Supplemental Material

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How Land Surface Characteristics Influence the Development of Flash Drought through the Drivers of Soil Moisture and Vapor Pressure Deficit
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Supplemental Material for "How land surface characteristics influence the development of flash drought through the drivers of soil moisture and vapor pressure deficit"

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1. Supplemental Figures

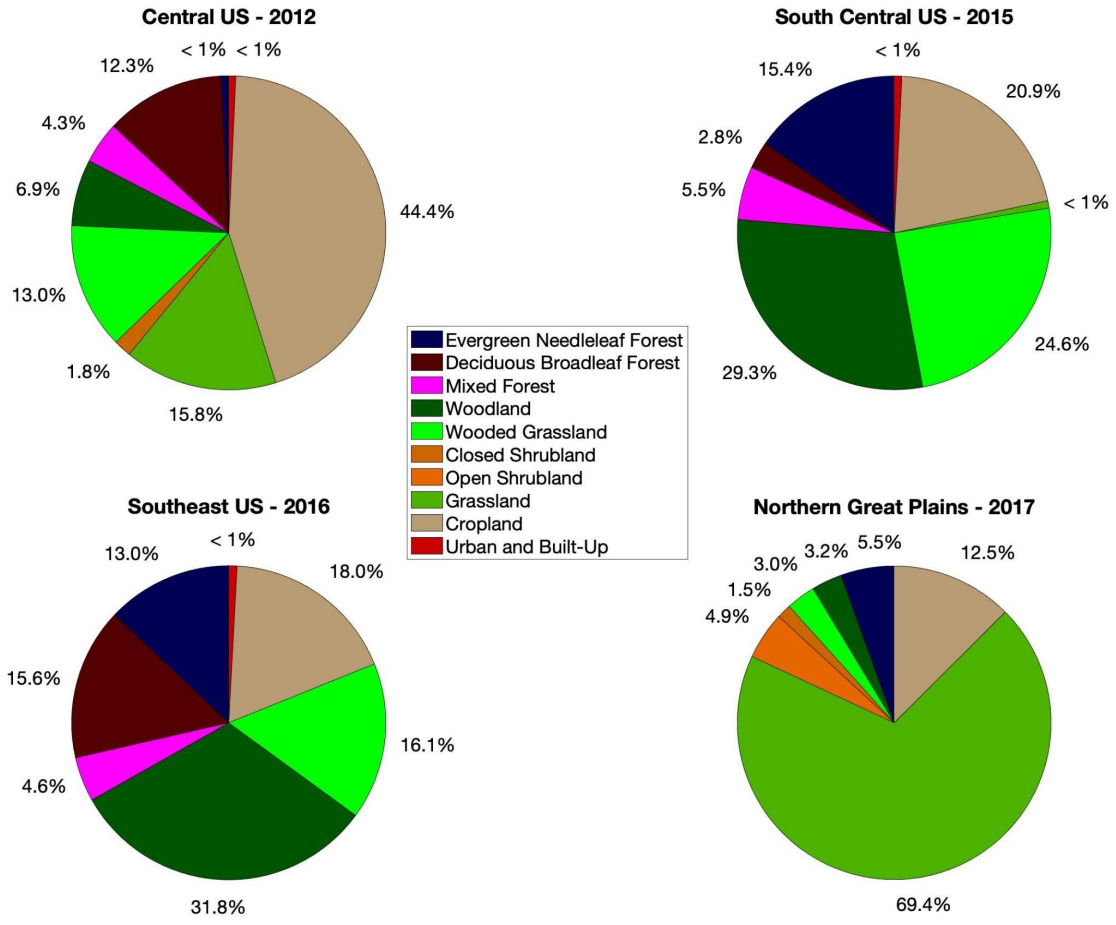

FIG. 1. Proportions of land cover types across the four study regions.

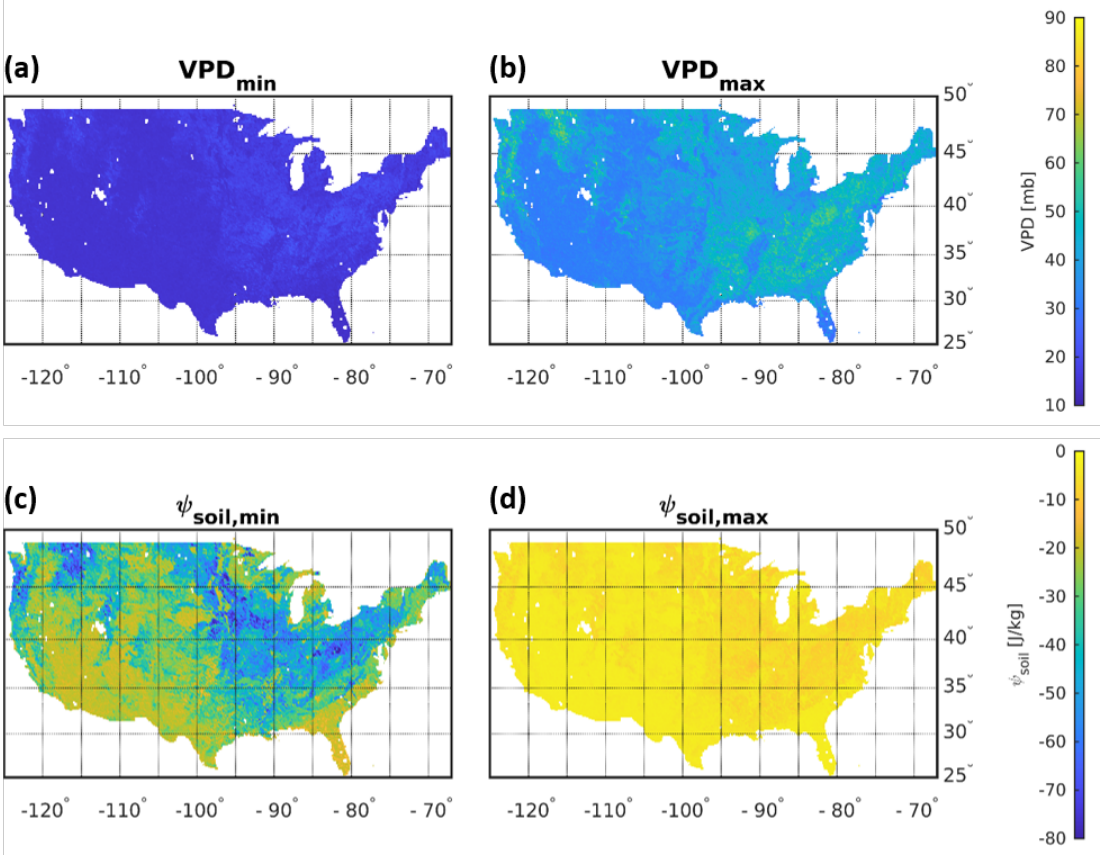

FIG. 2. Maps of Growing Season Index (GSI) parameter estimates for (a) minimum VPD, (b) maximum VPD, (c) minimum soil water potential, and (d) maximum soil water potential.

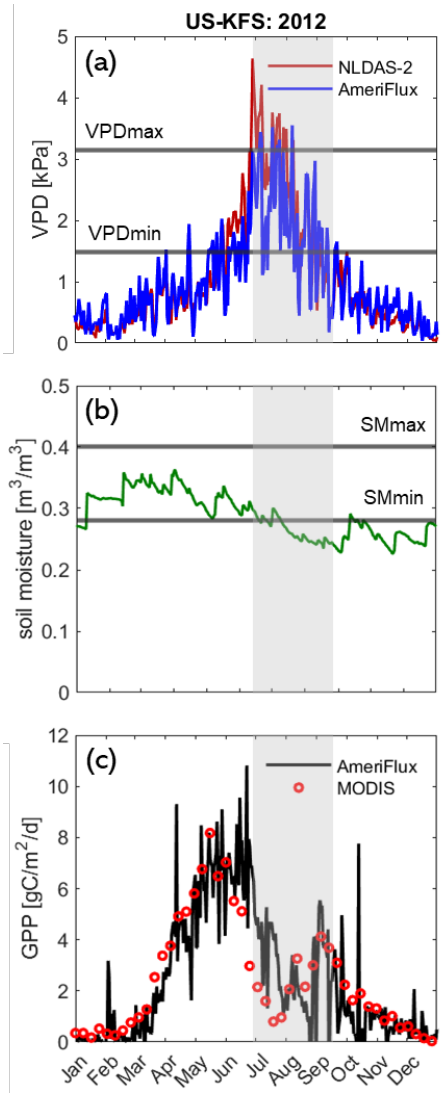

FIG. 3. Time series of: (a) VPD derived from NLDAS-2 (red line) and AmeriFlux (blue line), (b) root zone soil moisture from SMERGE, and (c) gross primary productivity (GPP) from AmeriFlux (black line) and MODIS MOD17A2HGF (red circle) for the Kansas Field Station (US-KFS) in 2012, when flash drought occurred in the Central U.S. The horizontal gray lines mark the suboptimal range for photosynthesis determined by assimilating MODIS FPAR/LAI data to a phenology forecasting model. Gray shading in highlights a period of drought stress marked by crossing the VPDmax and SMmin thresholds simultaneously. Cross both thresholds results in a significant drop off in productivity in (c).

2. Supplemental Tables

Soil texture class	ϕ	ψ_{ae}	λ	S_f
Sand	0.395	12.1	0.694	4.95
Loamy sand	0.410	9.0	0.553	6.13
Sandy loam	0.435	21.8	0.378	11.01
Silt loam	0.485	78.6	0.234	16.68
Silt	0.485	78.6	0.234	16.68
Loam	0.451	47.8	0.252	8.89
Sandy clay loam	0.420	29.9	0.319	21.85
Silty clay loam	0.477	35.6	0.177	27.30
Clay loam	0.476	63.0	0.242	20.88
Sandy clay	0.426	15.3	0.223	23.90
Silty clay	0.492	49.0	0.150	29.22
Clay	0.482	40.5	0.165	31.63

TABLE 1. Soil hydraulic parameters.

ϕ - porosity
ψ_{ae} - air-entry pressure head
λ - pore-size distribution, $b = \frac{1}{\lambda}$
S_f - wetting front suction head

3. References

Brunsell, N. 2022. AmeriFlux FLUXNET-1F US-KFS Kansas Field Station, Ver. 3-5, AmeriFlux AMP, (Dataset). https://doi.org/10.17190/AMF/1881585

Running, S., Zhao, M. 2021. MOD17A2HGF MODIS/Terra Gross Primary Productivity Gap-Filled 8-Day L4 Global 500 m SIN Grid V061. NASA EOSDIS Land Processes DAAC. https://doi.org/10.5067/MODIS/MOD17A2HGF.061