

Supplementary information for manuscript: “Nonlinear Response of Asian Summer Monsoon Precipitation to Emission Reductions in India and China”

The supplementary material consists of three figures (figures S1, S2, and S3) and one table (table S1).

Pre-monsoon ASCENT @ 500hPa

Monsoon WINDS @ 850hPa

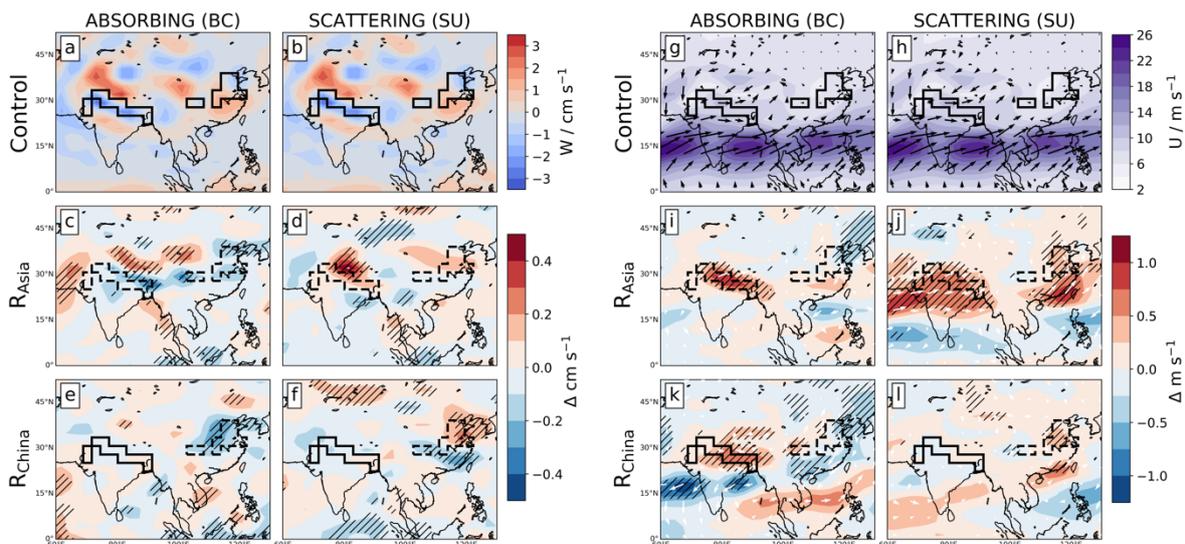


Figure S1. Effects on large-scale dynamics and circulation: pre-monsoon vertical ascent at 500 hPa (a – f) and monsoon horizontal winds at 850 hPa (g – l). The top row shows the seasonal mean in present day simulations (a – b, g – h), and the seasonal mean response due to aerosol reductions in experiments R_{Asia} (c – d, i – j) and R_{China} (e – f, k – l). Within each dataset the left-hand column is for absorbing aerosol and the right-hand column is for scattering aerosol. Hatched areas show a statistically significant change at or above a confidence of 90%. Solid black boxes show the location of the regional perturbation, and dashed boxes where the perturbation has been removed. For panels i – l white arrows show the anomalous meridional and zonal wind components, and contours show the absolute change in wind speed.

Pre-monsoon season (Apr-May)

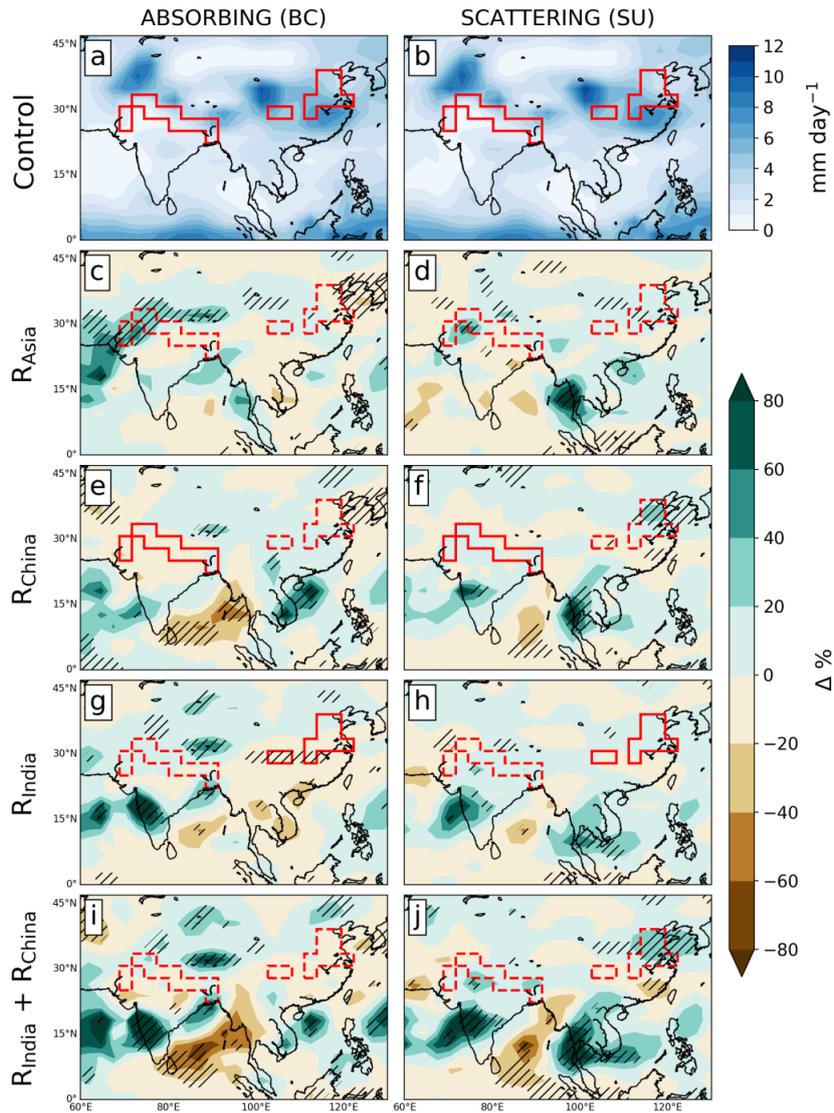


Figure S2. Pre-monsoon (April and May) seasonal mean precipitation rate in present day simulations (**a – b**), and the percentage change due to aerosol reductions in experiments R_{Asia} (**c – d**), R_{China} (**e – f**), R_{India} (**g – h**), and the summed contribution $R_{China}+R_{India}$ (**i – j**). The column on the left is for absorbing (BC) aerosol and the column on the right is for scattering (SU) aerosol. Hatched areas show a statistically significant change at or above a confidence of 90%. Solid red boxes show the location of the regional perturbation, and dashed boxes where the perturbation has been removed.

Monsoon season (Jun-Jul-Aug)

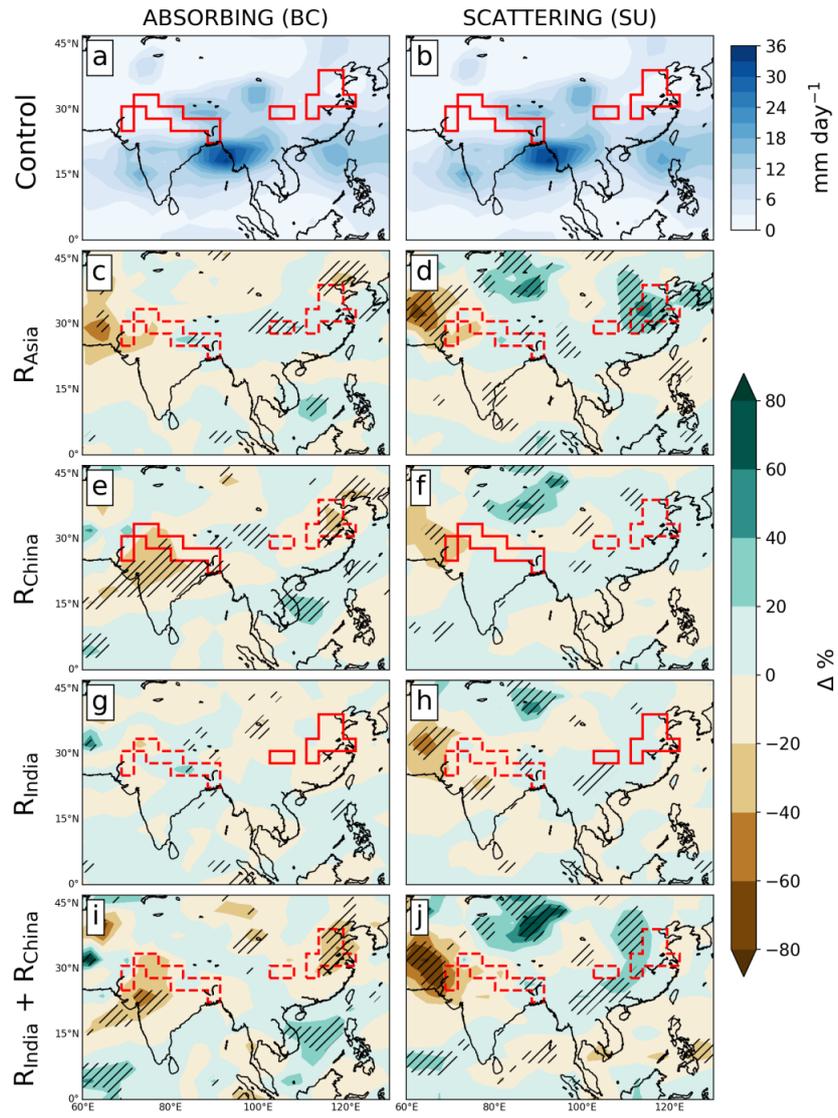


Figure S3. As figure S2 but for the monsoon season.

| | Pre-monsoon season | | Monsoon season | |
|------------------------|--------------------|------------|----------------|------------|
| | Absorbing | Scattering | Absorbing | Scattering |
| South India | 0.1 (0.3) | -0.2 (0.4) | -0.5 (-1.2) | -0.4 (0.0) |
| North India | 0.0 (-0.1) | 0.0 (0.2) | 0.0 (-0.8) | 0.4 (-0.1) |
| Tibetan Plateau | 0.4 (0.5) | 0.3 (0.1) | -0.1 (0.0) | 0.5 (-0.1) |
| South China | -0.2 (-0.2) | 0.2 (0.1) | 0.6 (0.3) | 0.5 (1.2) |
| Central China | 0.3 (-0.2) | 0.2 (-0.1) | 0.6 (-0.6) | 1.0 (1.1) |
| East China | -0.1 (-0.2) | 0.2 (0.1) | 0.2 (-0.9) | 0.8 (0.4) |

Table S1. Data as shown in figure 5 of the manuscript. Values show the mean precipitation response (mm day^{-1}) in each season, and for each region, for R_{Asia} simulations with either BC or SU aerosol. Data in brackets are for the summed response $R_{China}+R_{India}$.