

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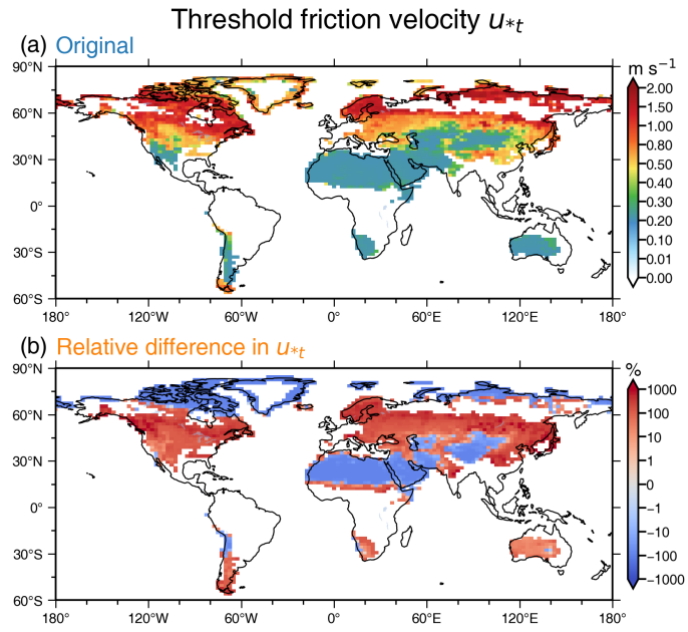
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Supplementary figures
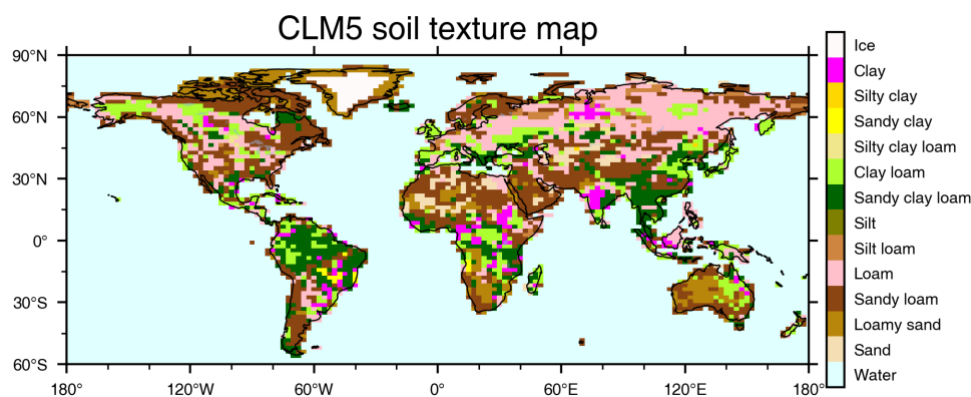
Figure S1. Soil texture map according to the USDA classification derived from CLM-provided clay and sand content of the underlying soil.

Figure S2. Threshold friction velocity in the original scheme and the relative difference between the revised and original scheme.
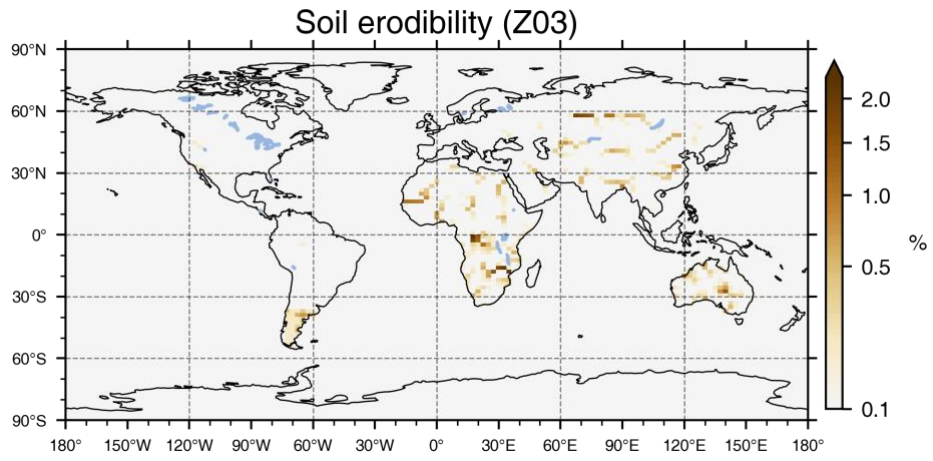
Figure S3. The erodibility factor S (also known as source function) from CESM2-CAM6 default dust scheme.
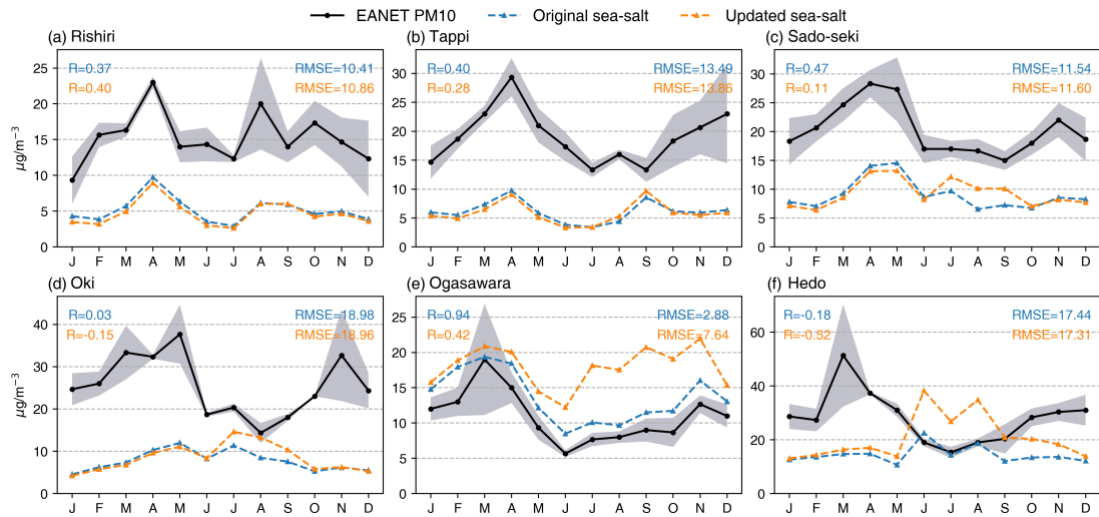
Figure S4. Seasonal cycle of monthly mean simulated sea-salt aerosol concentrations (coloured lines) and EANET PM10 concentrations (black lines) at selected stations. The locations of the stations are indicated in Fig.3. The blue and yellow lines represent the simulations from the original and revised schemes, respectively. The RMSE and Kendall's correlation coefficient (R) are noted in corresponding colored font for each simulation. The shading on the observations illustrates the standard deviation of the monthly mean concentration over the months with sufficient data.
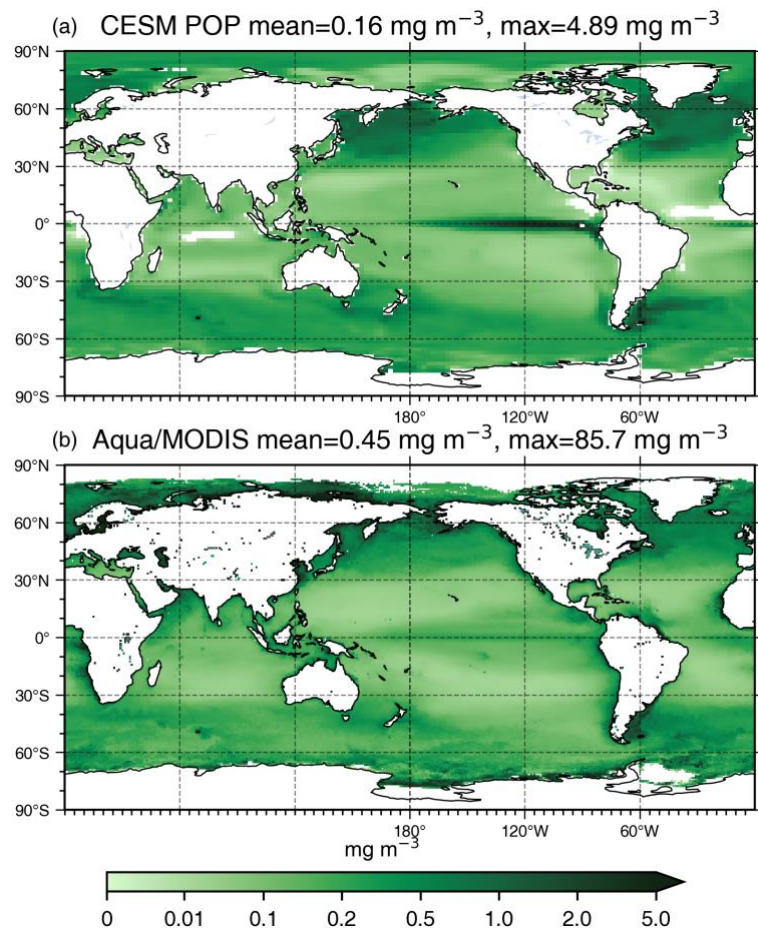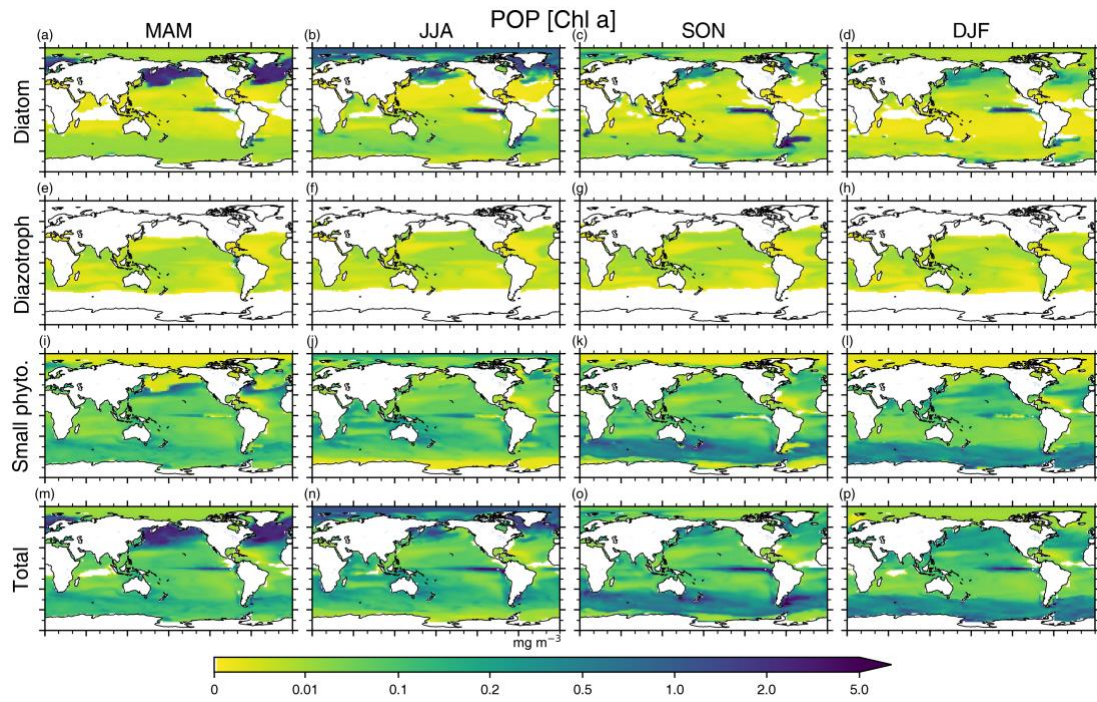
Figure S5. Annual mean sea surface [Chl *a*] from CESM POP model results **(a)** and MODIS/Aqua satellite products **(b)**.

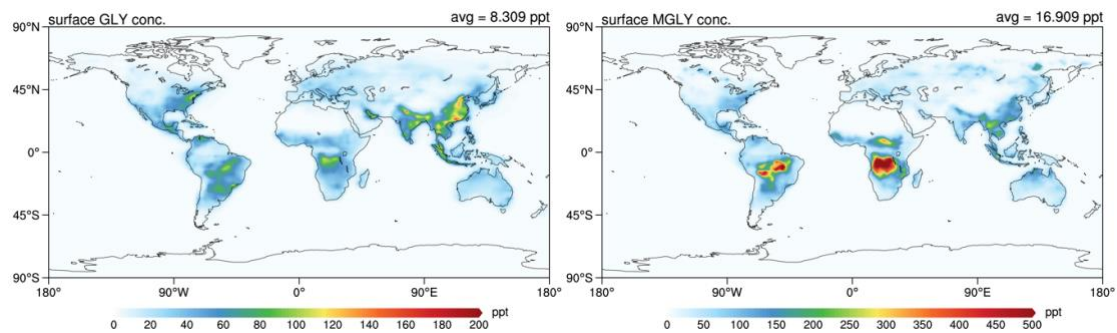Total mode (d=0.02-10 μm) sea-salt emission flux, g m^{-2}year^{-1}
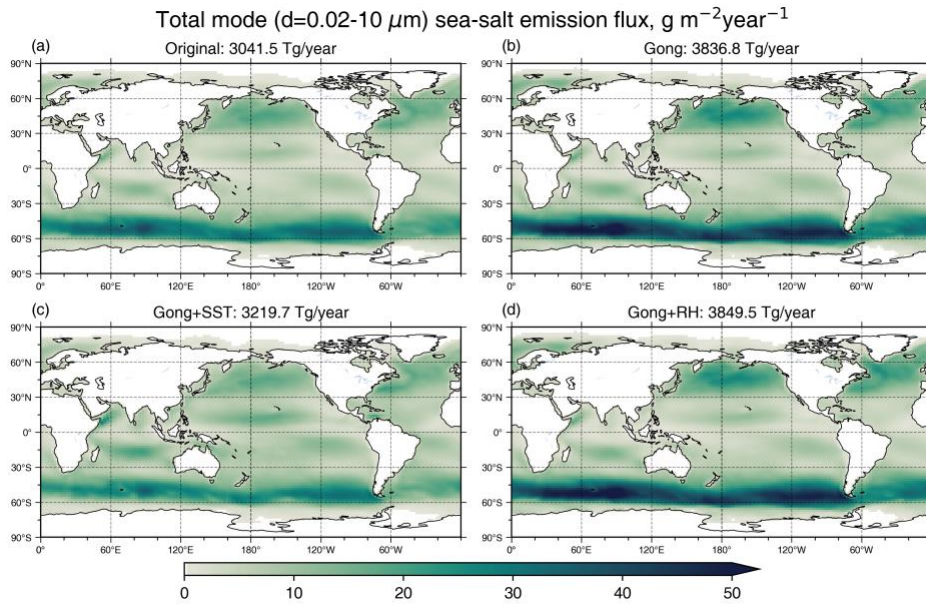
Figure S6. Annual mean sea-salt emissions of all the modes from sensitivity simulations. The global total emissions are also given at the top of each subplot.
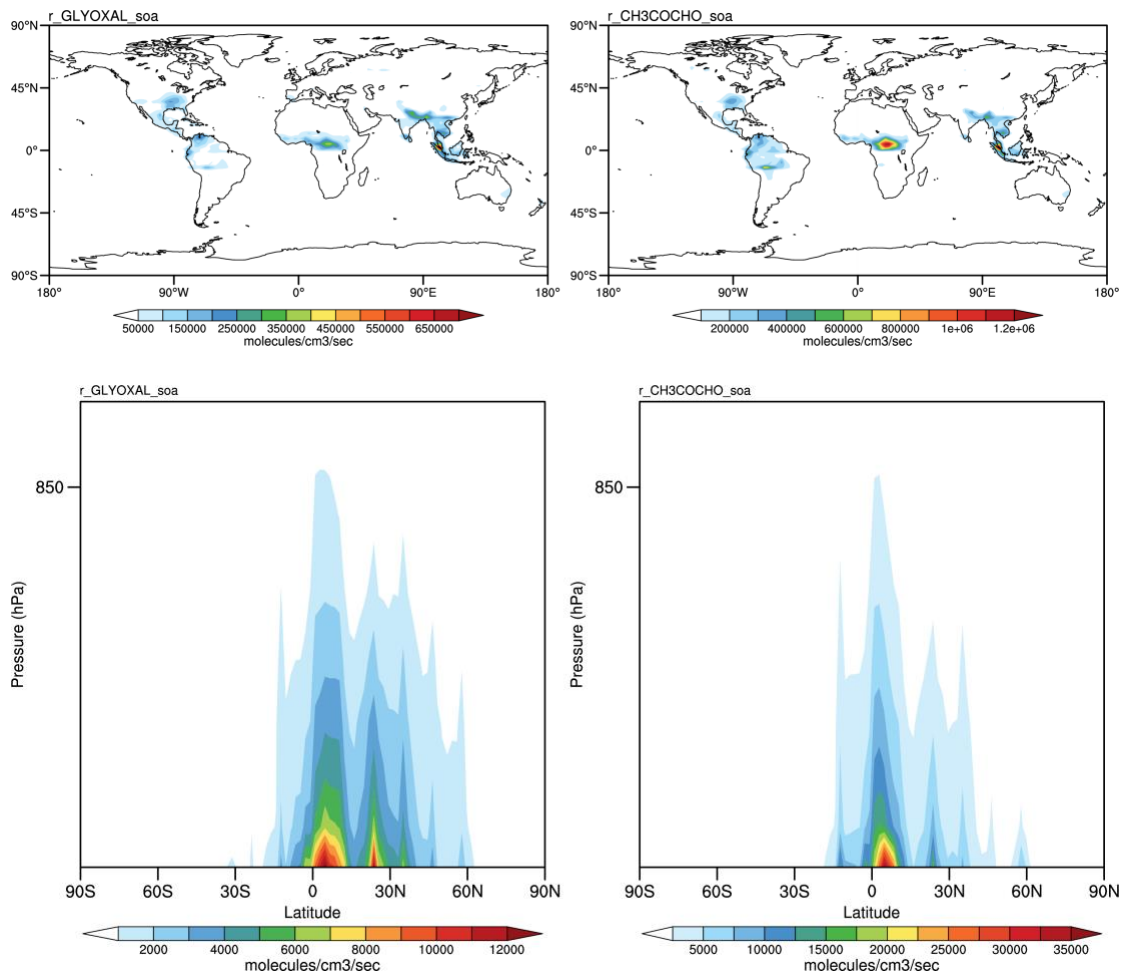
Figure S7. Seasonal mean [Chl *a*] concentrations in ocean surface from POP model results.

Figure S8. Annual mean surface concentrations of glyoxal (left) and methylglyoxal (right) in the revised scheme for the period from 2010 to 2012.

Figure S9. Vertical integral and zonal mean of glyoxal (left) and methylglyoxal (right) uptake rates simulated in revised scheme.