

Supporting Materials

Contributions of climate change, vegetation growth, and elevated atmospheric CO₂ concentration to variation in water use efficiency in subtropical China

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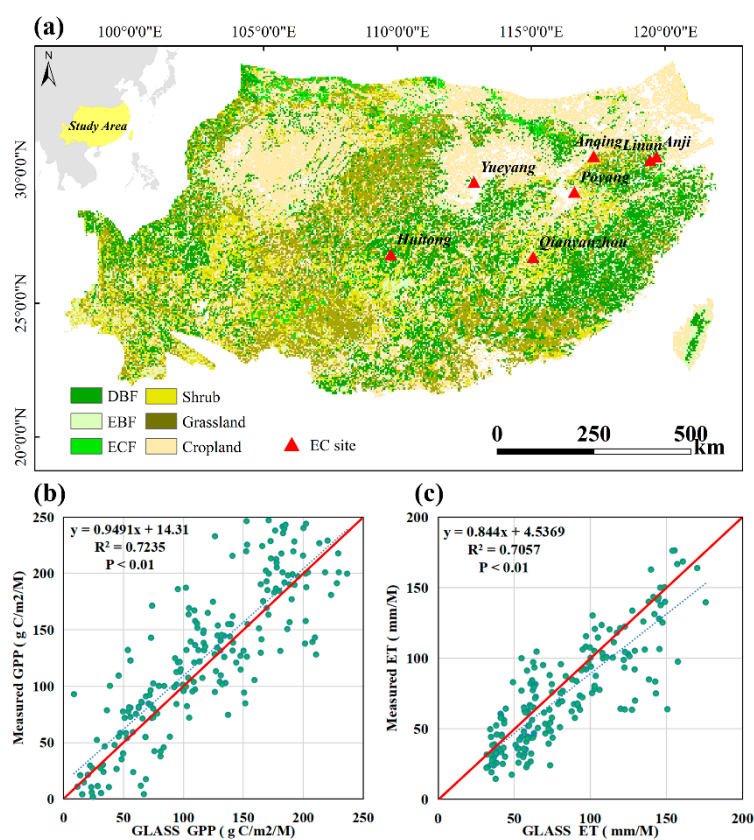


Figure. S1. Comparison of GPP and ET based on FLUXNET and GLASS. (a) Spatial distribution of flux towers, where the red triangle icons indicate the locations of flux towers. (b) Comparison of GPP between the two data sets; the abscissa represents the FLUXNET data, and the ordinate represents the GLASS data. (c) Comparison of ET between the two data sets. This study uses monthly data for verification, and the time span of the data is shown in Table S2.

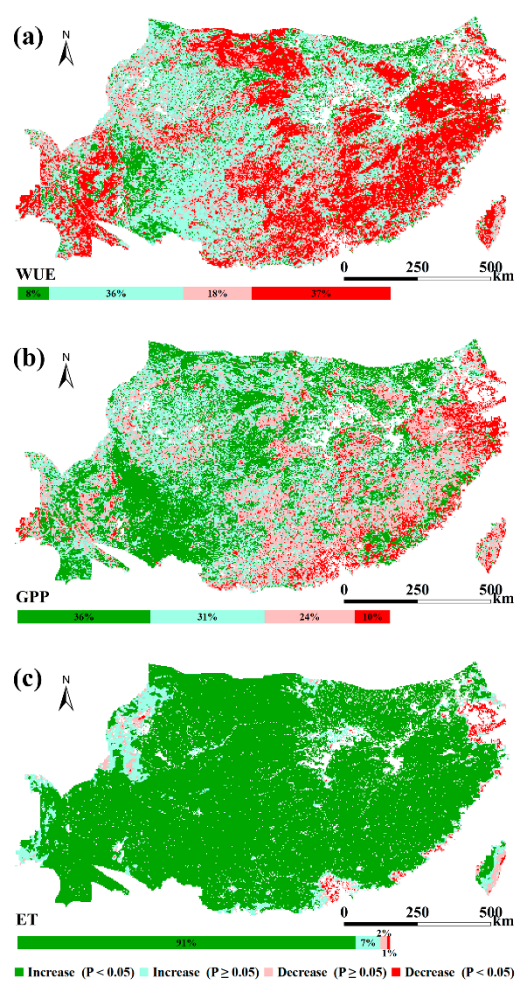


Figure. S2. Spatial pattern of the significant interannual trends in WUE (a), GPP (b), and ET (c) in subtropical China from 1982 to 2018.

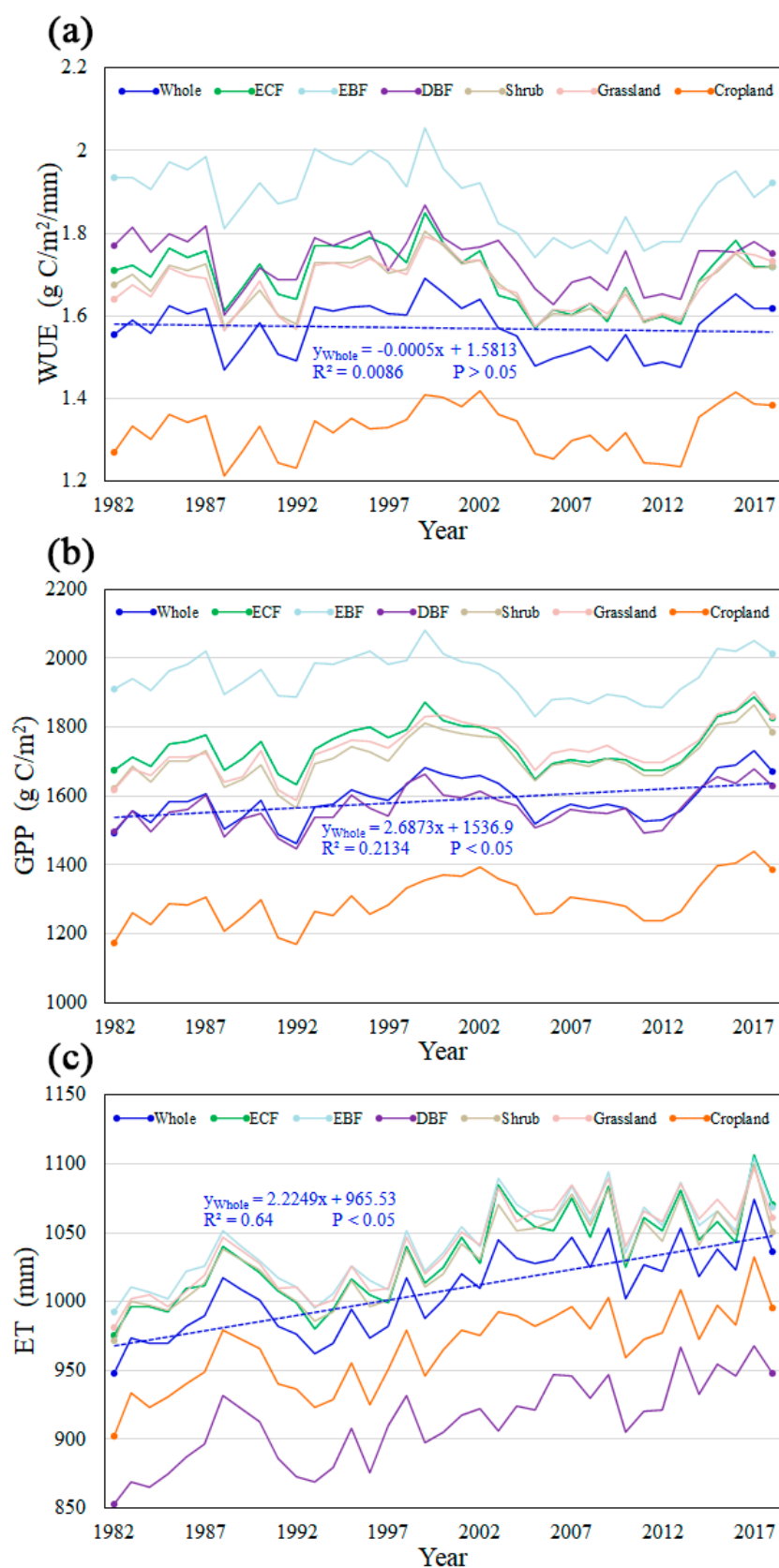


Figure. S3. Time series of annual WUE(a), GPP (b), ET(c) in different landscapes of the subtropical of China from 1982 to 2018.

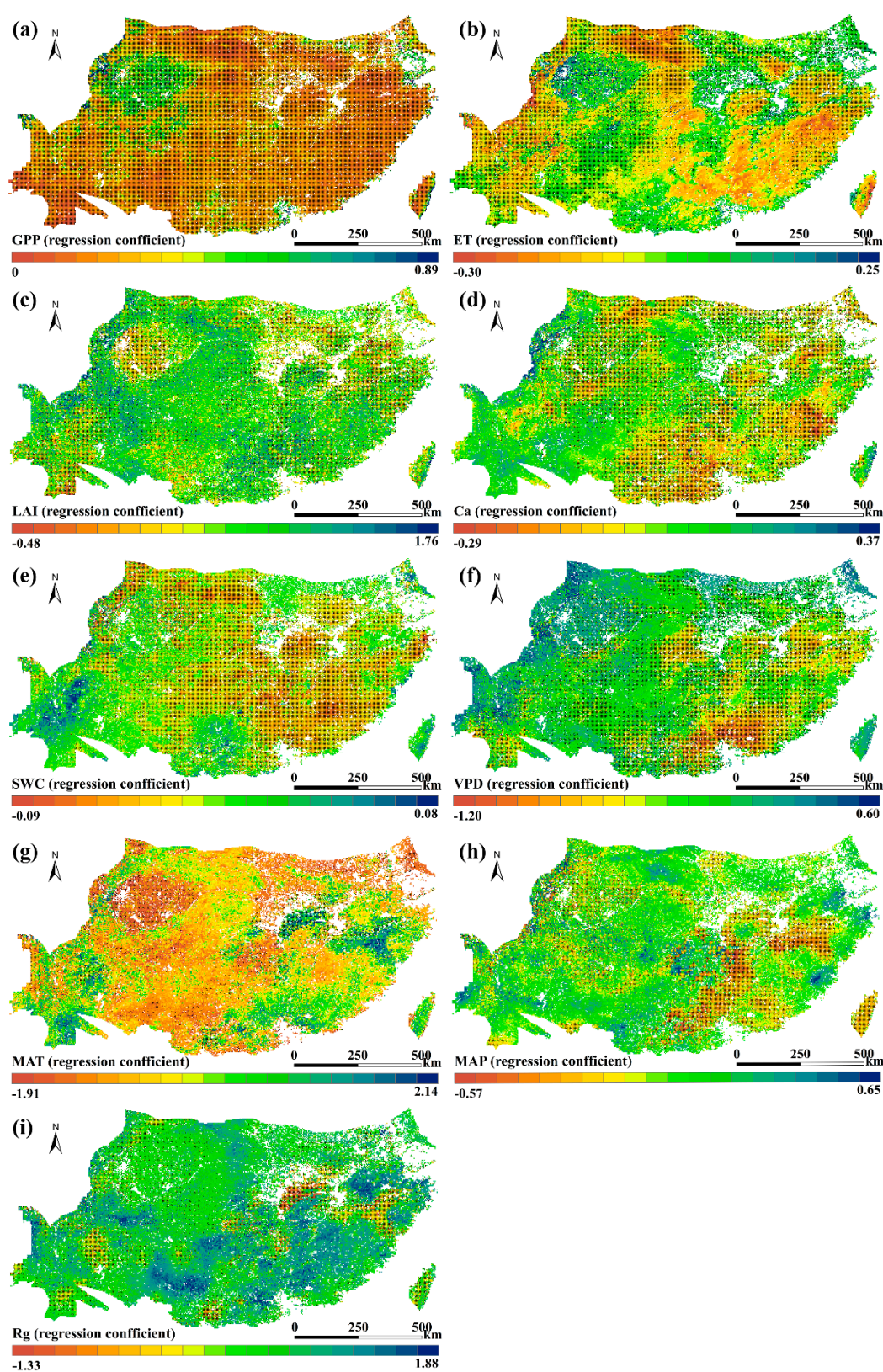


Figure. S4. Spatial pattern of the regression coefficients for the driving factors GPP (a), ET (b), LAI (c), Ca (d), SWC(e), VPD (f), MAT (g), MAP (h), and Rg (i) in the subtropical China. and the black dots in the figure showed the pixels that passed the $P < 0.05$ significance level test.

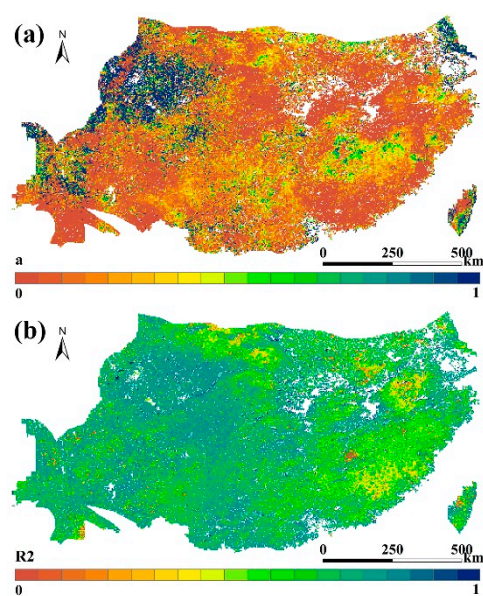


Figure. S5. Spatial pattern of ridge parameter “a” (a), coefficient of determination “R²” (b).

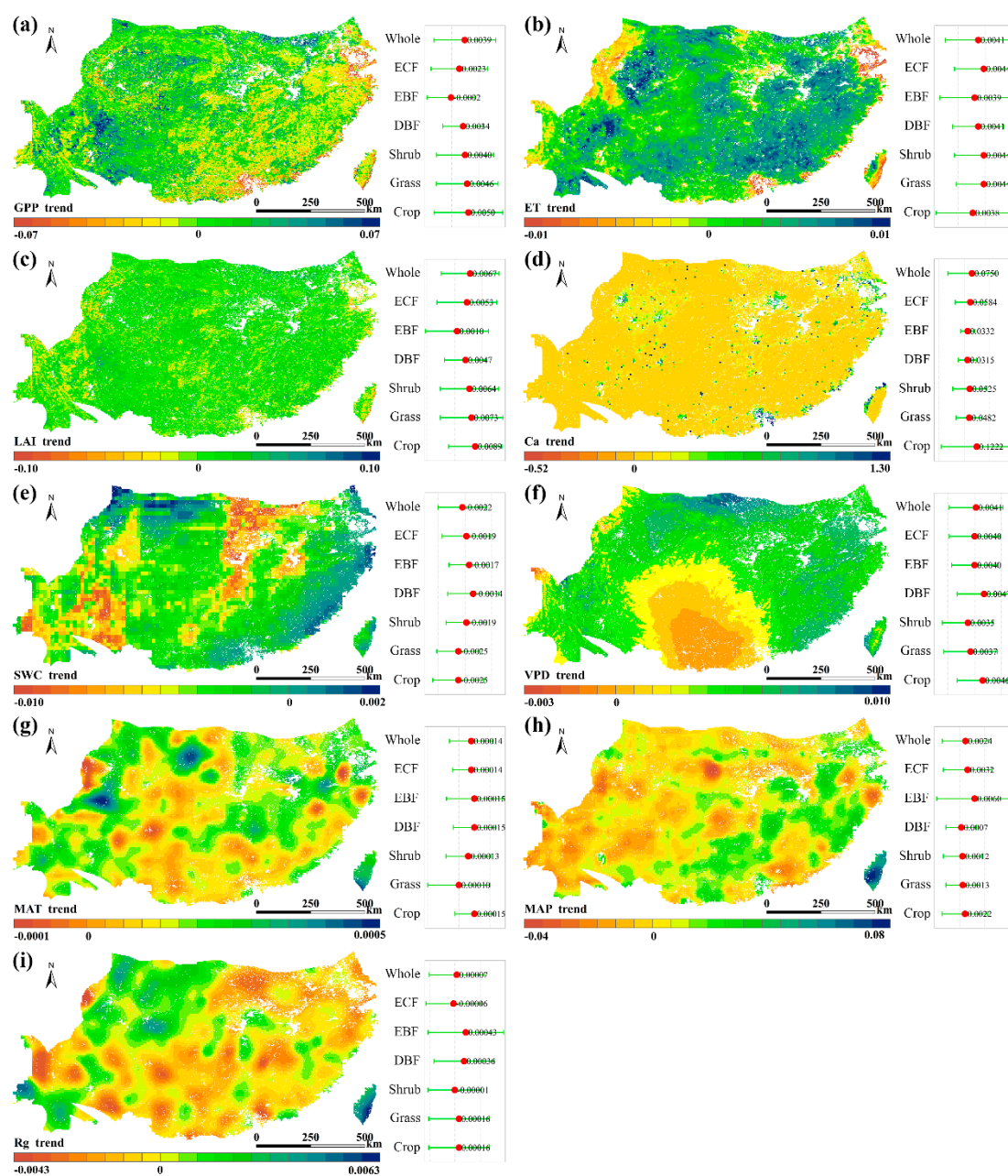


Figure S6. Spatial pattern of the normalized interannual trends in GPP (a), ET (b), LAI (c), Ca (d), SWC(e), VPD (f), MAT (g), MAP (h), and Rg (i) in the subtropical China from 1982 to 2018. The right insets indicate the interannual trends of different landscapes, with whiskers indicating the standard deviations of all grid cell values.

Table. S1. Main data.

Data	Resolution	Source	Site
GPP			
ET	0.05° × 0.05°	Global land surface satellite (GLASS)	http://www.geodata.cn/thematicView/GLASS
Leaf area index (LAI)			
temperature			
Precipitation			
specific humidity	0.1° × 0.1°	China meteorological forcing dataset (1979–2018)	http://data.tpdc.ac.cn/zh-hans
shortwave radiation			
Vapor Pressure Deficit (VPD)	1 km × 1 km	Terra Climate: Monthly Climate and Climatic Water Balance for Global Terrestrial Surfaces – VPD	https://code.earthengine.google.com
Soil water content (SWC)	0.25° × 0.25°	GLDAS Noah Land Surface Model L4 monthly 0.25 × 0.25degree V2.0	https://disc.gsfc.nasa.gov/datasets/GLDAS_NOAH025_M_2.0
CO2	1 km × 1 km	Center of Global Environmental Research	https://db.cger.nies.go.jp/dataset
Vegetation Types	1 km × 1 km	Chinese vegetation regionalization	https://www.resdc.cn
Climate division	-	China's climate division	https://www.resdc.cn

Table S2. Eddy covariance (EC) Flux sites used for model verification.

	Name	Lat	Long	Period	References
GPP	Qianyanzhou	26.73	115.07	2003.01–2010.12	ChinaFLUX
	Huitong	26.83	109.75	2008.01–2009.12	[6]
	Yueyang	29.53	112.86	2005.07–2007.07	[2]
	Anji	30.50	117.33	2005.07–2007.07	[2]
	Anqing	30.48	119.67	2011.01–2014.12	[1]
	Linan	30.35	119.44	2016.01–2016.12	[4]
ET	Qianyanzhou	26.73	115.07	2003.01–2010.12	ChinaFLUX
	Huitong	26.83	109.75	2009.01–2009.12	[5]
	Yueyang	29.53	112.86	2006.01–2006.12	[5]
	Linan	30.35	119.44	2016.01–2016.12	[4]
	Poyang	29.16	116.61	2013.07–2014.07	[3]

Table S3. All the variables with abbreviations and explanations used in this study.

NO	Abbreviations	Explanations
1	Ca	Elevated atmospheric CO ₂ concentration
2	Cli	Climate change
3	Crop	Cropland
4	DBF	Deciduous broad-leaved forest
5	EBF	Evergreen broad-leaf forest
6	ECF	Evergreen coniferous forest
7	ET	Evapotranspiration
8	GEE	Google Earth Engine
9	GLASS	Global Land Surface Satellite
10	GPP	Gross Primary Productivity
11	Grass	Grassland
12	LAI	Leaf area index
13	MAP	Annual accumulated precipitation
14	MAT	Annual average temperature
15	Rg	Annual solar radiation
16	STC	Subtropical region of China
17	SWC	Soil water content
18	VPD	Vapor pressure deficit
19	WUE	Water use efficiency

References

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