Supplementary Materials for "Extreme events driving year-to-year differences in gross primary productivity across the US"

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Introduction

This supporting information contains five additional figures and one movie. Figure S1 shows a scatterplot of the TROPOMI SIF data against the AmeriFlux GPP data. Figure S2 shows scatterplots of TROPOMI SIF against AmeriFlux GPP for the various ecosystems. Figure S3 shows the impact of temporal averaging on the SIF-GPP relationship. Figure S4 shows the difference between GPP in fall (August, September, October) 2019 and 2018. Figure S5 shows a comparison of SIF and GPP at two AmeriFlux sites dominated by C3 plants and two dominated by C4 plants. Figure S6 is the same as main text Figure 4 but shows MODIS LAI instead of NIR_v.



Figure S1: **Comparison of TROPOMI SIF and AmeriFlux GPP.** Scatterplot comparison of TROPOMI SIF (x-axis) and AmeriFlux GPP (y-axis) using all observations. Solid line is fitted using a bisquare regression. Light gray lines are bootstrap of the fit. (Left panel) All points plotted. (Right panel) Log-scale density map.



Figure S2: Comparison of TROPOMI SIF and AmeriFlux GPP by ecosystem. Same as left panel of Fig. S1 except broken down by ecosystem. x-axis is TROPOMI SIF ($mW/m^2/sr/s$) and y-axis is AmeriFlux GPP ($\mu mol/m^2/s$). WET = wetlands, CRO = croplands, GRA = grasslands, DBF = deciduous broadleaf forest, ENF = evergreen needleleaf forest, CSH = closed shrubland, WSA = woody savanna, MF = mixed forest, SAV = savanna. Open shrubland is not shown.



Figure S3: Impact of temporal averaging on SIF-GPP relationship. Same as Fig. S2 but using averaged data. Top row uses an 8-day moving window, middle row uses a 16-day moving window, and bottom row uses a 32-day moving window.



Figure S4: **Difference in GPP between Fall 2019 and Fall 2018.** Same as main text Fig. 3c but for August, September, and October.



Figure S5: Comparison of the SIF-GPP relationship for C3 and C4 plants. Comparison of TROPOMI SIF and AmeriFlux GPP for C3 (blue) and C4 (red) plants at four AmeriFlux sites: US-CS1, US-CS3, US-Bi2, and US-KL1..



Figure S6: Major drivers of interannual variability in CONUS GPP. Same as main text Fig. 4 but show MODIS LAI instead of NIR_v . Here we use the MCD15A2H MODIS LAI product that was available at a coarser time resolution.