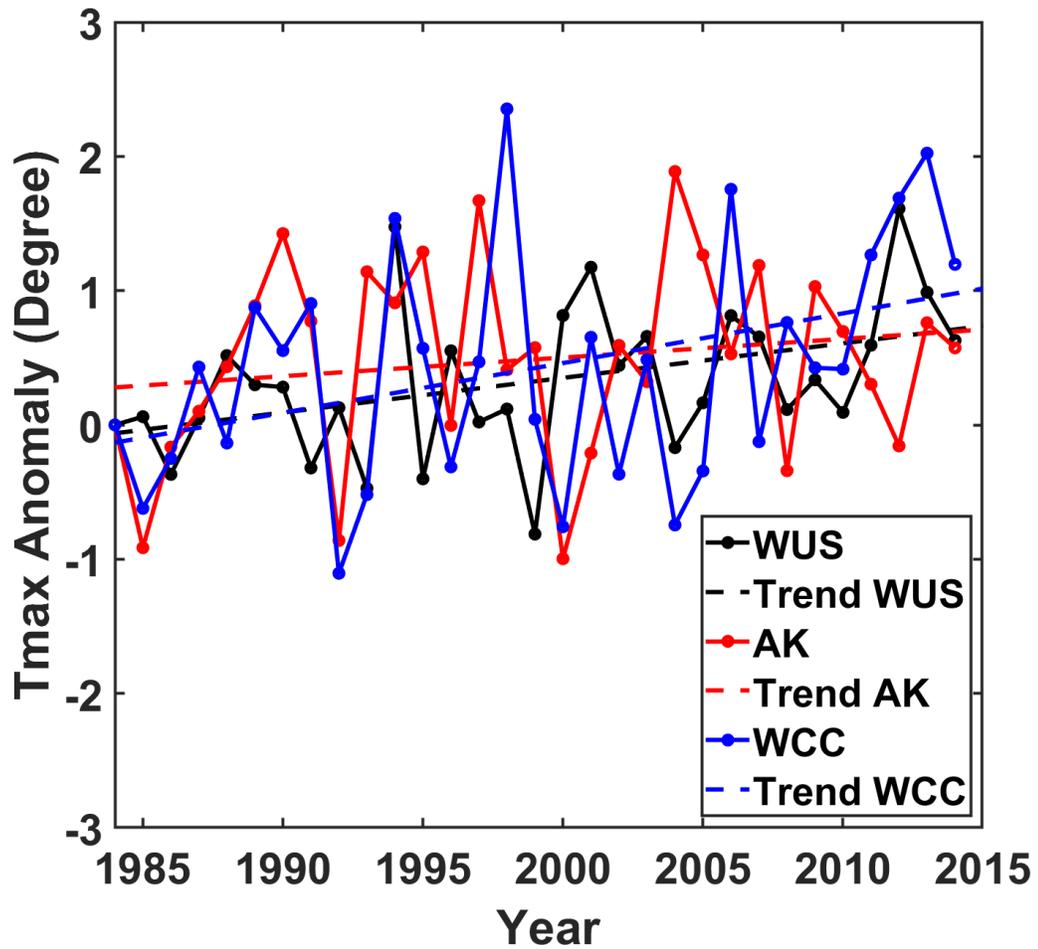
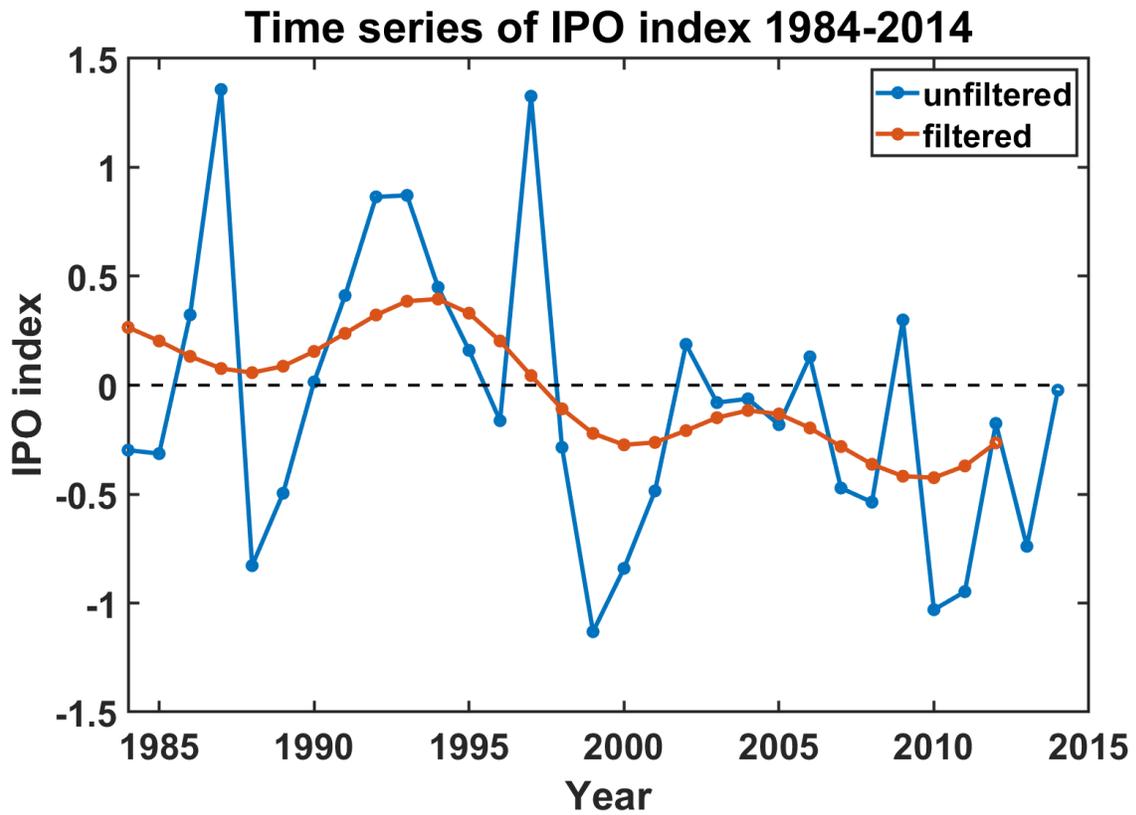


Supplementary Materials for  
Large wildfires in the western US exacerbated by tropospheric  
drying linked to the expansion of the Hadley circulation

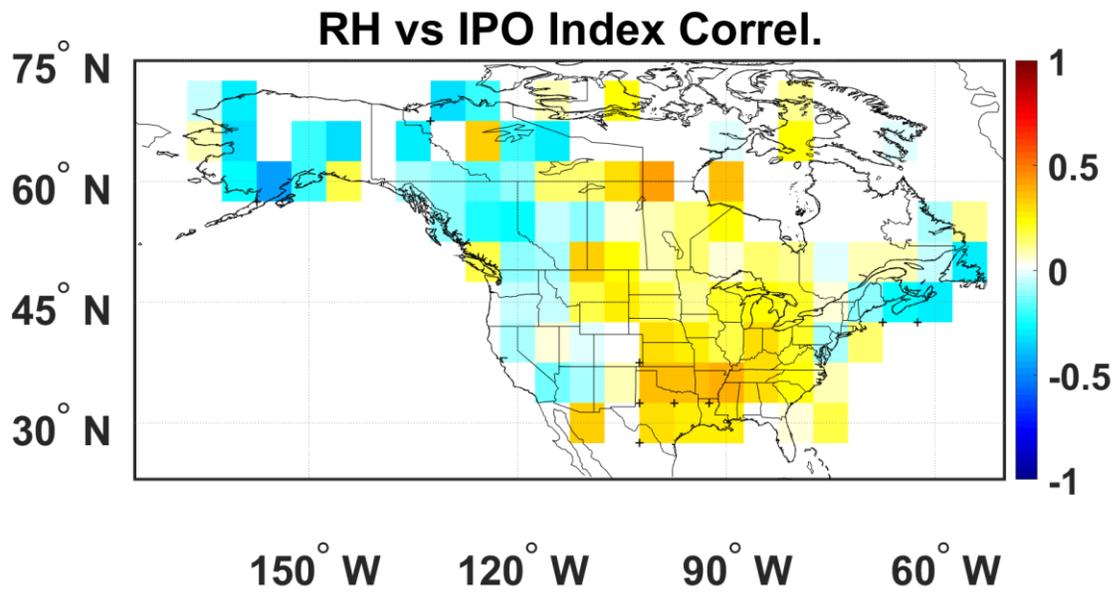
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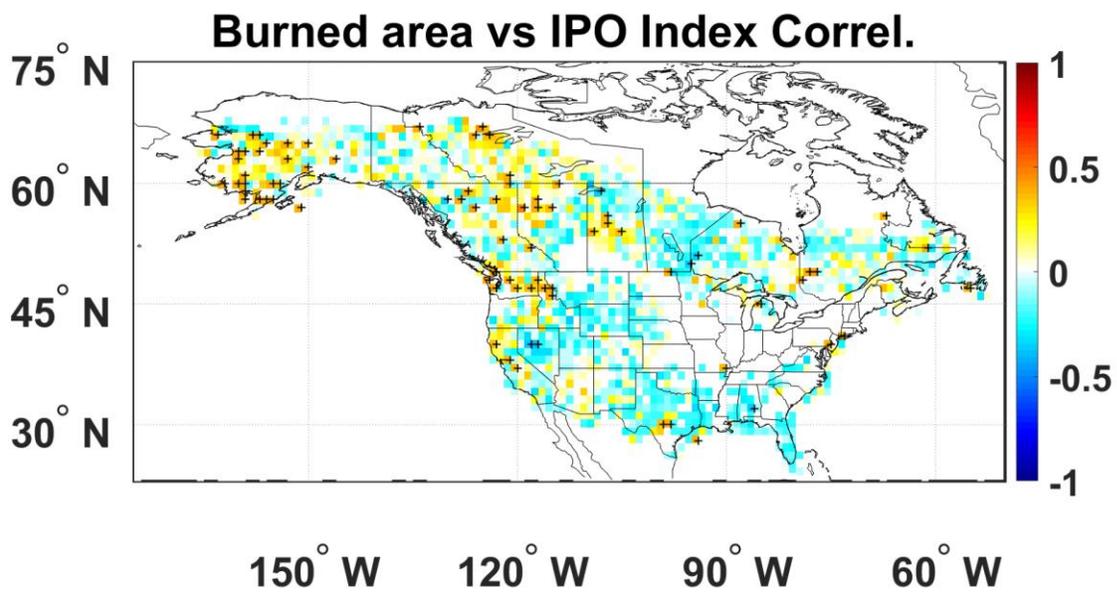
**Figure S1.** Time series of maximum air temperature anomalies (unit: °C) in the western US (WUS, black), Alaska (AK, red), and western-central Canada (WCC, blue) from May-September of 1984–2014. The linear trends are shown as dashed lines. Data are from the Climatic Research Unit Timeseries V4.04



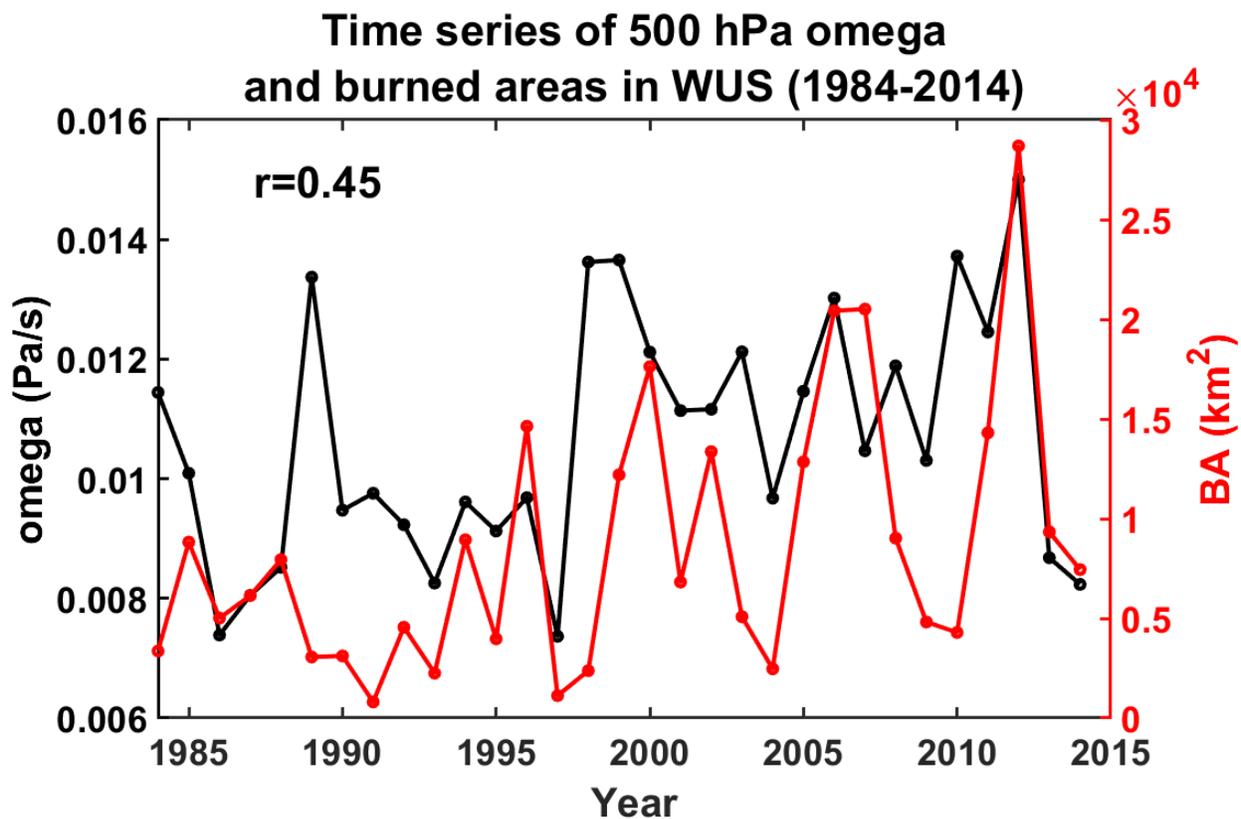
**Figure S2.** Filtered (orange) and unfiltered (blue) time series of the Interdecadal Pacific Oscillation (IPO) index from May-September of 1984–2014. Monthly IPO index data are obtained from HADISST1.1 (<https://psl.noaa.gov/data/timeseries/IPOTPI/>).



**Figure S3.** Spatial pattern of correlations between near-surface relative humidity (RH) and the Interdecadal Pacific Oscillation (IPO) index from May-September of 1984–2014. Statistically significant ( $p < 0.05$ ) trends are denoted by black crosses.



**Figure S4.** Same as Figure S3 except for correlations between burned area and the Interdecadal Pacific Oscillation (IPO) index. Crosses indicate areas with confidence level exceeding 10%.



**Figure S5.** Time series of the mean omega at 500 hPa (black) over the descending branch of the HC over the subtropical North Pacific (90-140°W, 30-45°N) and burned areas (red) in WUS from May-September. Positive value of omega denotes descending motion. Serial correlation of the two time series,  $r = 0.45$ , with  $p\text{-value} = 0.011$ .

**Table S1.** Detailed information about the five reanalysis datasets.

Name	20CR	ERA-Interim	JRA55	MERRA2	NCEP2
Source	NOAA-CIRES	ECMWF	JMA	NASA	NCEP-NCAR
Atmospheric forecast system	Global Forecast System	Integrated Forecast System	Global spectral model	Goddard Earth Observing System	Global Forecast System
Data assimilation method	Three-dimensional variational data assimilation (3DVAR)	Four-dimensional variational data assimilation (4DVAR)	4DVAR	3DVAR	3DVAR
Satellite data processing	/	Fast Radiative Transfer Model	Fast Radiative Transfer Model	Community Radiative Transfer Model	Retrieved
Spatial resolution	2°×2°×24-levels	0.7°×0.7°×37-levels	1.25°×1.25°×37-levels	0.5°×0.625°×42-levels	2.5°×2.5°×17-levels
Time period	1851–2014	1979-present	1958-present	1980-present	1979-present
Reference	Compo et al. (2011)	Dee et al. (2011)	Kobayashi et al. (2015)	Gelaro et al. (2017)	Kanamitsu et al. (2002)

**Table S2.** Slopes of the linear regression lines for the near-surface relative humidity (RH), cloud cover, surface downward shortwave (SW) radiation, and the Palmer drought severity index (PDSI), and correlations with burned area over the western US (WUS), Alaska (AK), and western-central Canada (WCC) from May-September of 1984–2014. The first column for each variable denotes the slope of the time series trend (in unit per decade). The second column denotes the correlation with burned area. Values marked with \*\* (\*) represent  $p < 0.01$  ( $p < 0.05$ ).

Region	Burned Area	RH		Cloud Cover		Downward SW		PDSI	
	slope km <sup>2</sup> /decade	slope %/decade	Corr	slope %/decade	Corr	slope W/m <sup>2</sup> /decade	Corr	Slope decade <sup>-1</sup>	Corr
WUS	7.5**	-0.69*	-0.64**	-5.9**	-0.56**	5.7**	0.49**	-0.4*	-0.44*
AK	8.6**	0.2	-0.002	-0.97	-0.03	3.2	-0.05	0.4	-0.23
WCC	3.9*	-0.4	-0.4*	0.02	0.25	-5.2*	-0.01	-0.5*	-0.43*