Direct radiative effect of dust-pollution interactions
Supplement

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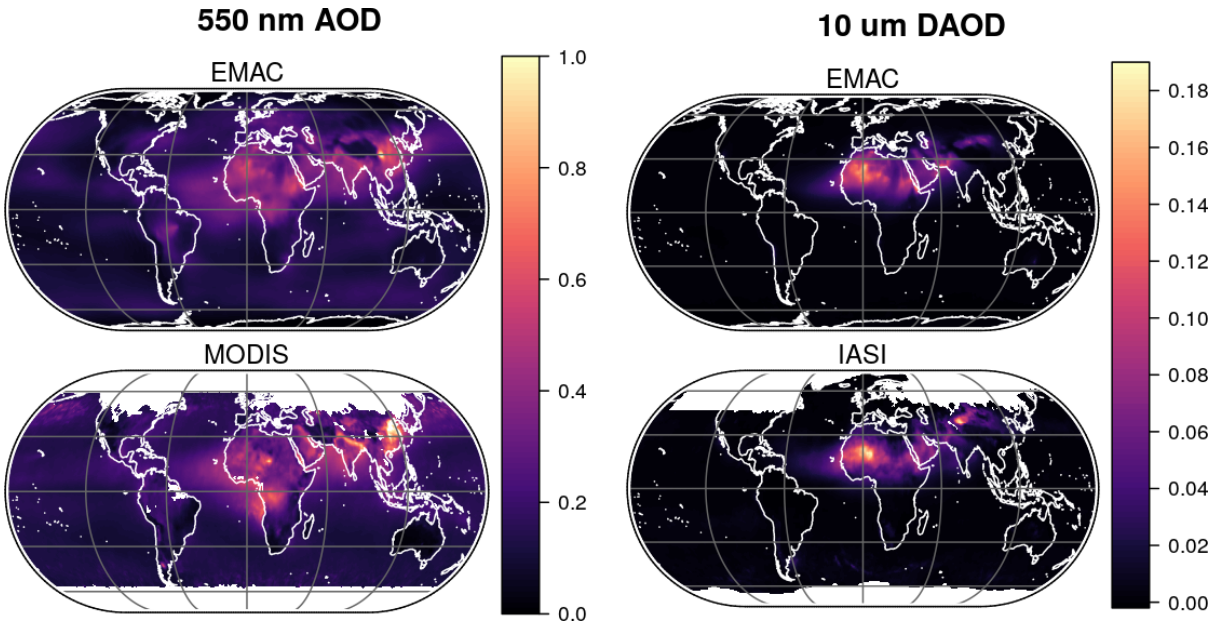

Figure S1: The EMAC setup yields realistic results for the AOD at visible wavelength (550 nm, left) and in the infrared (10 μm, right, dust related AOD only). The top row shows the model results, the bottom row satellite observations by MODIS (left) and IASI (right).

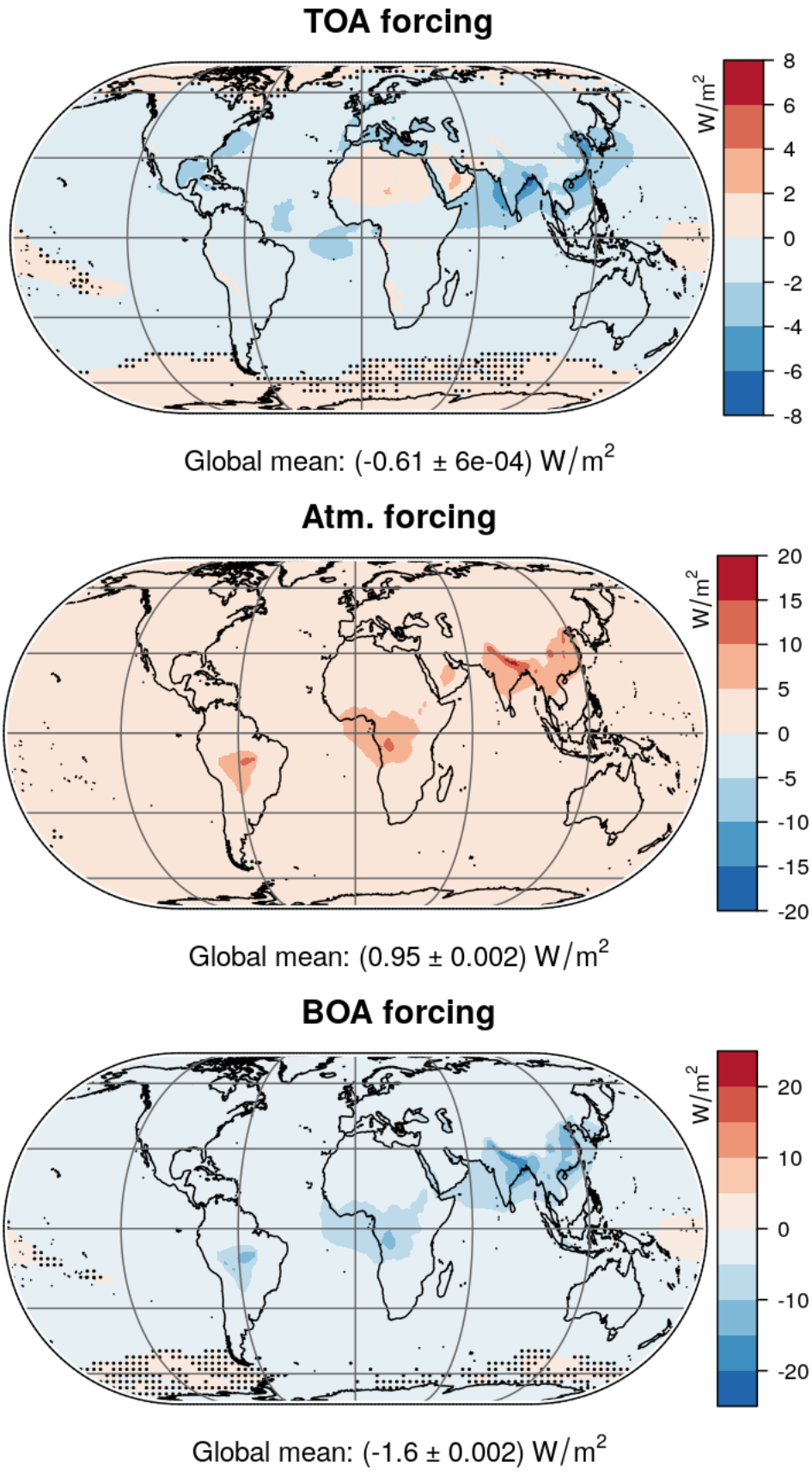

Figure S2: The total (solar and terrestrial) direct radiative forcing of anthropogenic aerosol in the dust free scenario at the top of the atmosphere (TOA, top), within the atmosphere (centre) and at the bottom of the atmosphere (BOA, bottom). Dots indicate regions where the forcing is insignificant.

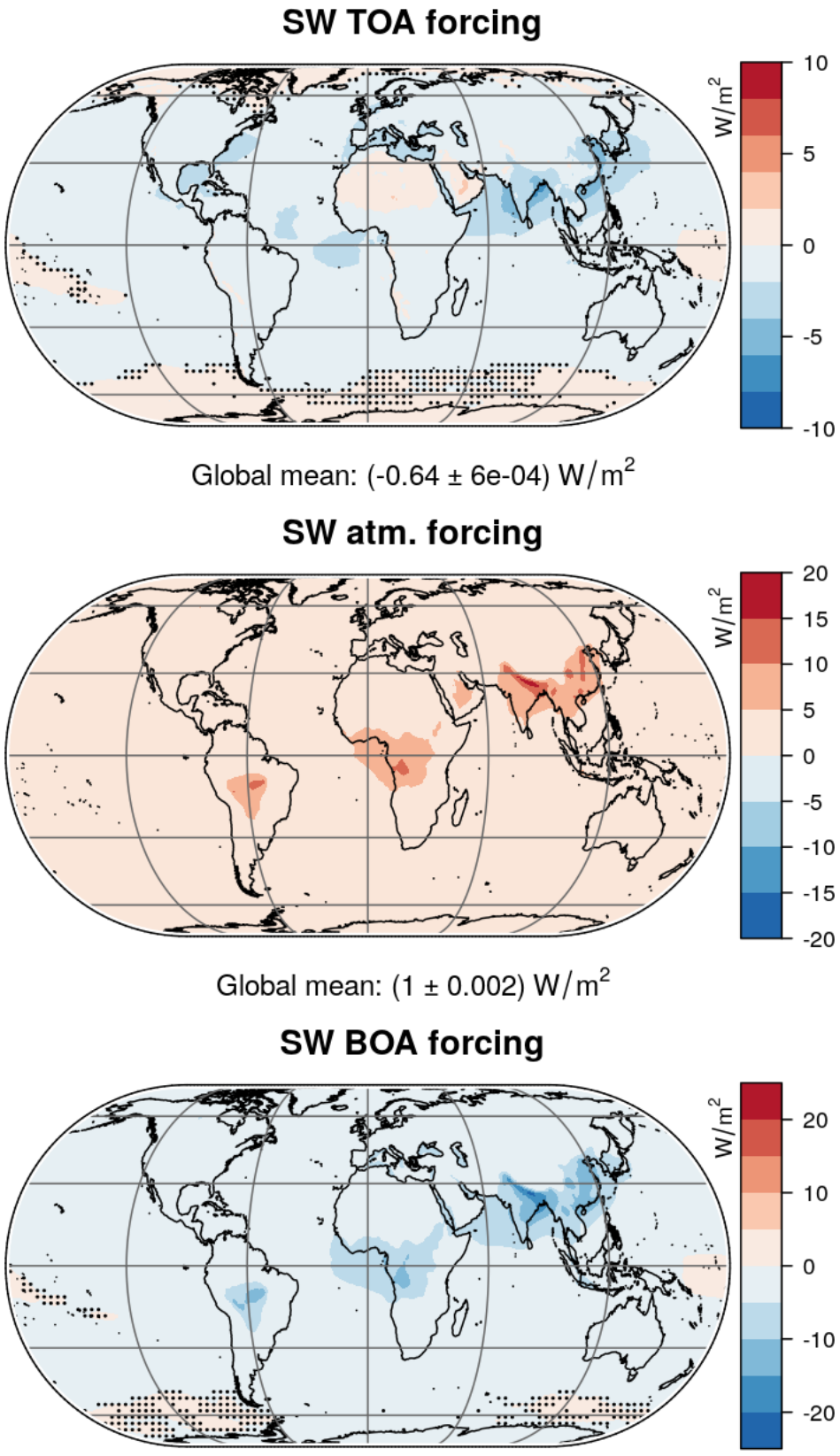

Figure S3: Same as Fig. S2, but only considering solar (shortwave, SW) radiation.

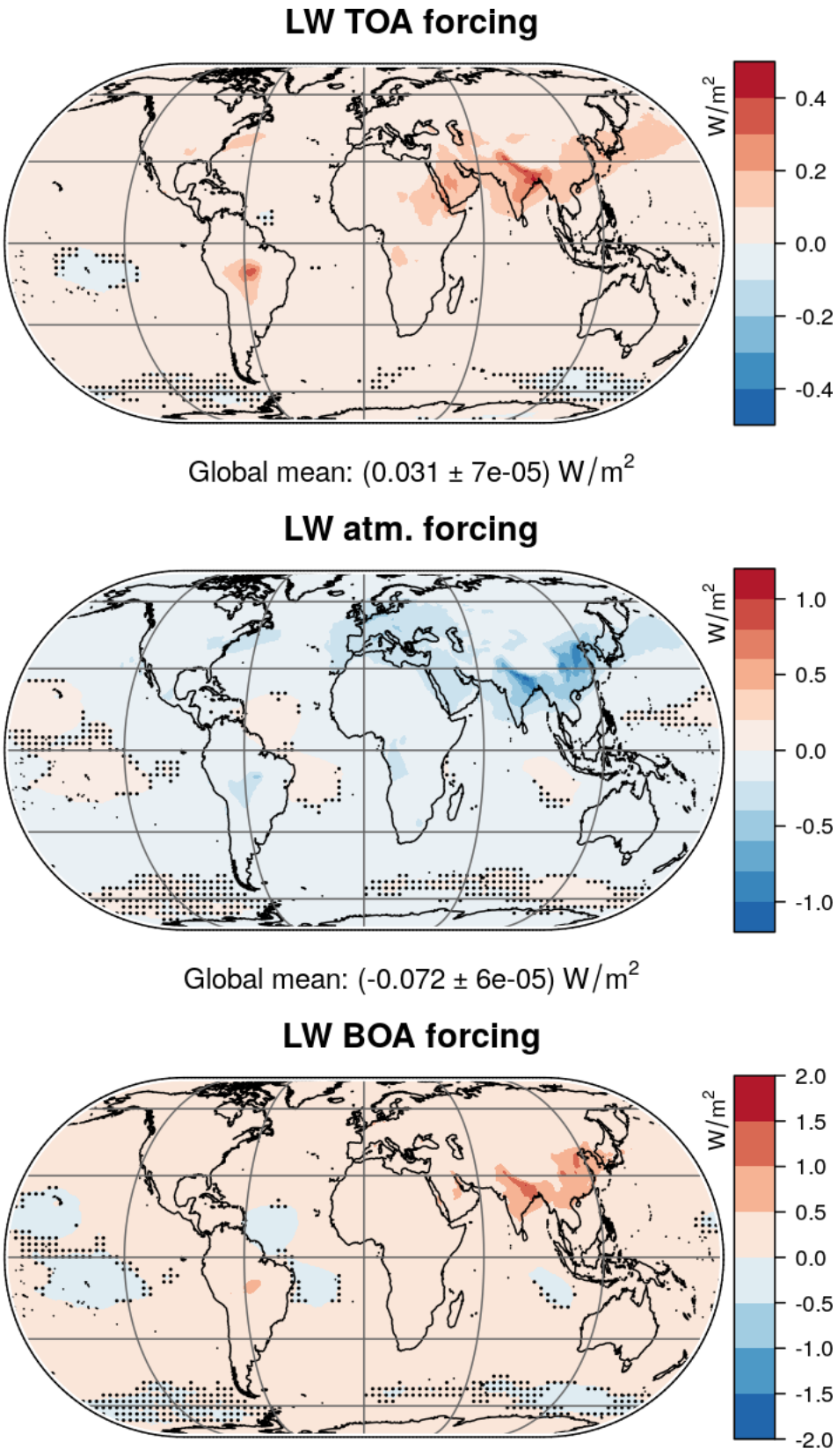

Figure S4: Same as Fig. S2, but only considering terrestrial (longwave, LW) radiation.

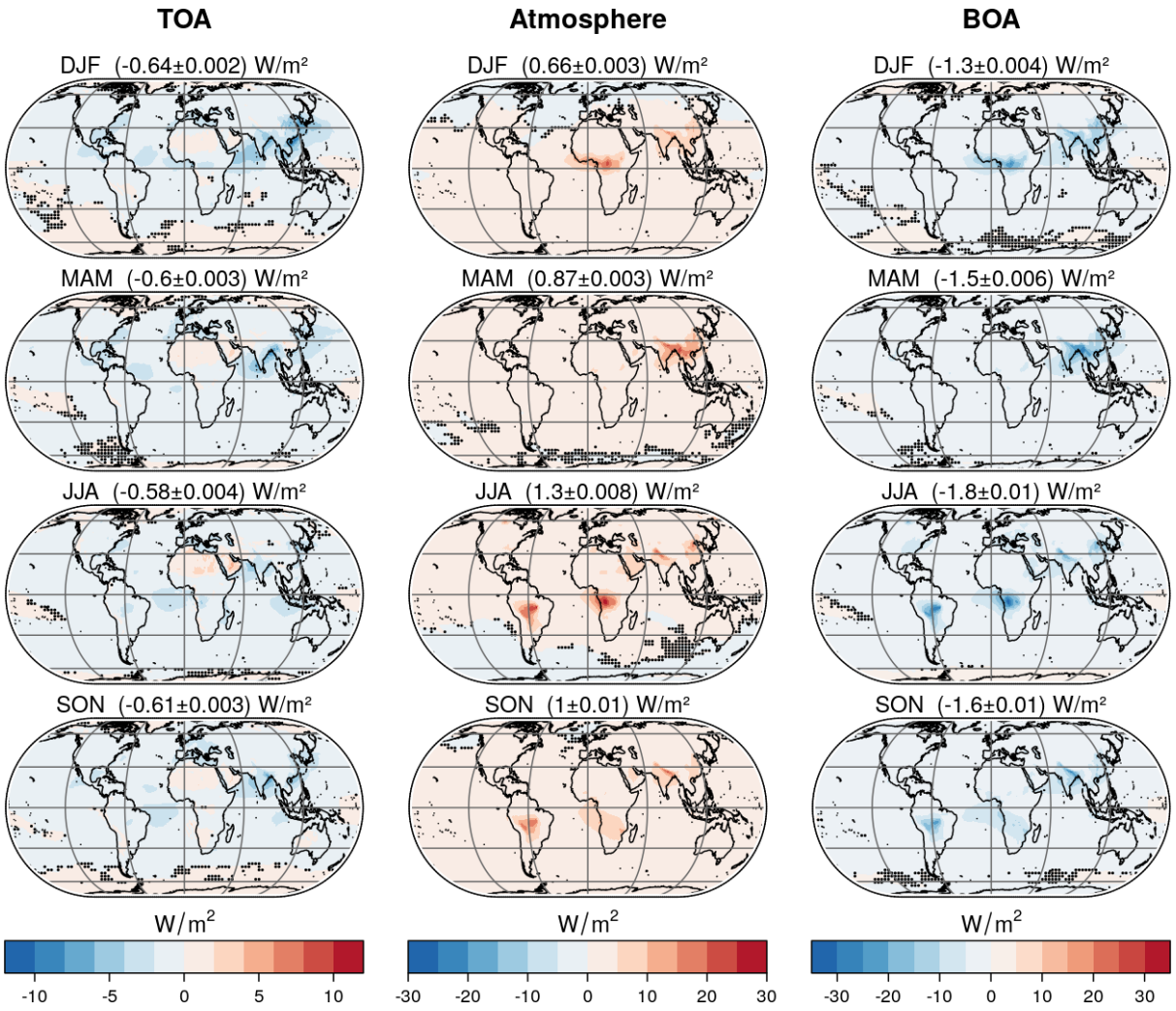

Figure S5: Same as Fig. S2, but for each season (December, January, February (DJF); March, April, May (MAM); June, July, August (JJA); September, October, November (SON)) individually.

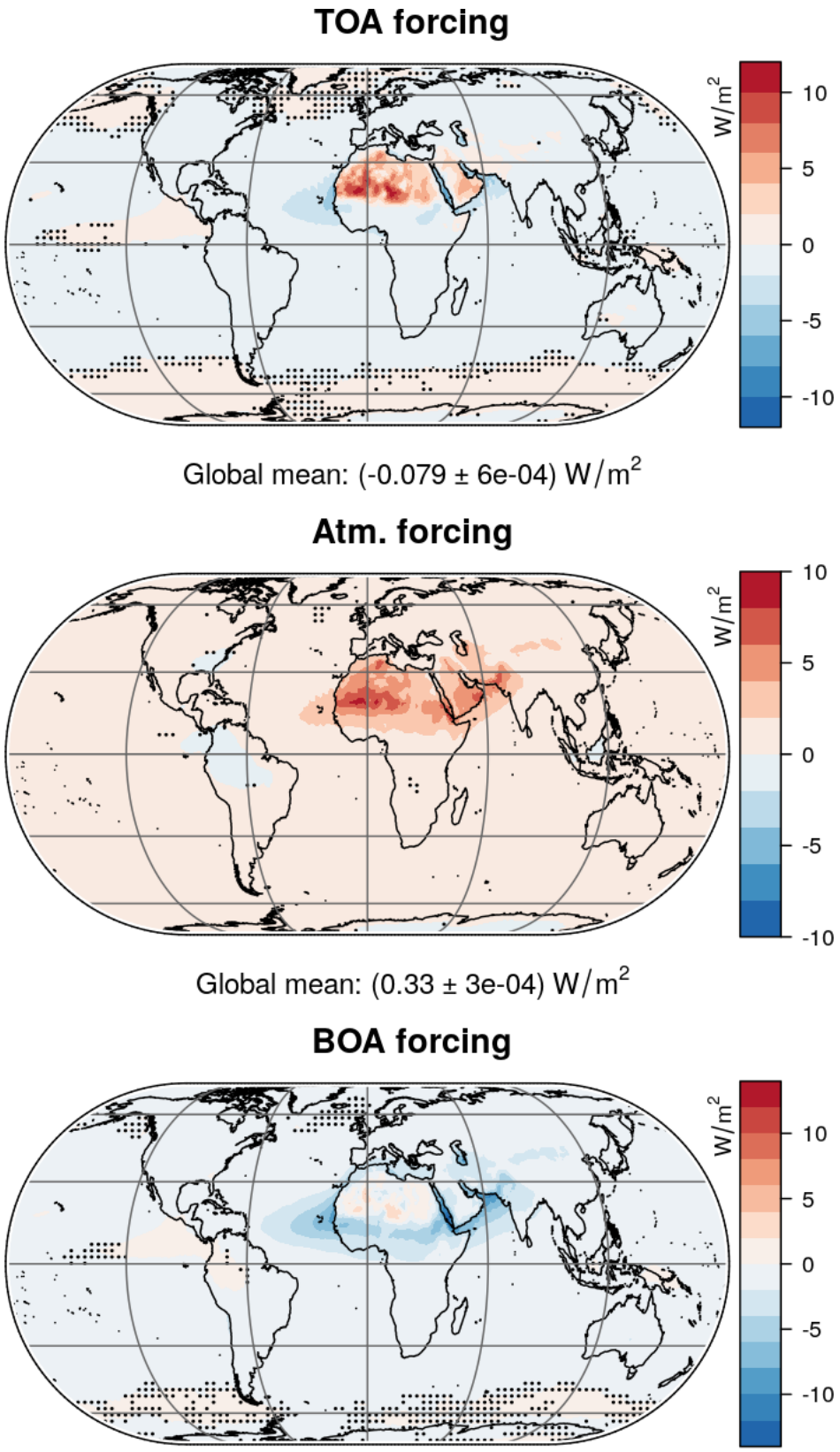

Figure S6: The total (solar and terrestrial) direct radiative forcing of mineral dust in the natural scenario at the top of the atmosphere (TOA, top), within the atmosphere (centre) and at the bottom of the atmosphere (BOA, bottom). Dots indicate regions where the forcing is insignificant.

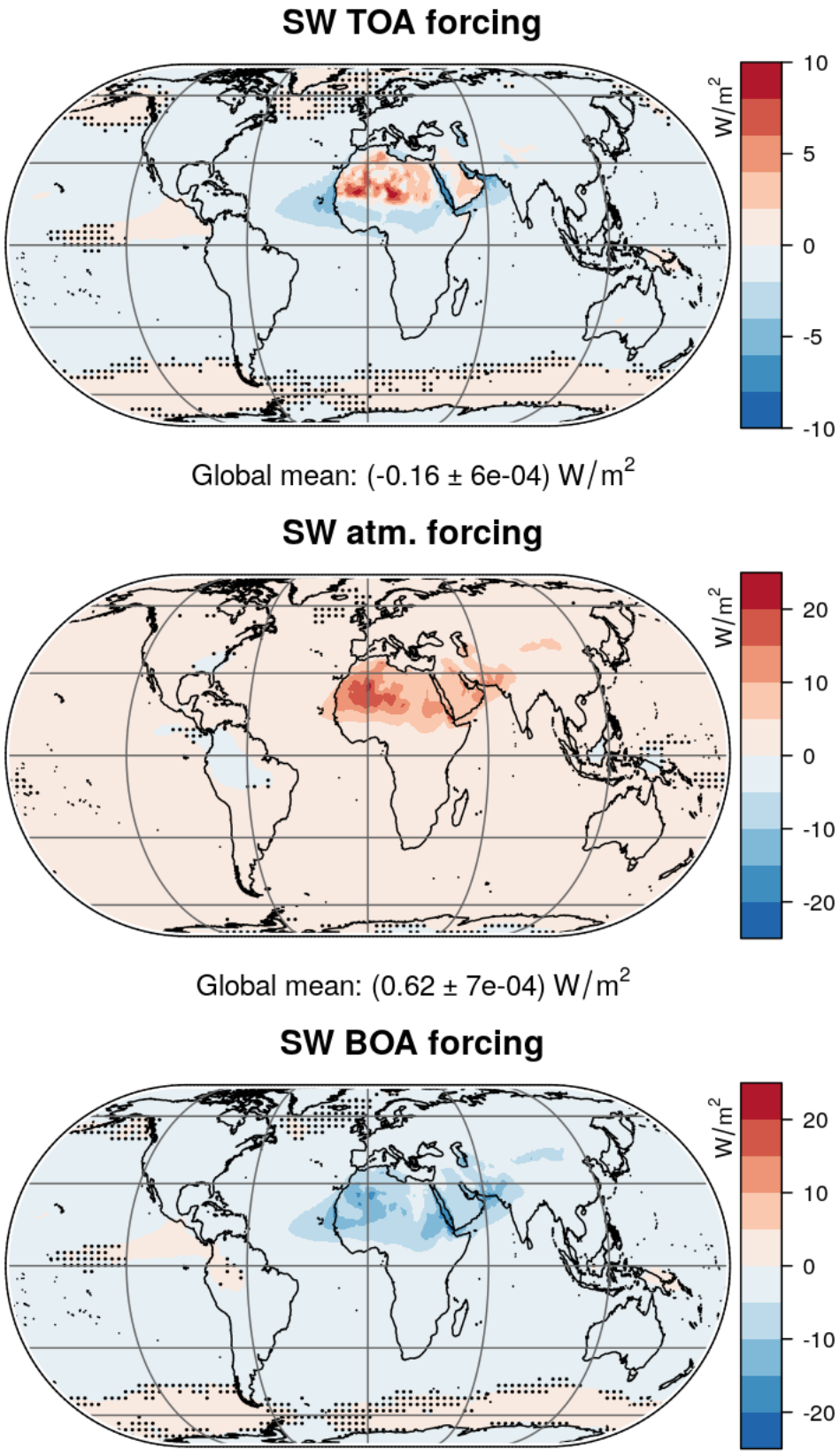

Figure S7: Same as Fig. S6, but only considering solar (shortwave, SW) radiation.

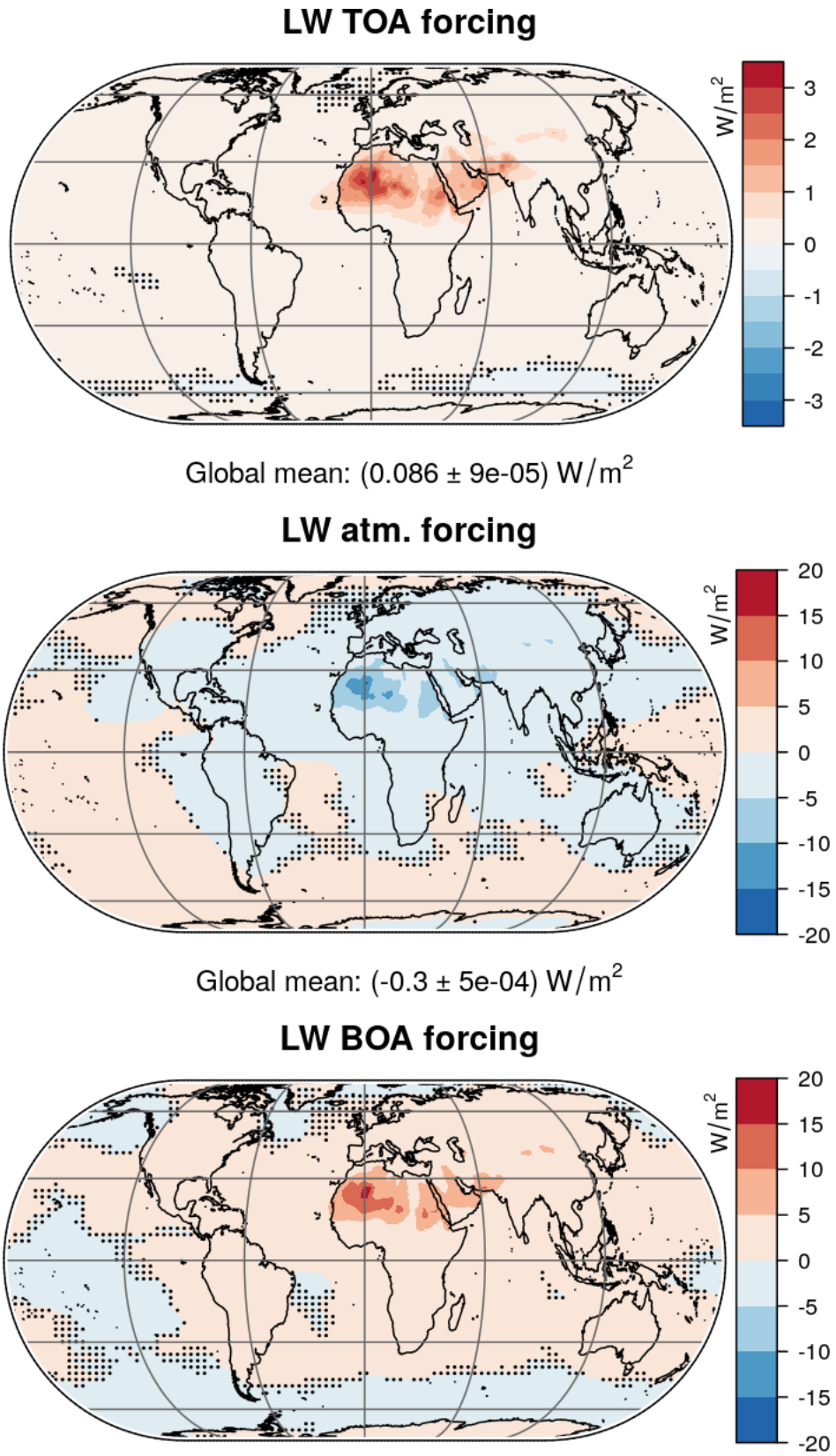

Figure S8: Same as Fig. S6, but only considering terrestrial (longwave, LW) radiation.

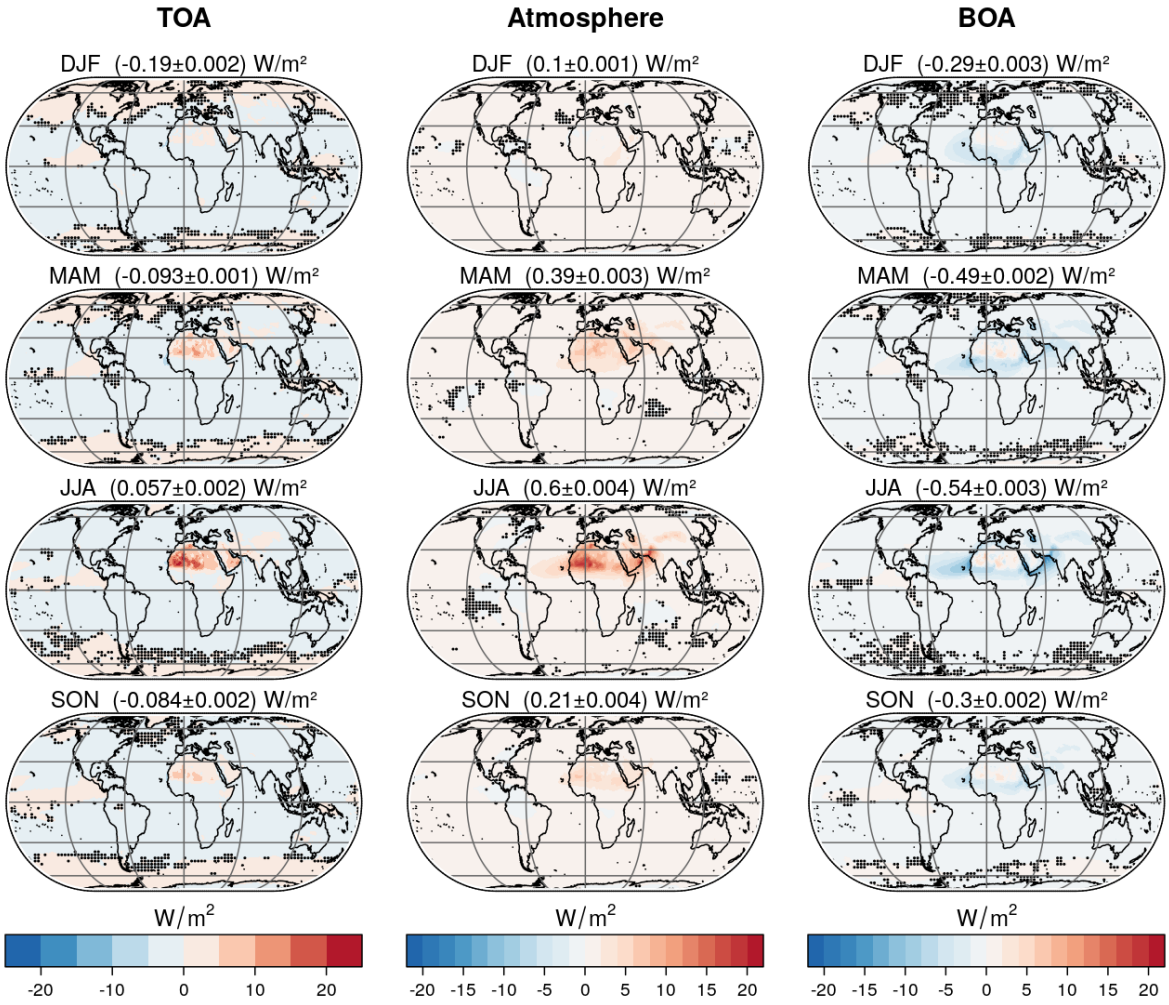

Figure S9: Same as Fig. S6, but for each season (December, January, February (DJF); March, April, May (MAM); June, July, August (JJA); September, October, November (SON)) individually.

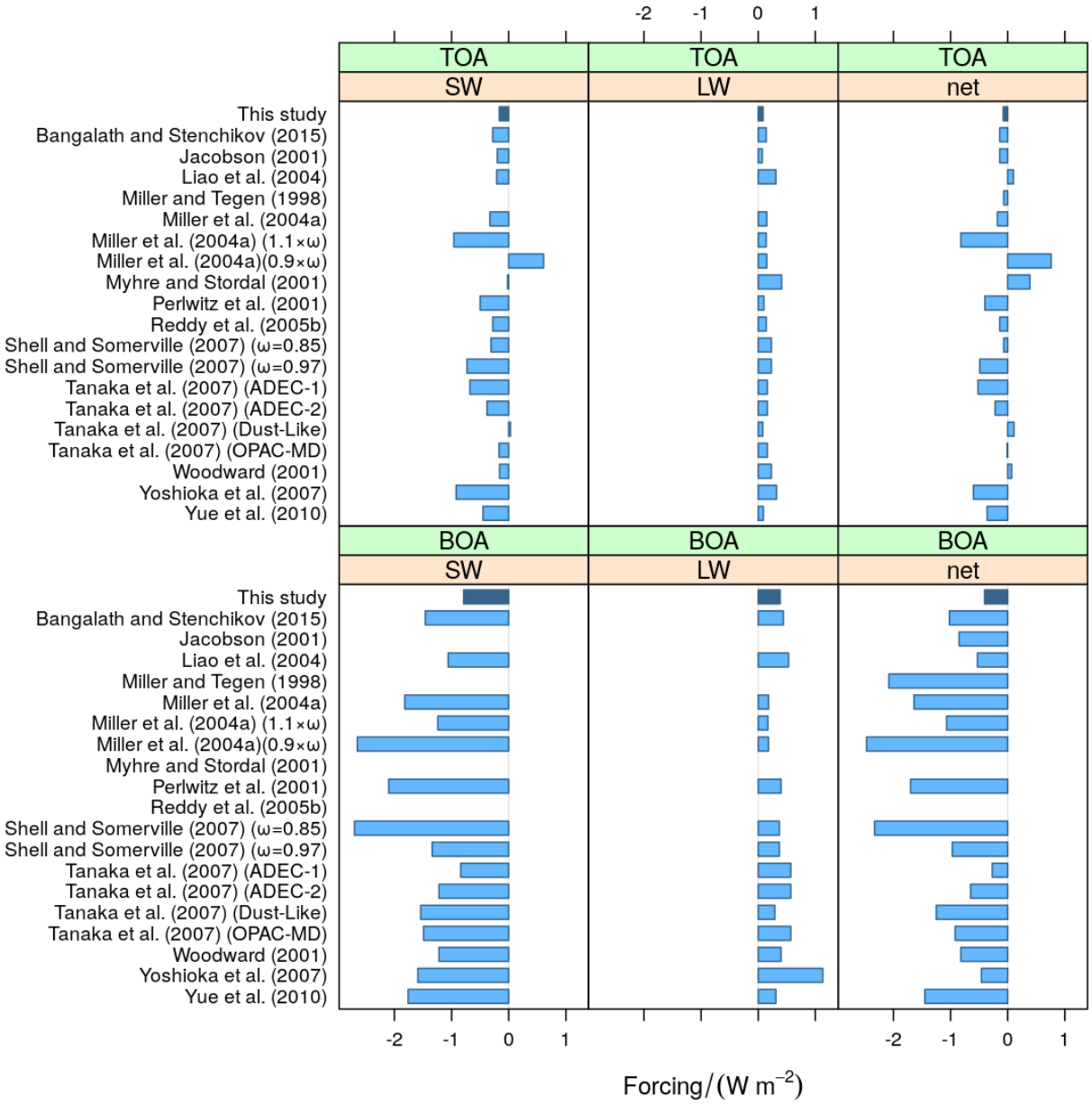

Figure S10: Global direct radiative forcing by dust in the EMAC simulations of the present study in comparison to results of previous studies (Yue et al. 2010, Table 1).

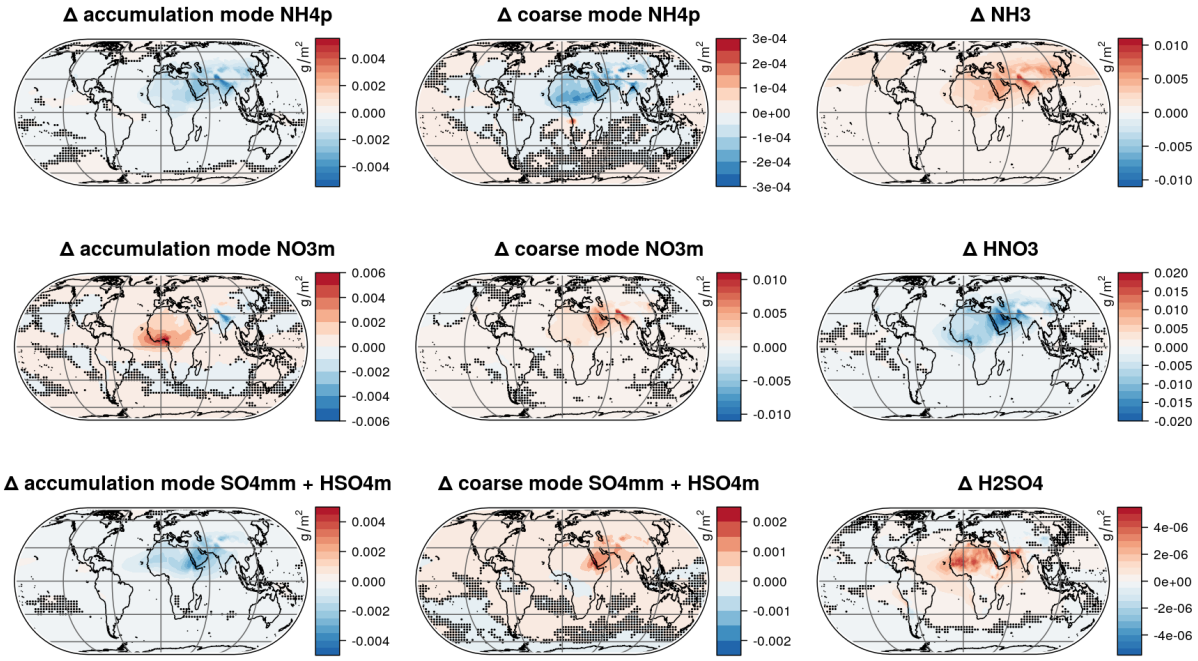

Figure S11: Effect of the dust-pollution interaction on the burdens of the main aerosol ions (left column: accumulation mode, centre column: coarse mode) and the corresponding precurser gases (right column).

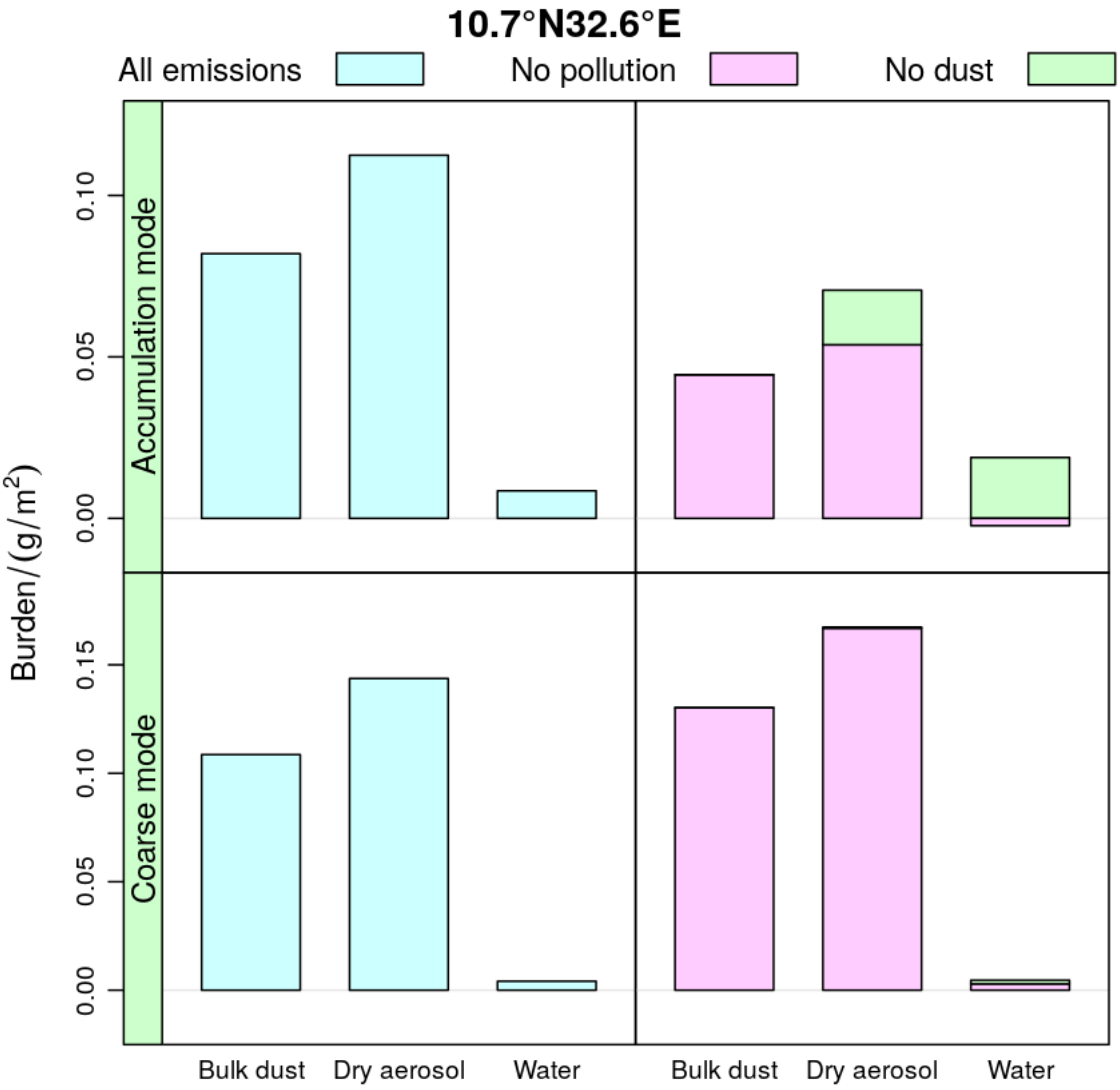

Figure S12: Annual mean aerosol mass burdens over the northern part of South Sudan, where the interaction of dust and pollution yields the strongest accumulation mode burden increase. Burdens from simulation 1 with all emissions, simulation 2 without dust emissions and simulation 3 without anthropgenic pollution are shown after subtracting the burdens from simulation 4 without dust and pollution. Dry aerosol, aerosol water and bulk dust (also included in dry aerosol) burdens of accumulation mode (top) and coarse mode (bottom) are shown separately.

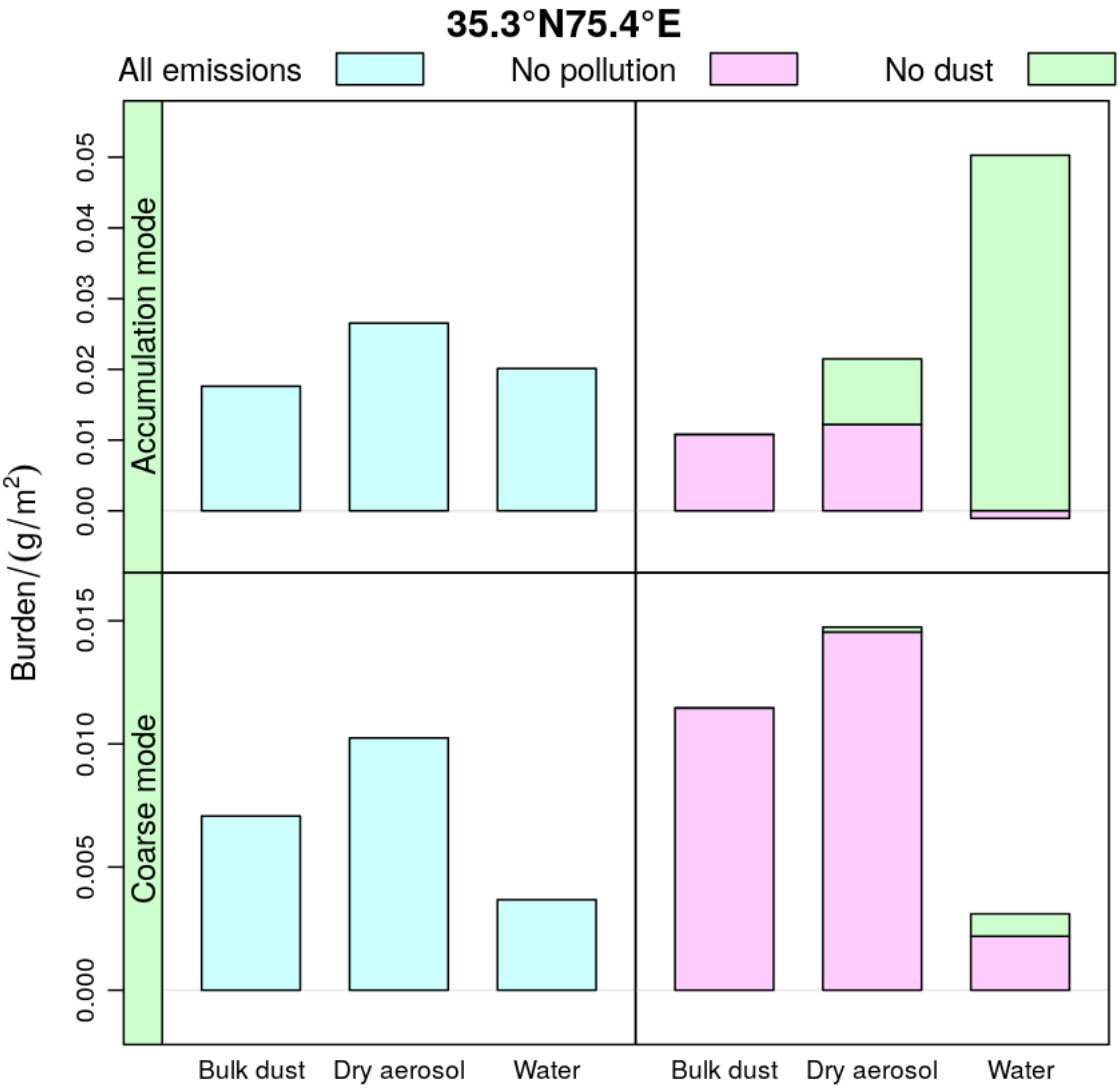

Figure S13: Annual mean aerosol mass burdens over the north of Pakistan, where the interaction of dust and pollution yields the strongest accumulation mode burden decrease. Burdens from simulation 1 with all emissions, simulation 2 without dust emissions and simulation 3 without anthropgenic pollution are shown after subtracting the burdens from simulation 4 without dust and pollution. Dry aerosol, aerosol water and bulk dust (also included in dry aerosol) burdens of accumulation mode (top) and coarse mode (bottom) are shown separately.

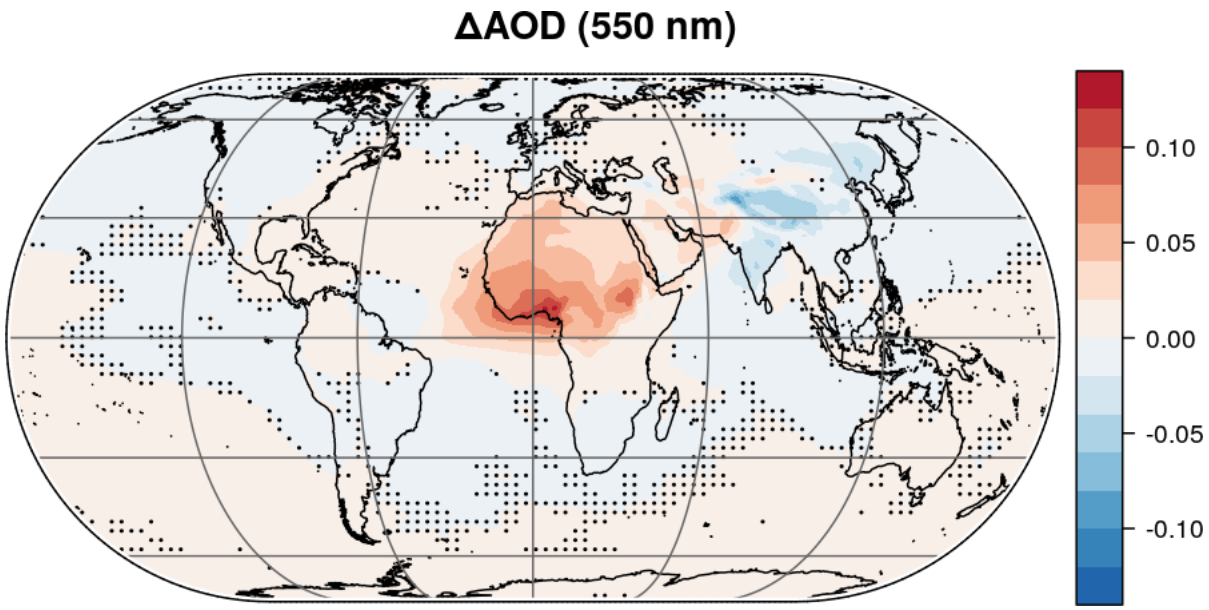

Figure S14: Same as Fig. 2 (top) but at 550 nm wavelength.

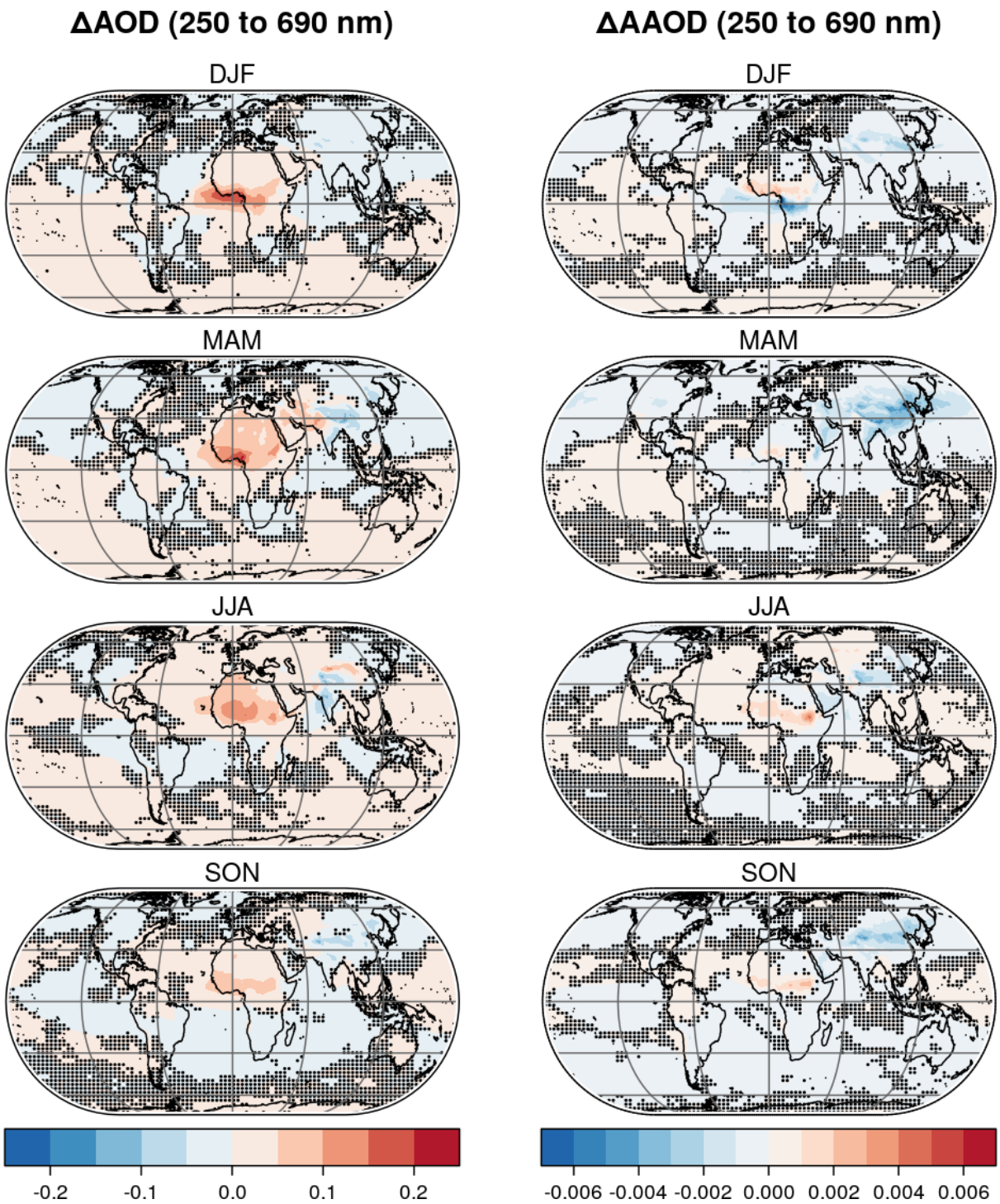

Figure S15: Same as Fig. 2, but for each season (December, January, February (DJF); March, April, May (MAM); June, July, August (JJA); September, October, November (SON)) individually.

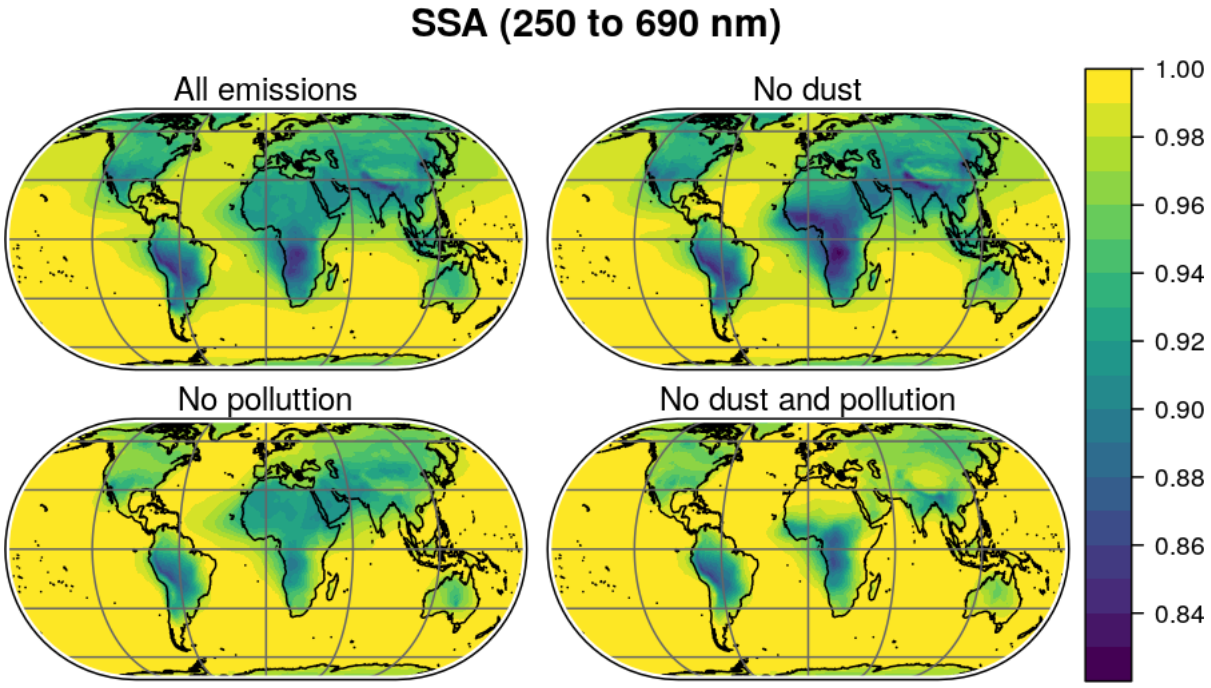

Figure S16: Annual mean of the extinction weighted single scattering albedo (SSA) for the different emission setups.

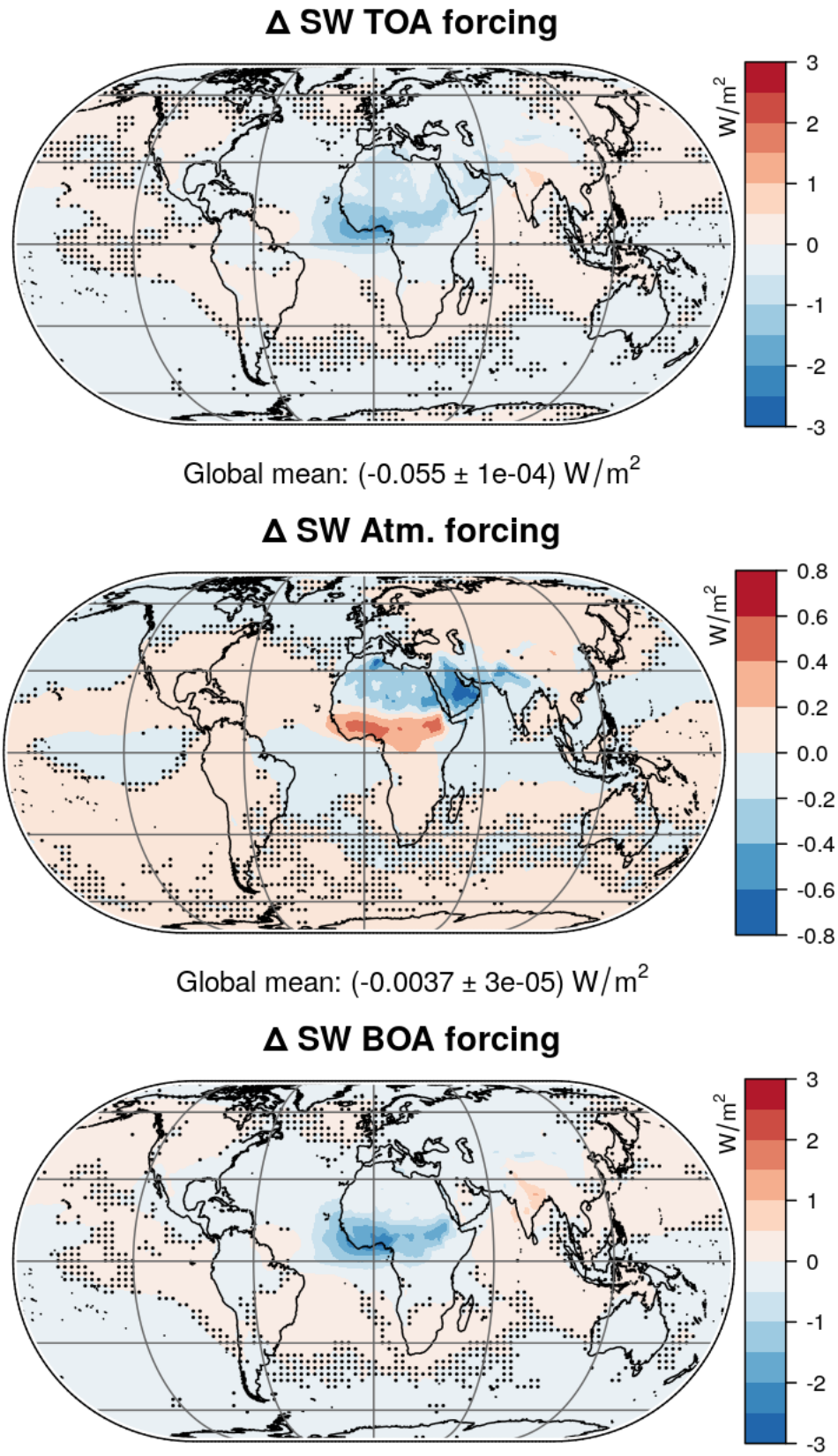

Figure S17: Same as Fig. 4, but only considering solar (shortwave, SW) radiation.

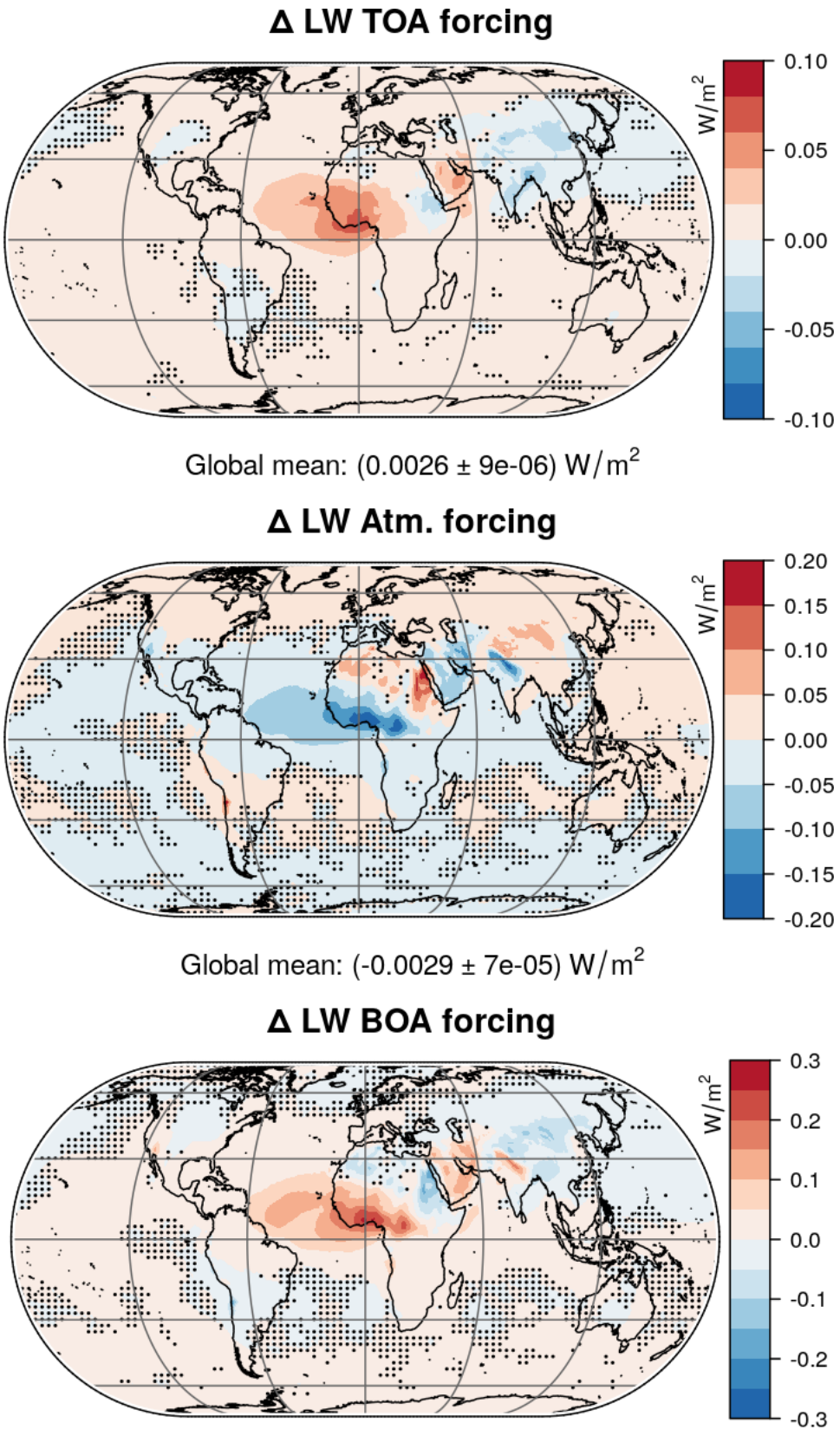

Figure S18: Same as Fig. 4, but only considering terrestrial (longwave, LW) radiation.

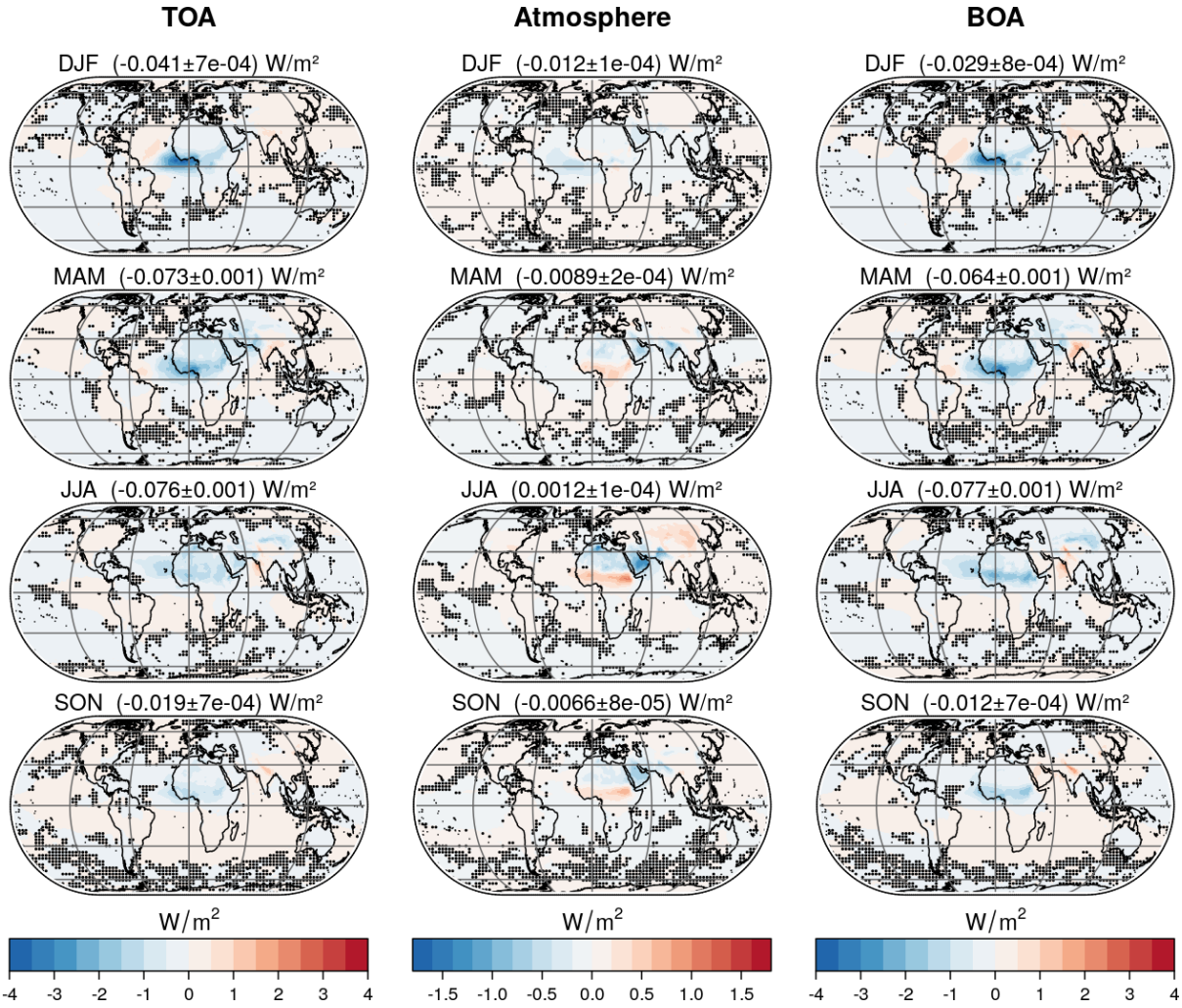

Figure S19: Same as Fig. 4, but for each season (December, January, February (DJF); March, April, May (MAM); June, July, August (JJA); September, October, November (SON)) individually.

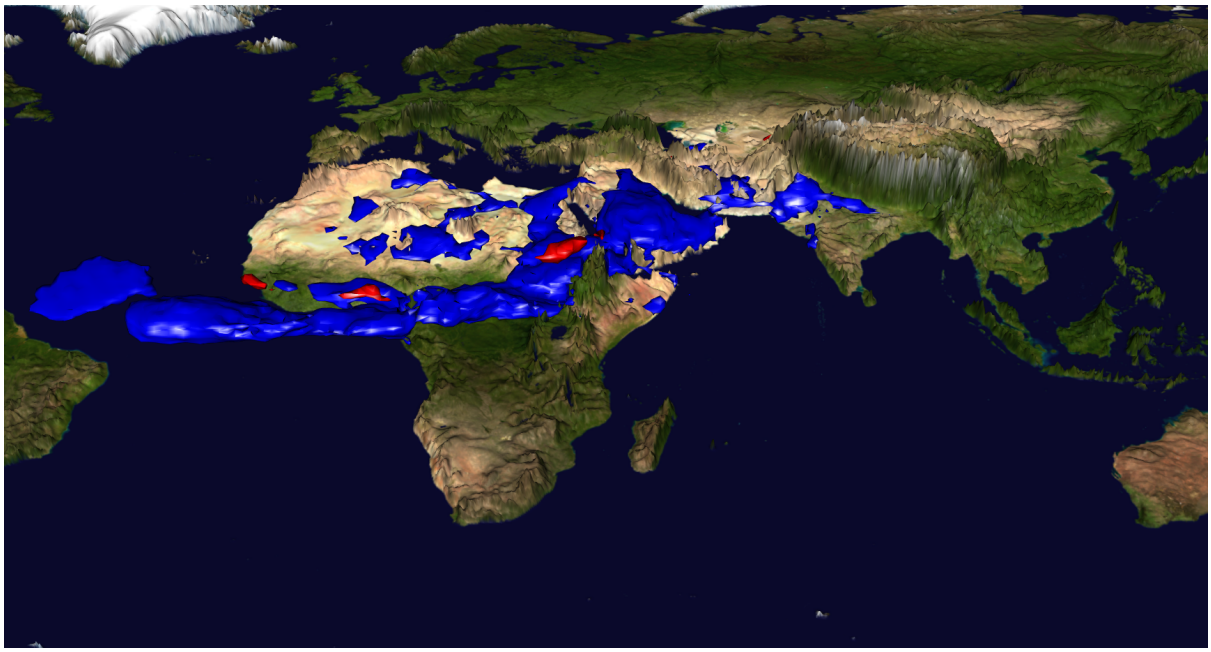

Figure S20: Atmospheric cooling (blue, below -0.01 K / day) and heating (red, above 0.01 K / day) by dust-pollution interaction during **Winter** (December, January, February)

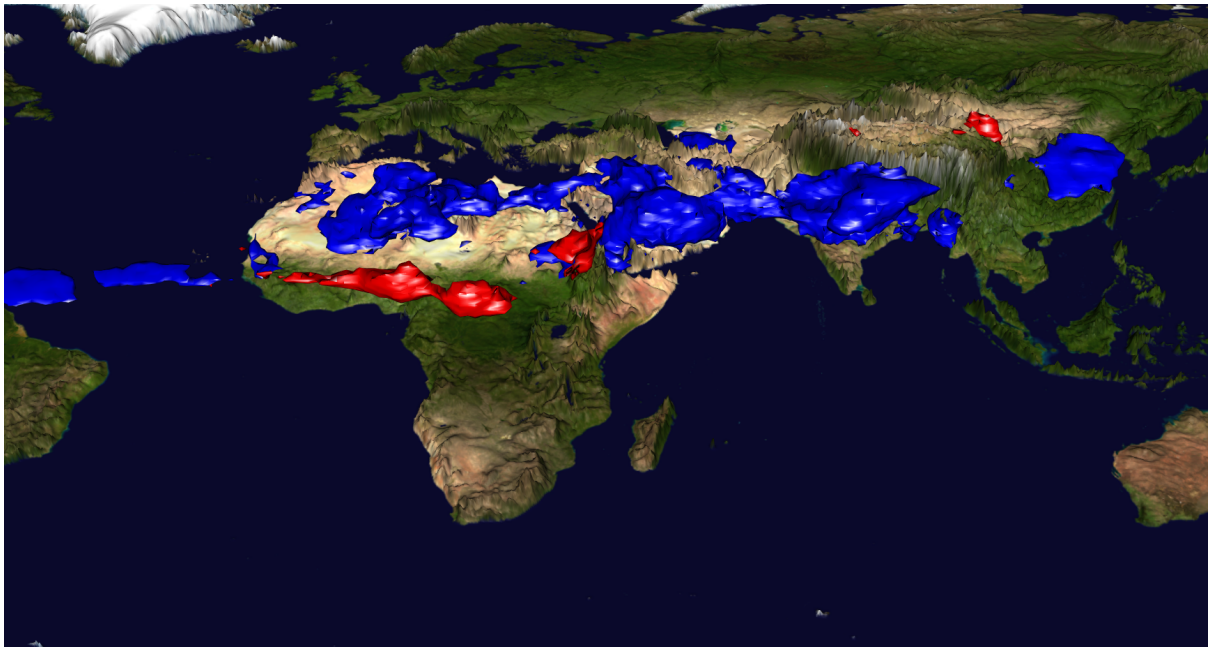

Figure S21: Atmospheric cooling (blue, below -0.01 K / day) and heating (red, above 0.01 K / day) by dust-pollution interaction during **Spring** (March, April, May)

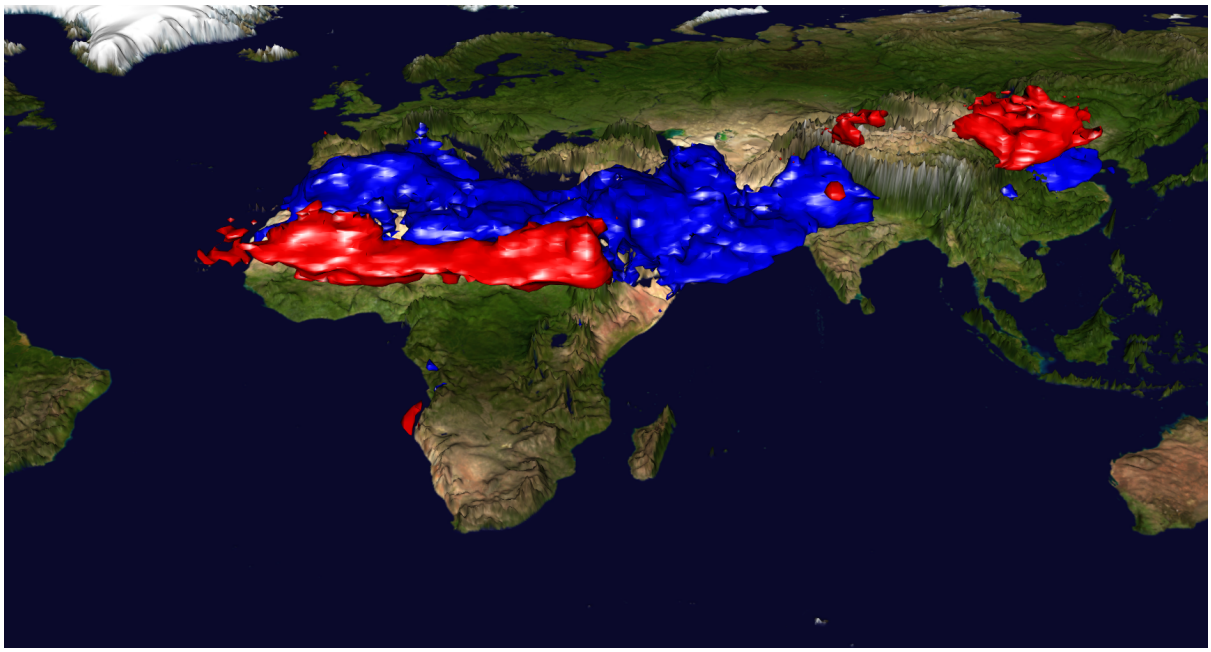

Figure S22: Atmospheric cooling (blue, below -0.01 K / day) and heating (red, above 0.01 K / day) by dust-pollution interaction during **Summer** (June, July, August)

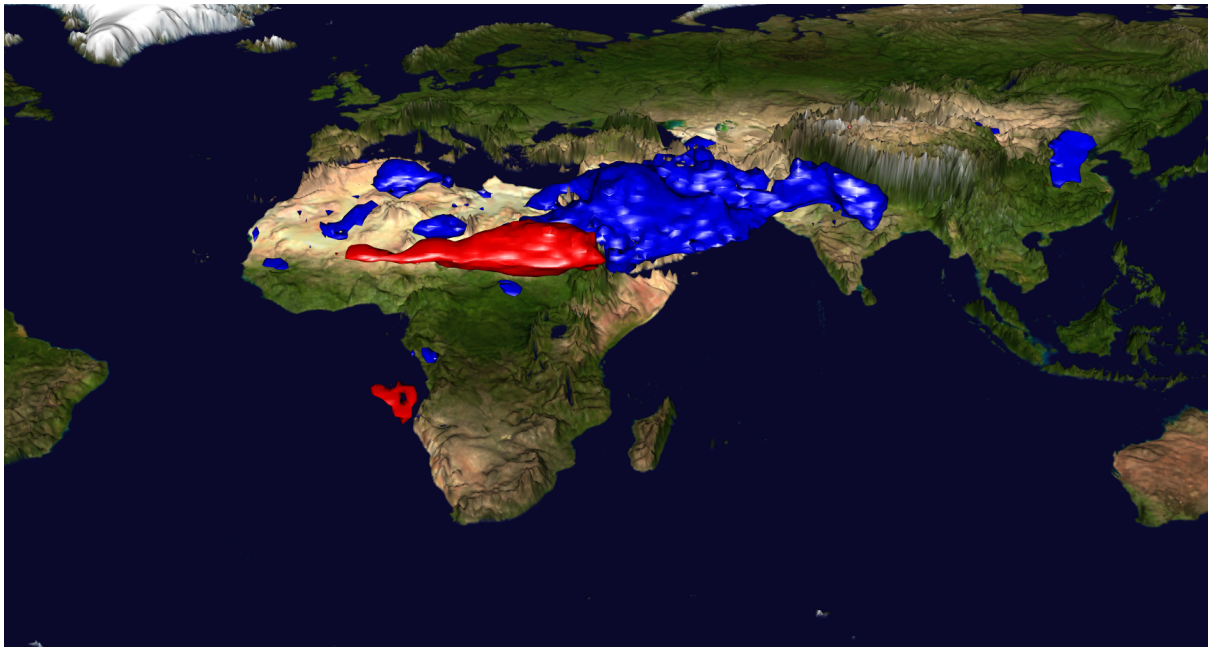

Figure S23: Atmospheric cooling (blue, below -0.01 K / day) and heating (red, above 0.01 K / day) by dust-pollution interaction during **Autumn** (September, October, November)

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