Supplement of

Reduced surface fine dust under droughts over the southeastern United States during summertime: observations and CMIP6 model simulations

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Table S1. Dataset and related variables used in this study.

Variables	Datasets	Temporal resolution	Spatial resolution (latitude x longitude)	Periods used (JJA only)	Download links
Drought indicator	USDM	Weekly	0.5°×0.5°	2000-2019	https://droughtmonitor.unl.edu/
	SPEI	Monthly	0.5°×0.5°	1973-2018	http://sac.csic.es/spei/
Fine dust	IMPROVE	Every 3 days	1°×1° or station	2000-2019	http://views.cira.colostate.edu/fed/QueryWizard/
	EPA-CSN	Every 3 or 6 days	1°×1° or station	2000-2019	https://www.epa.gov/outdoor-air-quality-data/download-daily-data
Total dust	Barbados	Daily	station	1973-2014	https://doi.org/10.17604/q3vf-8m31
AOD	MODIS Terra/Aqua	Daily	1°×1°	2003-2019	https://ladsweb.modaps.eosdis.nasa.gov/
Dust extinction coefficient	CALIPSO	Monthly	2°×5°	2006-2019	https://asdc.larc.nasa.gov/project/CALIPSO
Precipitation	GPCP	Daily	1°×1°	2000-2019	https://www.ncei.noaa.gov/precipitation-gpcp
Wind, geopotential height	ERA5	Daily	0.25°×0.25°	2000-2019	https://cds.climate.copernicus.eu
NAO	CRU	Monthly	N/A	2000-2019	https://crudata.uea.ac.uk/cru/

Table S2. Information of the four CMIP6 models selected for evaluation.

Models	Resolution	Size bins (μm)	Model references
CNRM-ESM2-1	1.40°×1.40°	3 bins: 0.01-1.0,1.0-2.5,2.5-20	Séférián et al., (2019)
GFDL-ESM4	1.25° × 1.00°	5 bins: 0.1-1,1-2,2-3,3-6,6-10	Dunne et al., (2020)
GISS-E2-1-G	2.00 × 2.50	6 bins: <1,1-2,2-4,4-8, 8-16,16-32	Kelley et al., (2020)
MRI-ESM2-0	1.87 × 1.87	6 bins: 0.2-2,2-4,4-6,6-8,8-10,10-12,12-20	Yukimoto et al., (2019)

(a) Dust distribution under non-drought conditions (left) and its changes from severe drought conditions (right)

(b) Dust density plot over the CONUS (left) and the southeast region (right)

Figure S1. (a) Maps of the mean gridded and in-situ (dots) fine dust under SPEI-based non-drought (wet and normal) conditions (left) from 2000 to 2018 and its changes from severe drought conditions (right). The number of grids (sites) within the southeast region is denoted by N_Grid (N_Site). (b) Comparisons of density distributions of gridded (solid lines) and in-situ (dash lines) fine dust concentrations under drought (red lines) and non-drought (blue lines) conditions over the CONUS (left) and southeast region (right), respectively. Vertical dash and solid lines indicate the modes.

Table S3. Statistics of dust elemental ratios under wet and normal (non-drought) and severe drought conditions.

Ratios	Dryness	Mean	Median	Standard deviation	10% quantile	90% quantile
Fe:Ca	wet and normal	1.64	1.59	0.16	1.51	1.86
	severe drought	1.45	1.45	0.33	1.08	1.90
Al:Ca	wet and normal	2.53	2.59	0.47	2.04	3.13
	severe drought	2.19	2.20	0.66	1.46	2.94
K:Fe	wet and normal	1.05	1.04	0.21	0.84	1.30
	severe drought	1.45	1.27	0.44	0.99	2.03
Si:Al	wet and normal	2.71	2.47	0.68	2.18	3.58
	severe drought	2.83	2.64	0.65	2.24	3.78