Supplementary figures

(a)   Length of records (year)

(b)   Numbers of stations with records in each year
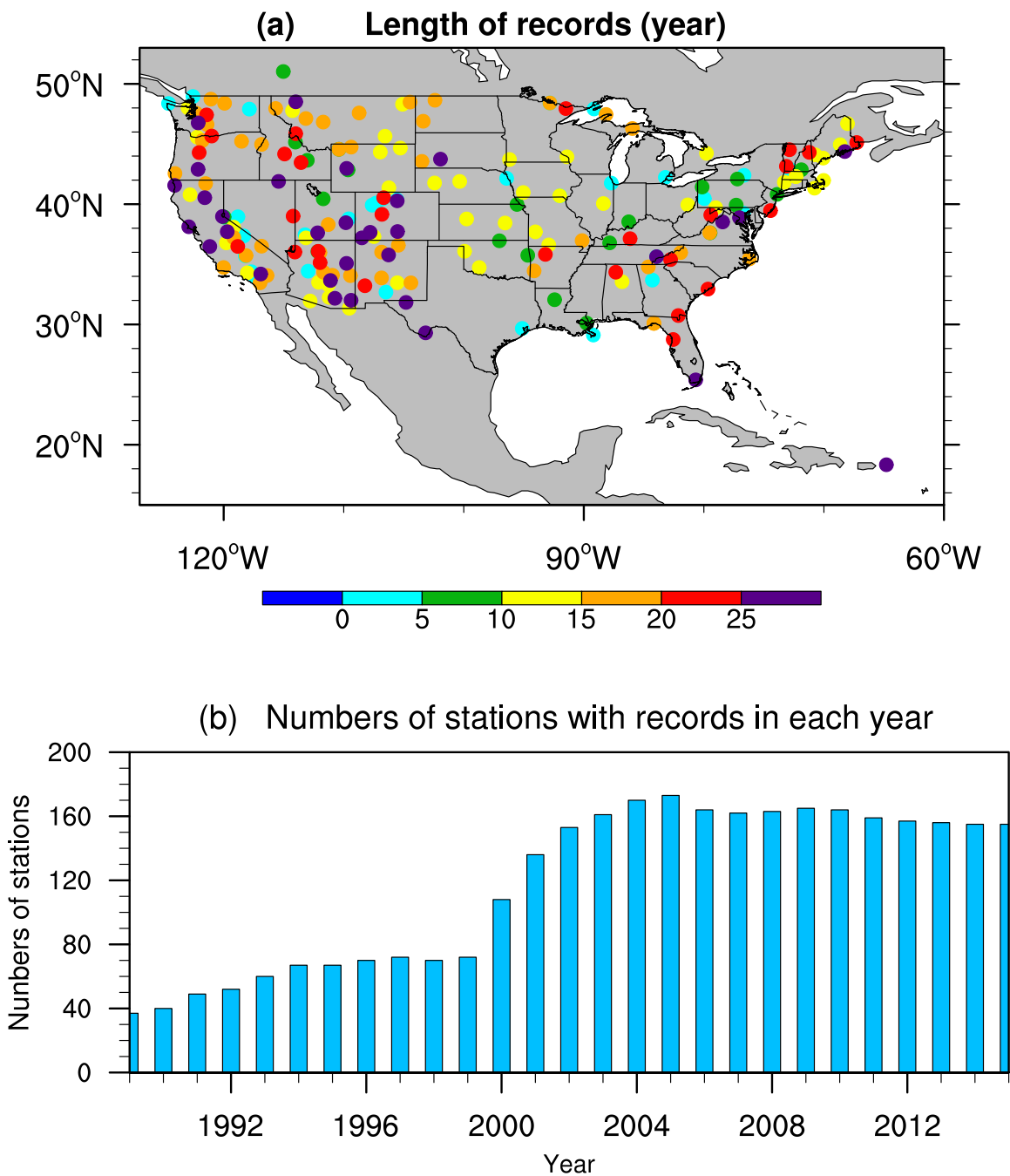

Figure S1. (a) Location of IMPROVE stations in the domain. Color denotes the length (years) of record at each station. (b) Numbers of station with records available in each year from 1989 to 2015.
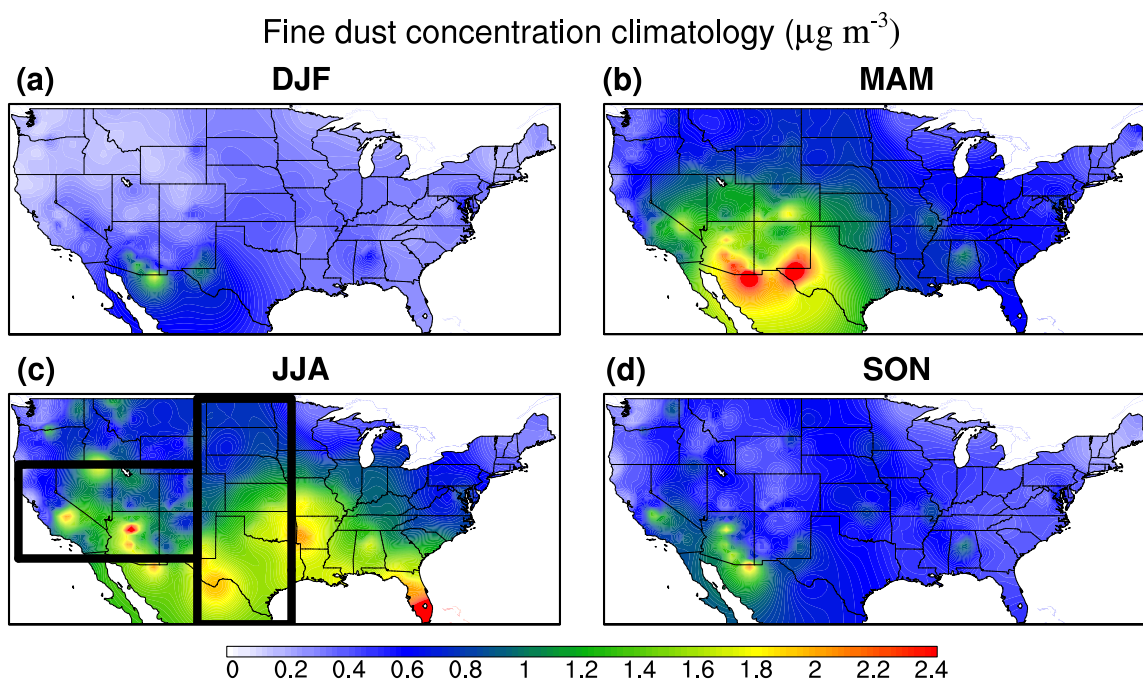
Fine dust concentration climatology (μg m^{-3})

Figure S2. Climatology of fine dust concentration (μg m^{-3}) averaged from 1990 to 2015. Black boxes denote the southwestern U.S. and the Great Plains.
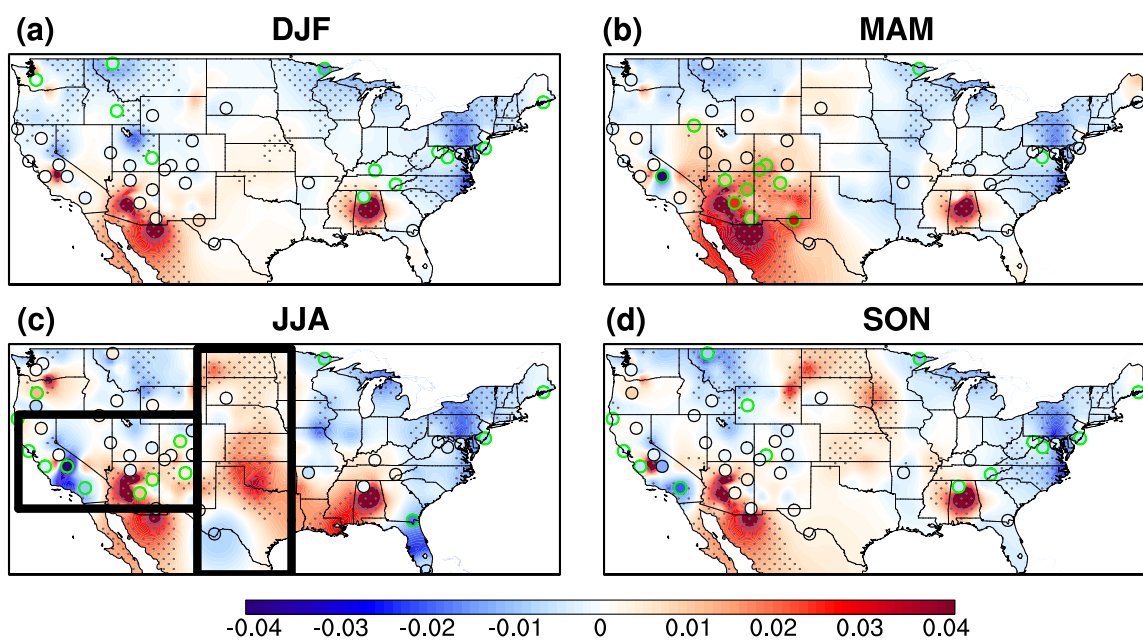
Fine Fe trend (1990-2015)

(a) DJF

(b) MAM

(c) JJA

(d) SON

-0.04   -0.03   -0.02   -0.01   0   0.01   0.02   0.03   0.04

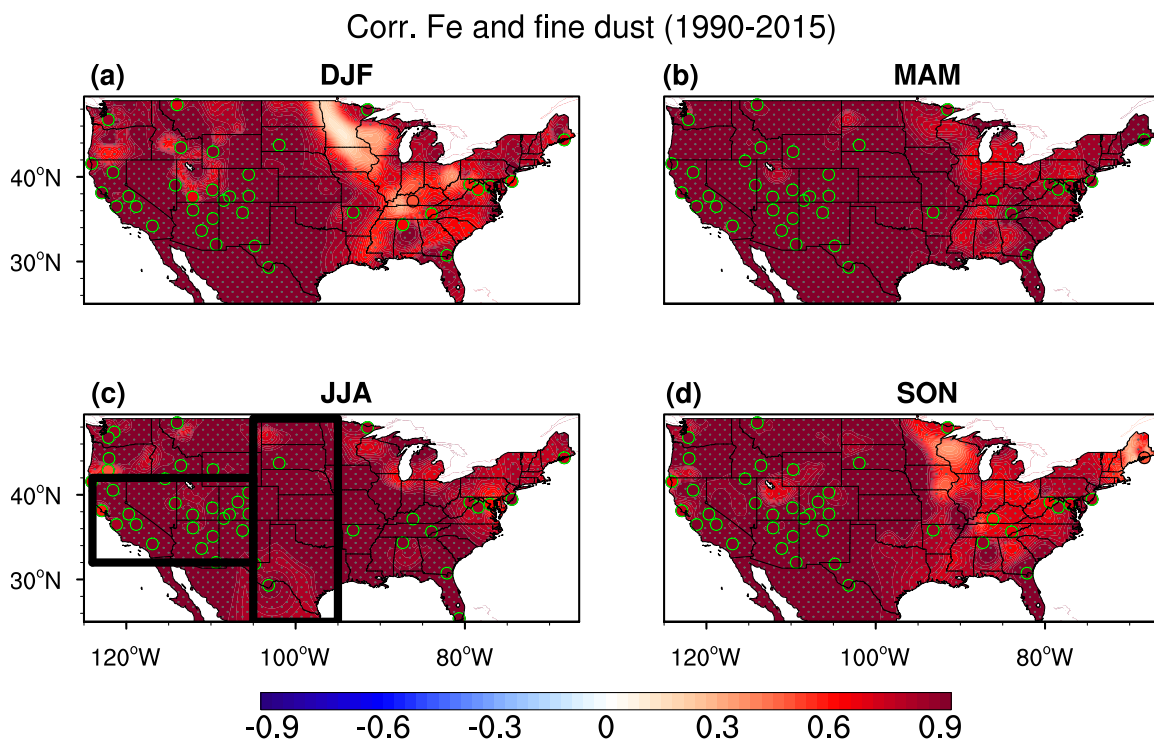Figure S3. Same as Fig. 1 but for the trend of fine iron (Fe) (10^{-1} µg m^{-3}).

Figure S4. Correlation between fine Fe and fine dust concentrations from 1990 to 2015. Areas significant at the 99% confidence level are dotted in grey. The colored circles show correlations at IMPROVE stations with consecutive records for at least 23 years during 1990-2015. Circles with green outlines denote the trend is significant at the 99% confidence level.
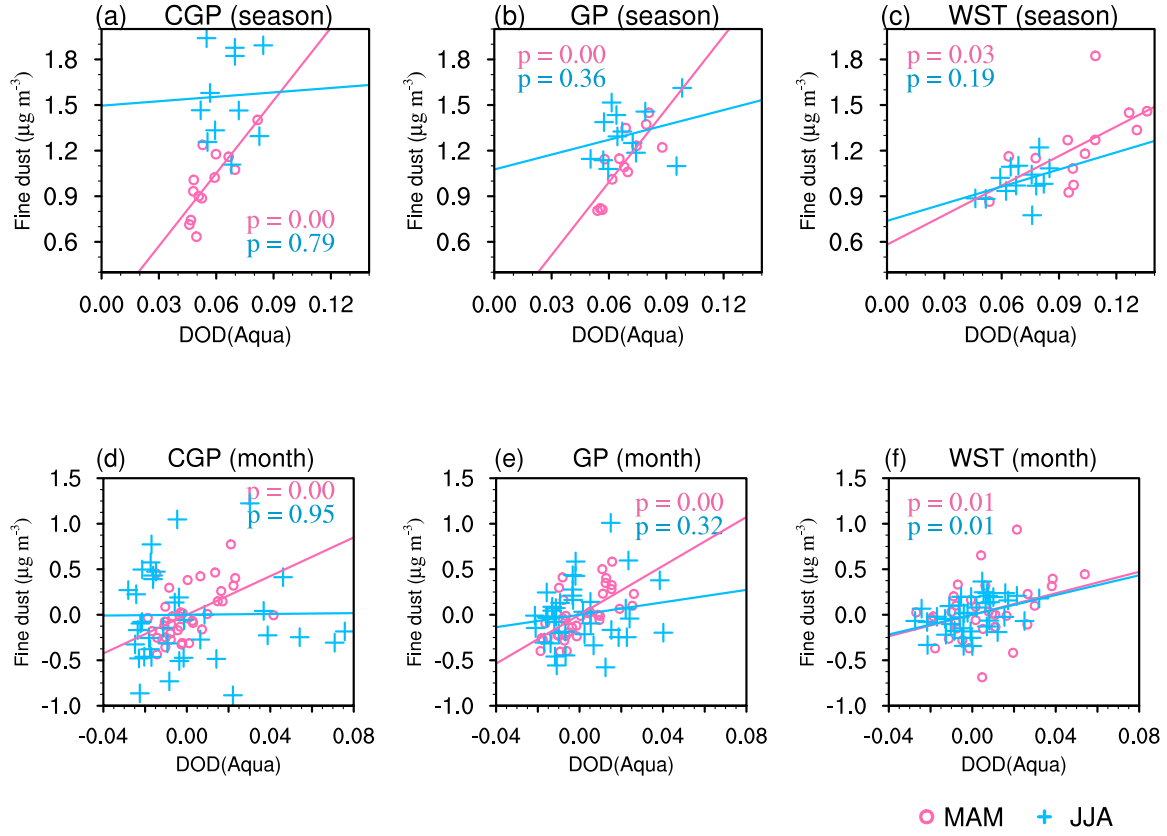
Figure S5. Scatter plot of (a)-(c) seasonal mean and (d)-(f) monthly mean fine dust concentration versus DOD during spring (pink circles) and summer (light blue plus) over the central Great Plains (CGP), Great Plains (GP) and the southwestern U.S. (WST). p-values of the liner fitting are shown at the corner of each plot.
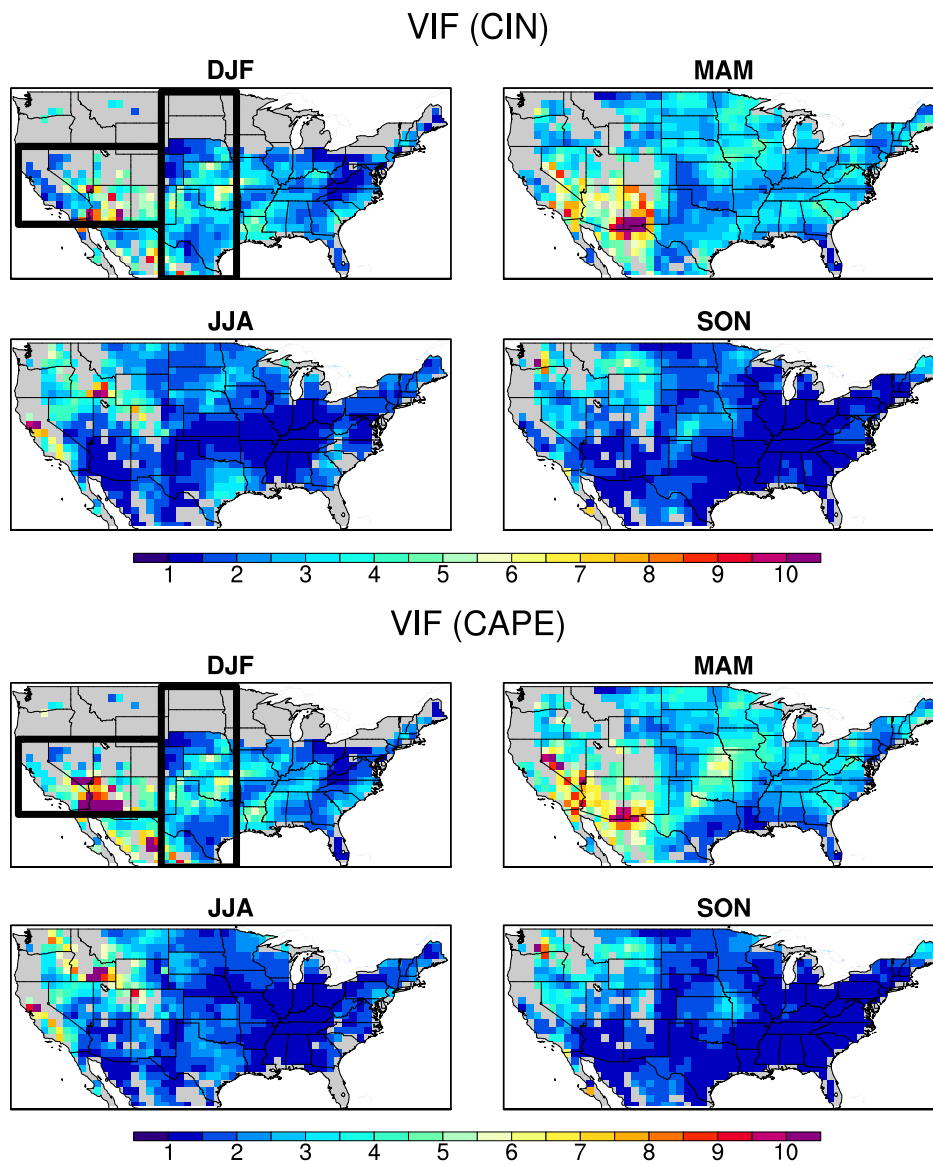
Figure S6. Variance inflation factor (VIF) for CIN (top) and CAPE (bottom) in five-factor multiple-linear regression with fine dust.
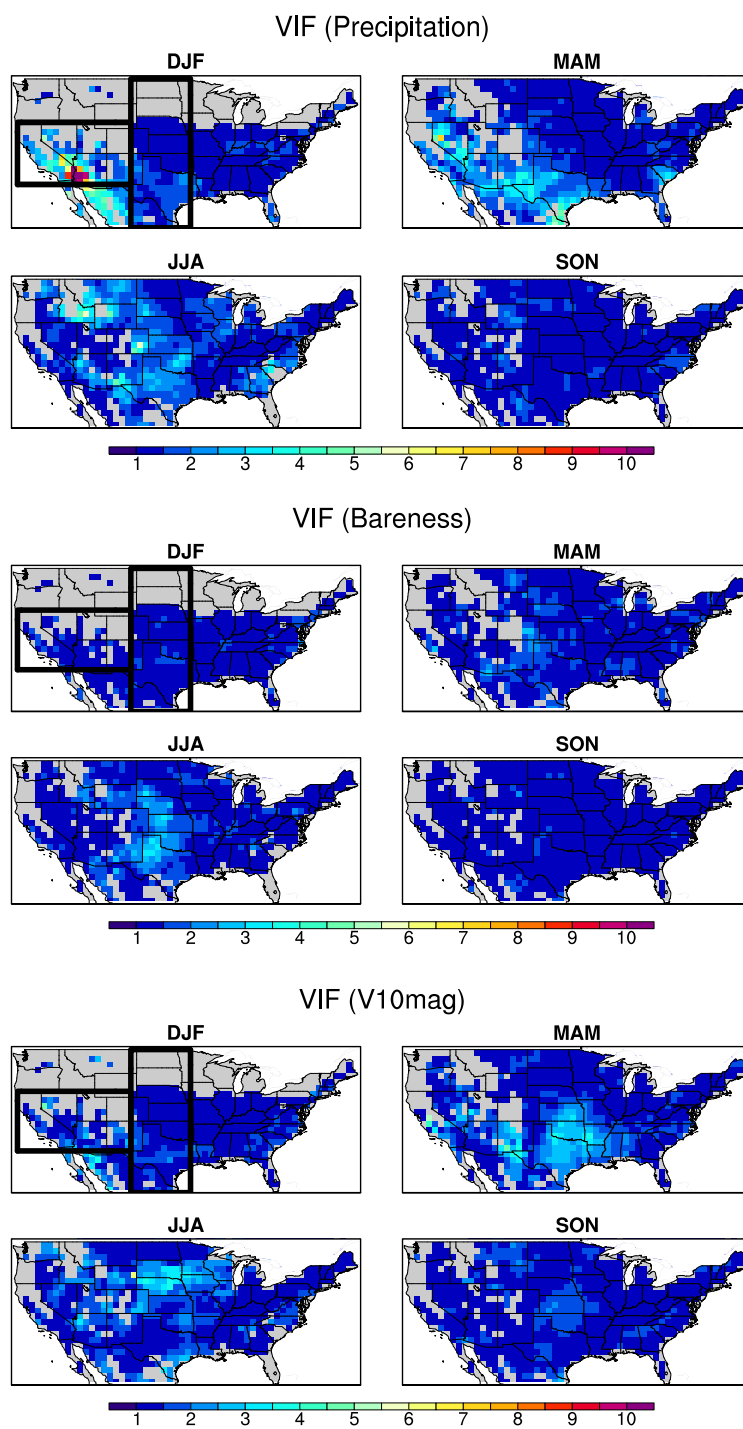
Figure S7. Same as Fig. S6 but for precipitation (top), surface bareness (middle), and surface wind (bottom).

1990-2015

Corr. with Station EVER1   **Corr. with Station VIIS1**

-0.8 -0.6 -0.4 -0.2   0   0.2   0.4   0.6   0.8

2002-2015

Corr. with Station EVER1   **Corr. with Station VIIS1**

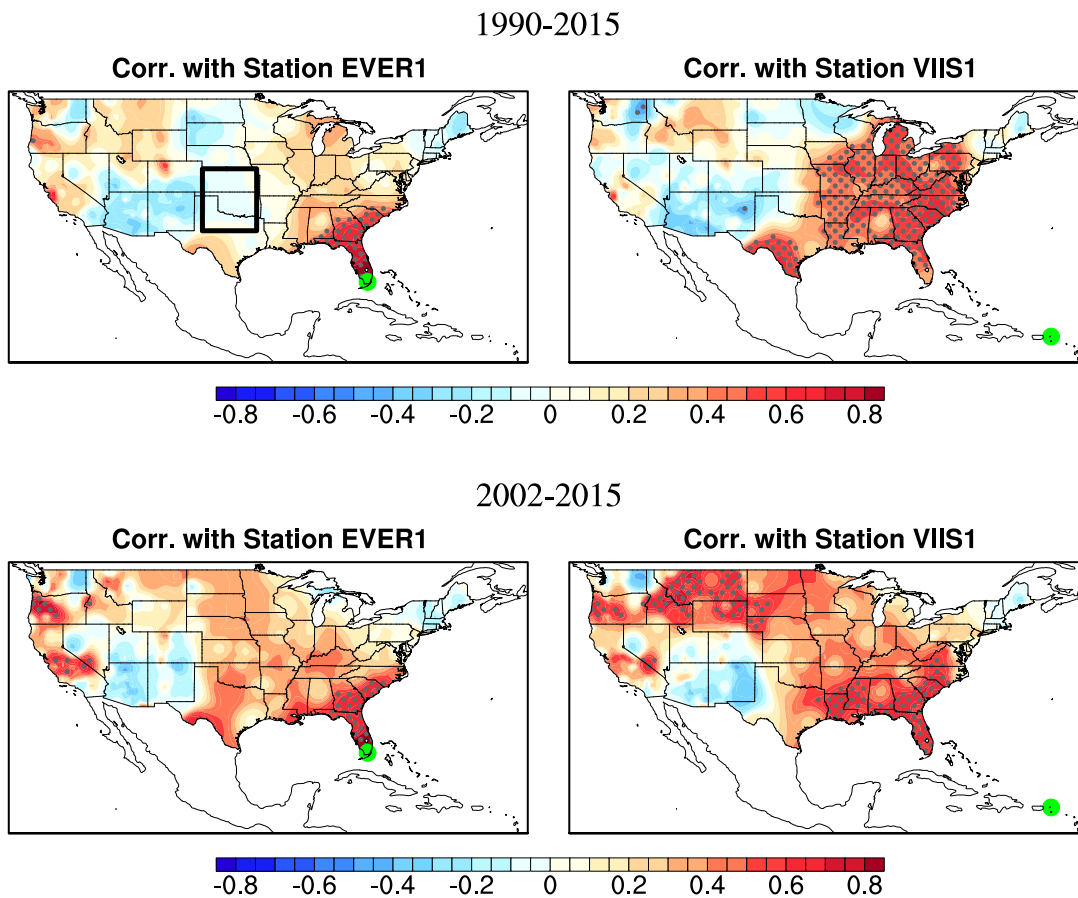-0.8 -0.6 -0.4 -0.2   0   0.2   0.4   0.6   0.8

Figure S8. Correlations between fine dust concentration at EVER1 (25.4°N, 80.7°W, in the Everglades National Park) and VIIS1 (18.3°N, 64.8°W, in the Virgin Islands National Park) stations (denoted by green dots) with gridded fine dust concentration in the U.S. for JJA during 1990-2015 (top), and 2002-2015 (bottom). Areas significant at the 95% confidence level are dotted. Black box denotes the CGP area.