Supporting Information for

Anthropogenic aerosols contribute to the recent decline in precipitation over the U.S. Southwest

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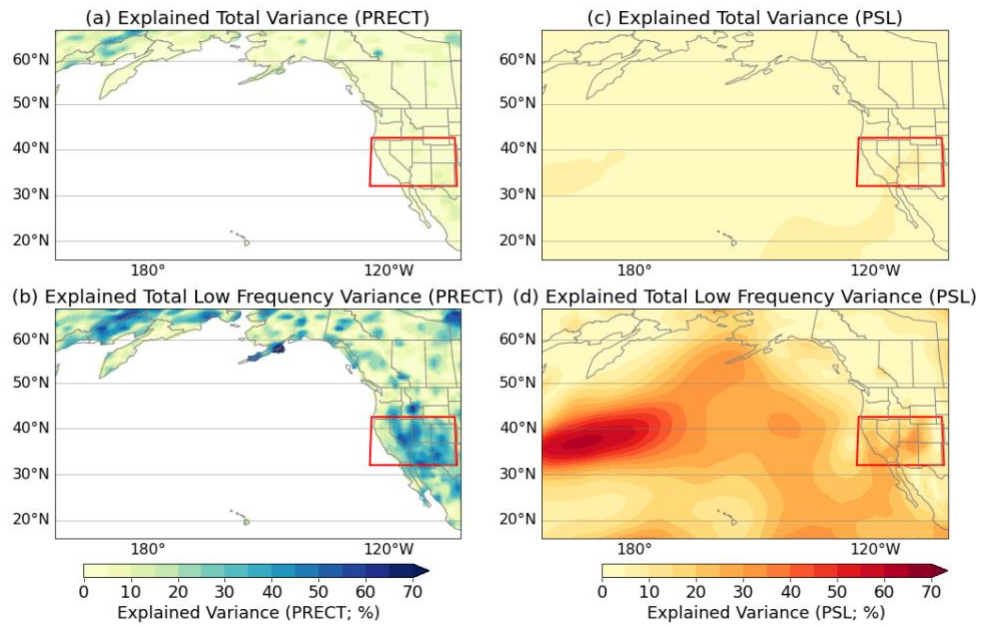
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Figure S1. The total variance of (a) precipitation and (b) sea level pressure (SLP) and the total low-frequency variance of (c) precipitation and (d) SLP explained by the multivariate linear regression with the leading two LFCs in observations (ERSSTv5/GPCC/ERA5).

(a) LFC1 (aerosol increase mode)

(b) LFC2 (aerosol shift mode)
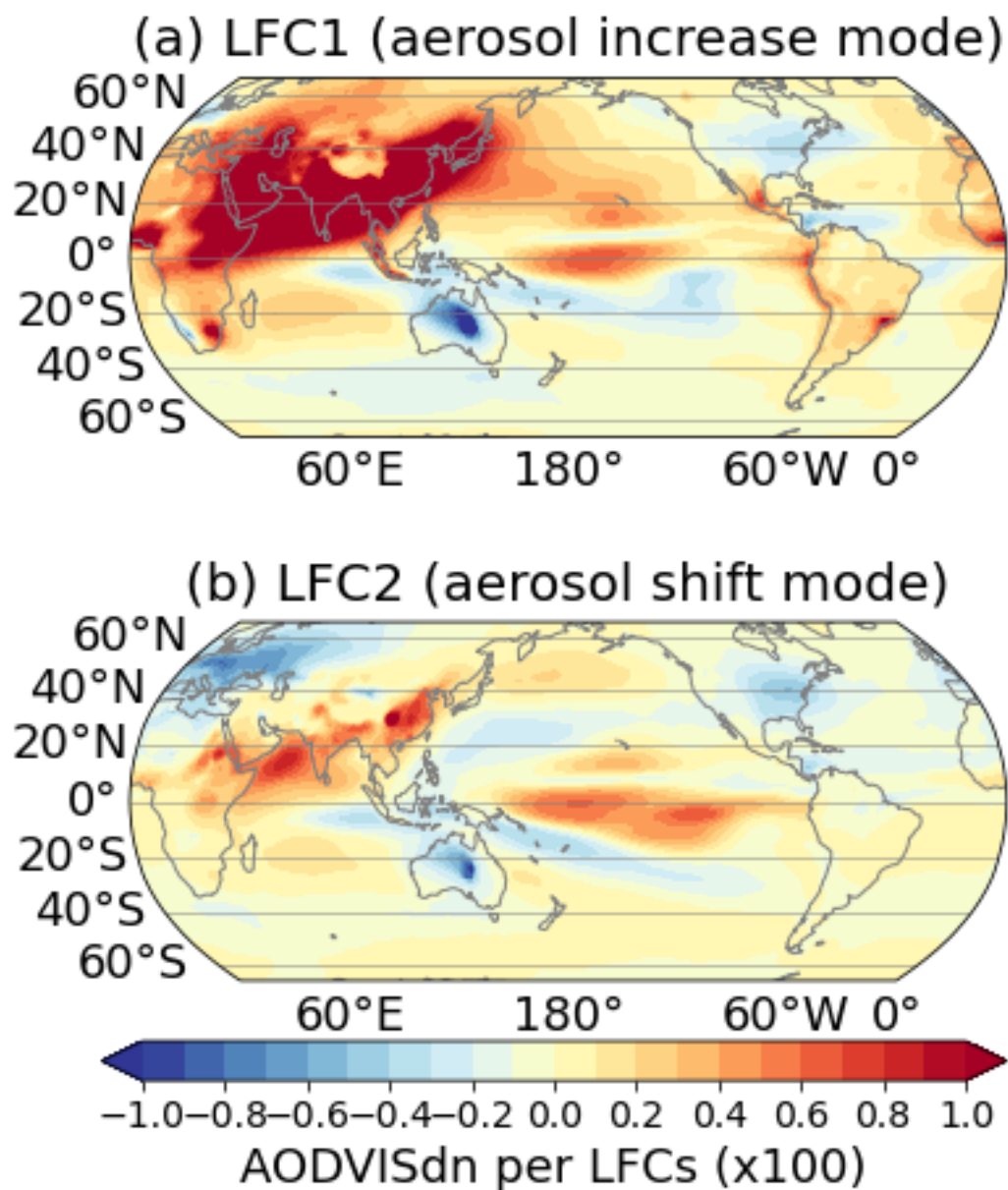
AODVISdn per LFCs (x100)

Figure S2. 15-ensemble mean of the regressions of DJFMAM mean aerosol optical depth at 550nm day night (variable name in CESM2: AODVISdn) onto DJFMAM mean (a) LFC1 and (b) LFC2 from AAER.
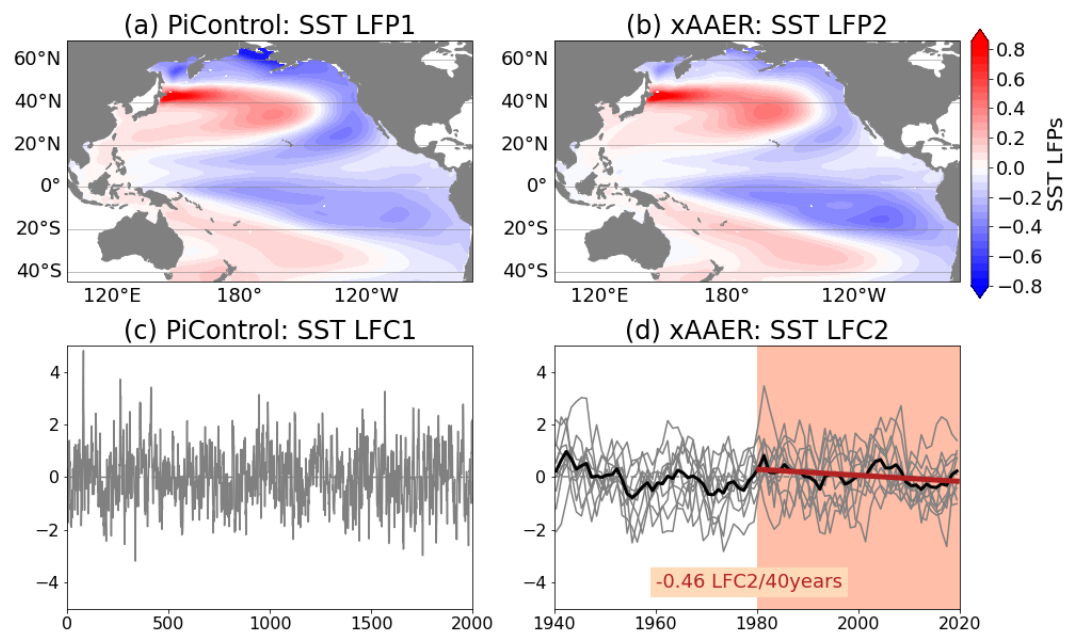
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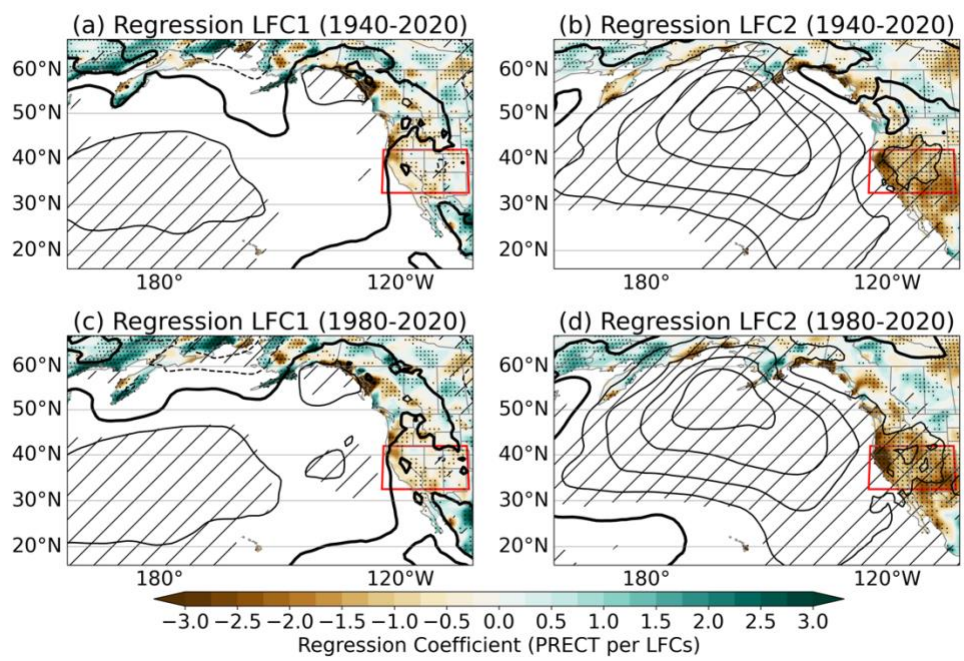
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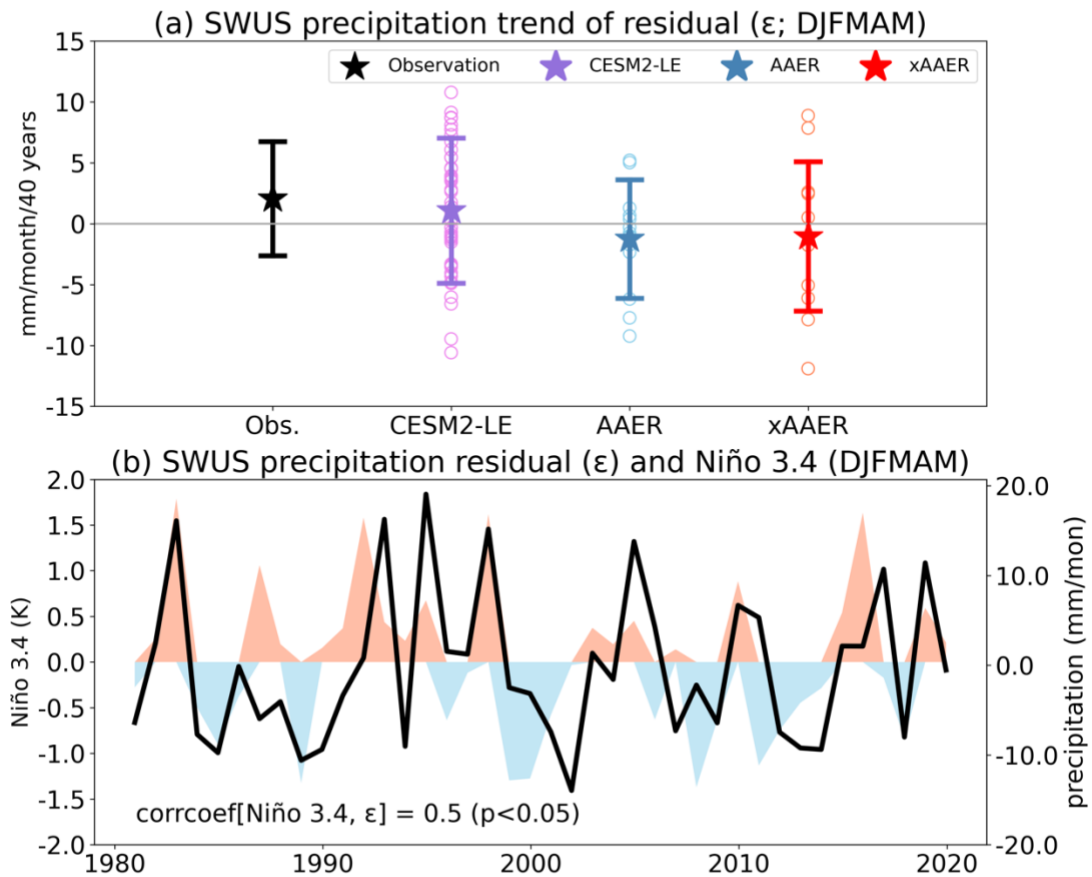
Figure S5. (a) The distributions of residuals of SWUS DJFMAM precipitation trends during 1980-2020 from observation (black), CESM2-LE (purple), AAER (blue), and xAAER (red). The error bars around observations (black) are 1 standard deviation of its trend. Stars, ranges, and dots for CESM2 represent the ensemble mean trends, ensemble mean standard deviation of trends, and individual ensemble members. (b) The observed DJFMAM precipitation residual and observed Niño 3.4 time series.
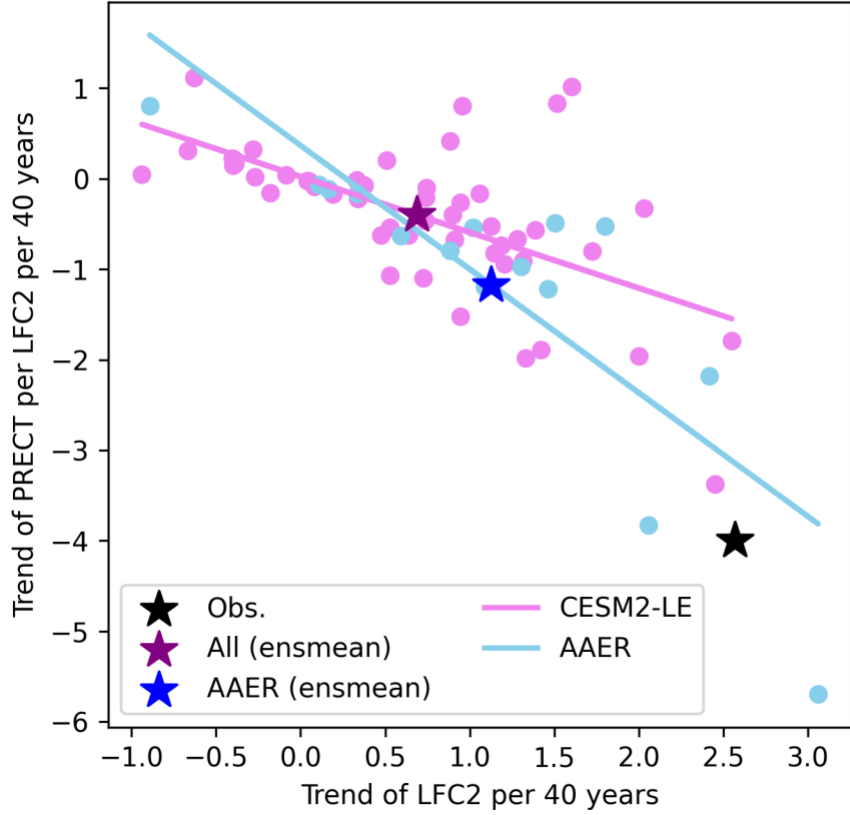
Figure S6. The sensitivity of the 1980-2020 DJFMAM precipitation trend to the corresponding LFC2 trend calculated as a linear trend across ensemble members in CESM2-LE (purple), AAER (blue). Individual ensemble members are shown as dots. The stars are observations (black) and the ensemble means of CESM2-LE (purple) and AAER (blue).