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Evaluation of global terrestrial evapotranspiration using state-of-the-art approaches in remote sensing, machine learning and land surface modeling

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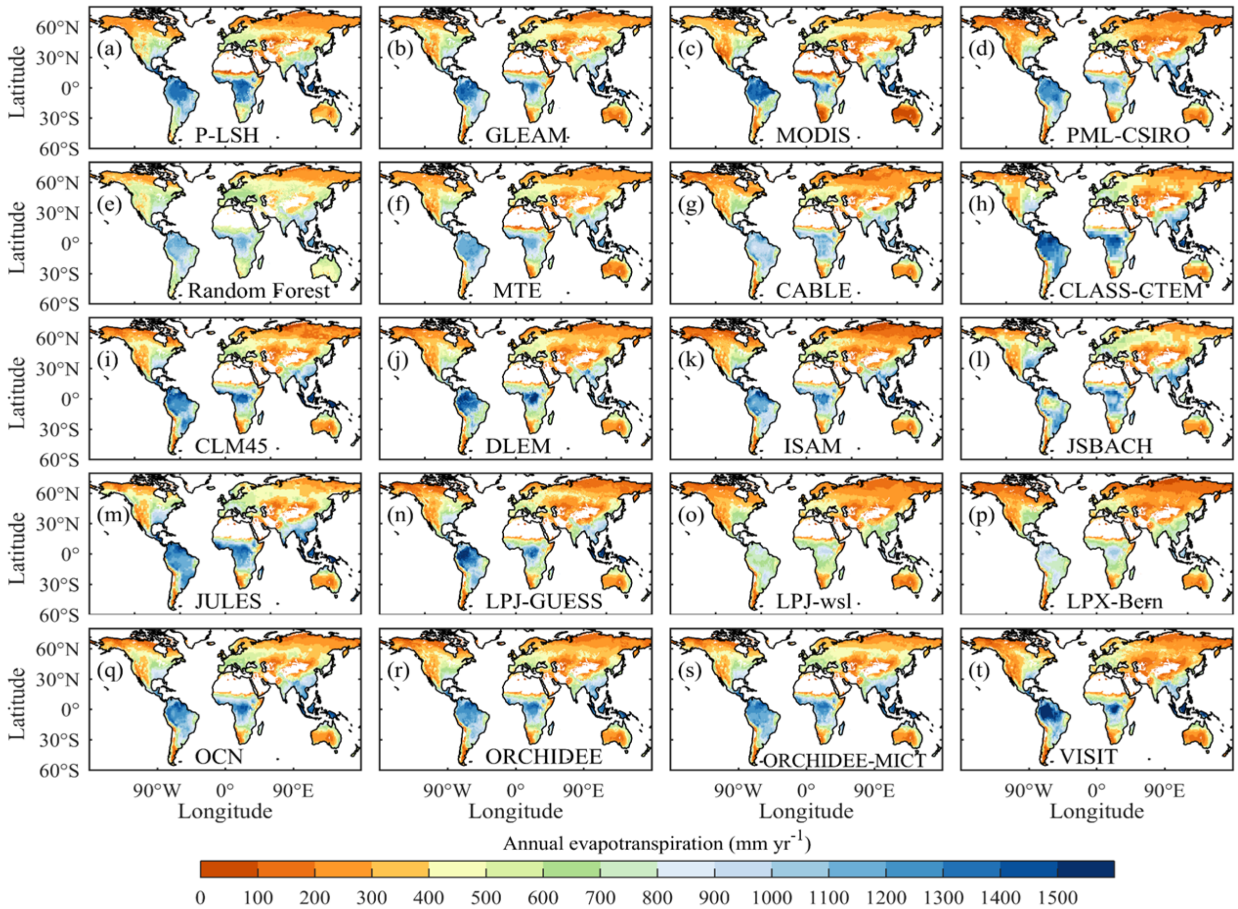

Figure S1. Spatial distributions of mean annual ET derived from (a-d) remote sensing-based physical models, (e-f) machine learning algorithms, and (g-t) TRENDY LSMs.

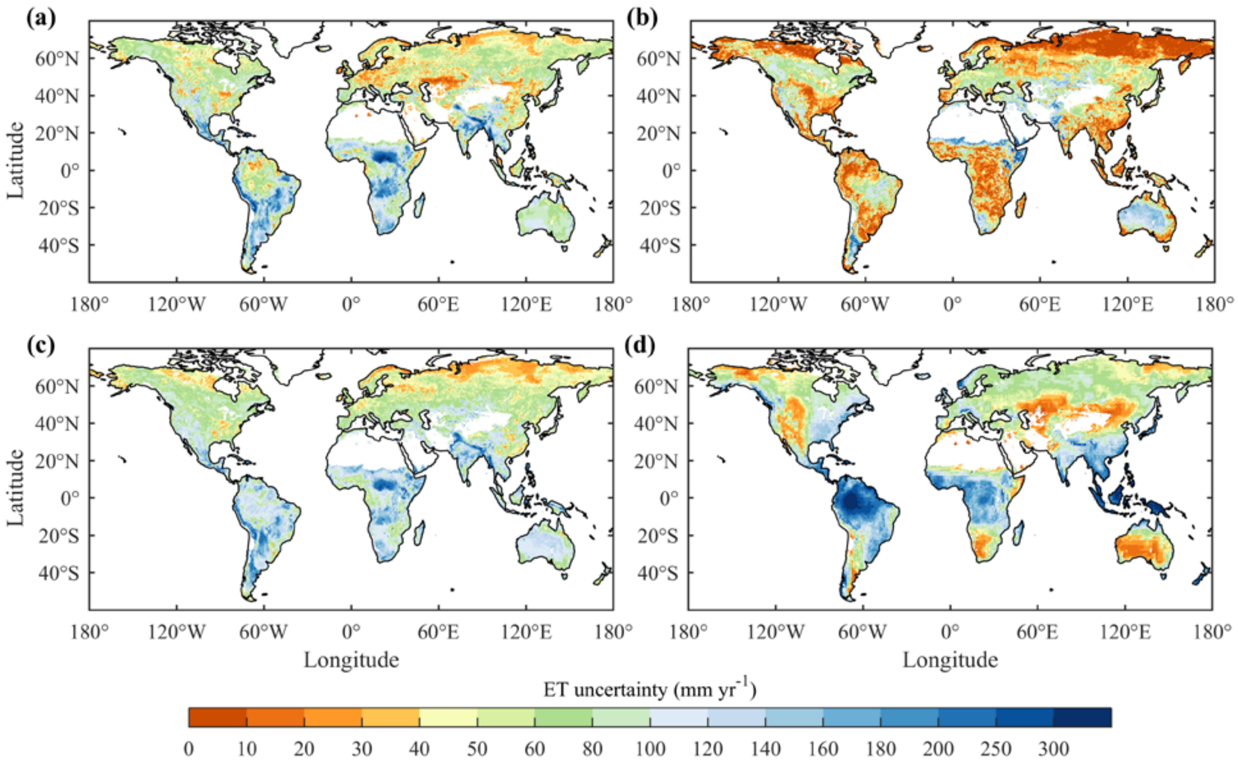

Figure S2. Spatial distribution of uncertainty of ET (standard deviation) for each category. (a)-(d) show the results of remote sensing-based physical models, machine learning algorithms, benchmark data and LSMs.

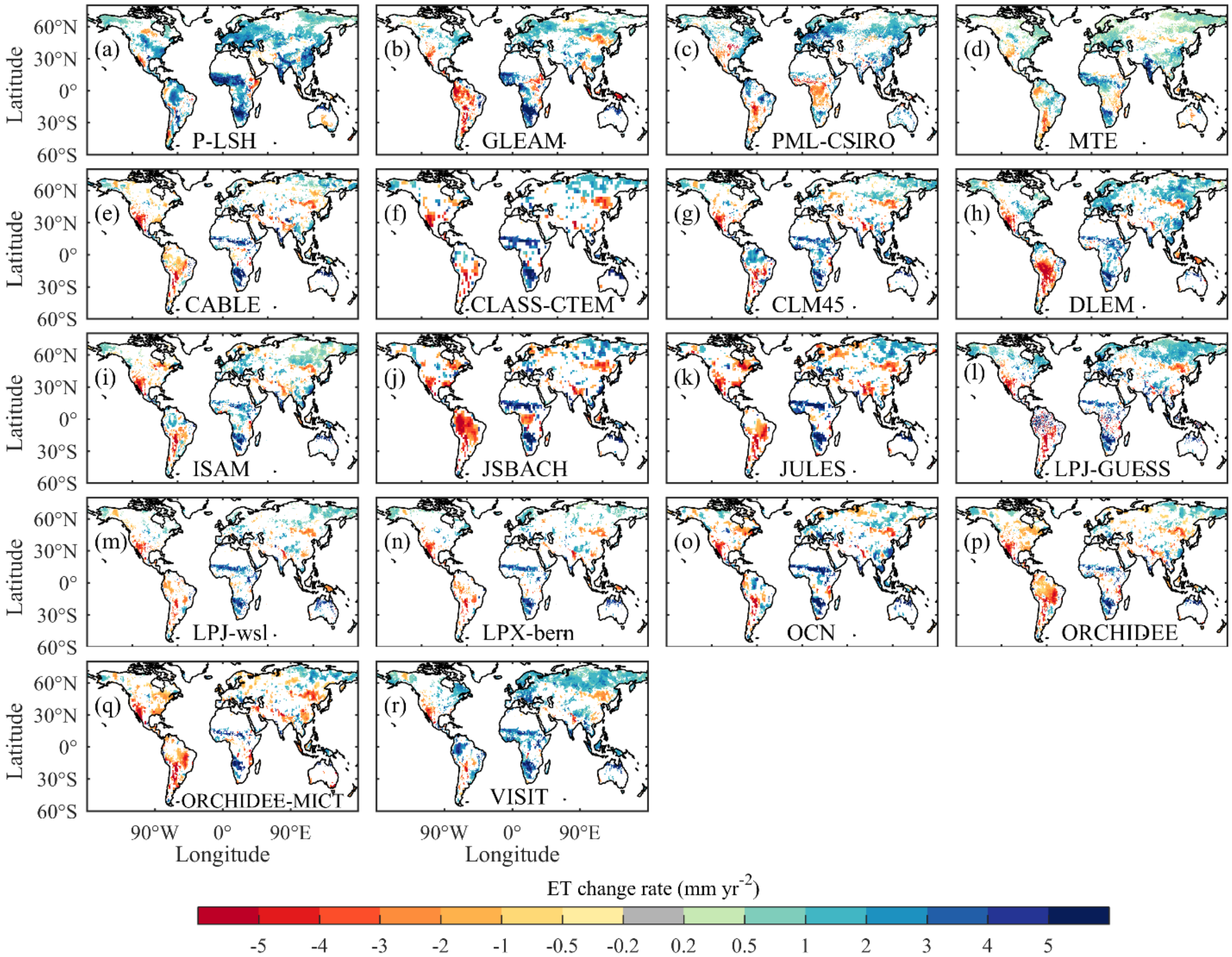

Figure S3. Spatial distributions of ET trends derived from (a-c) remote sensing-based physical models, (d) machine learning algorithm, and (e-r) TRENDY LSMs. The study period is from 1982 to 2011. Regions with non-significant trends were excluded.

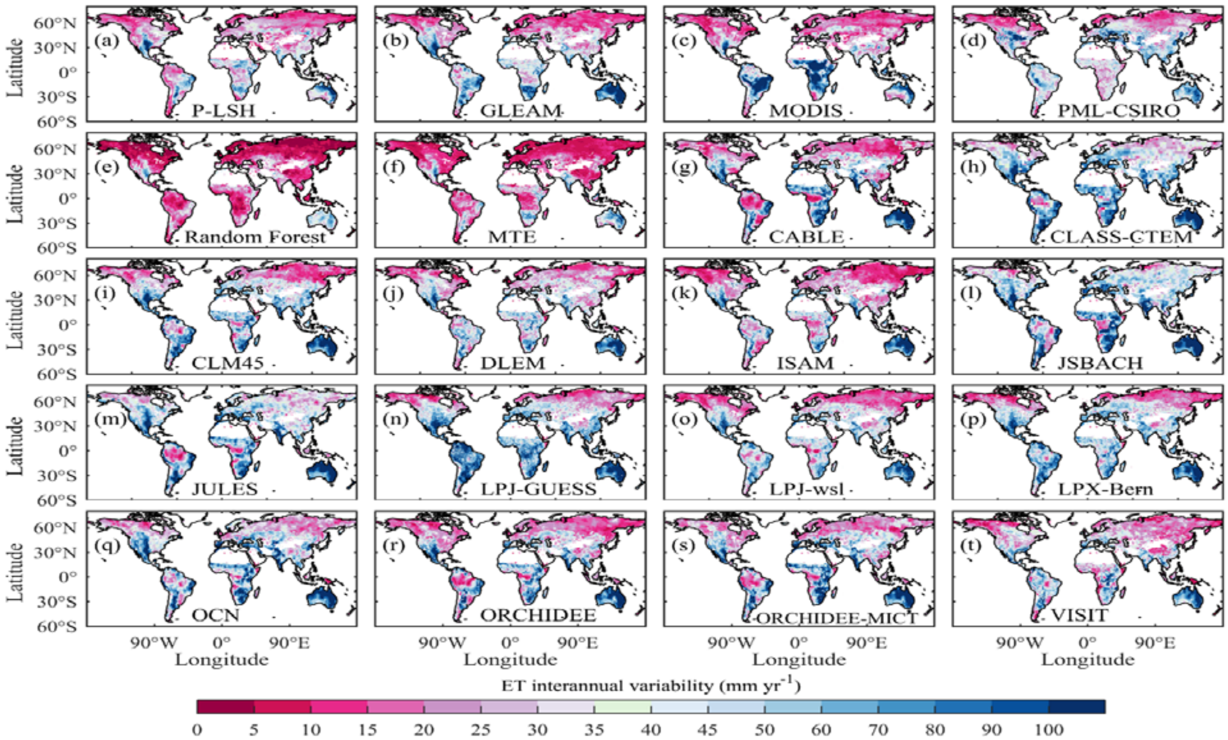

Figure S4. Spatial distributions of the inter-annual variability in global ET derived from (a-d) remote sensing-based physical models, (e-f) machine learning algorithms, and (g-t) TRENDY LSMs.

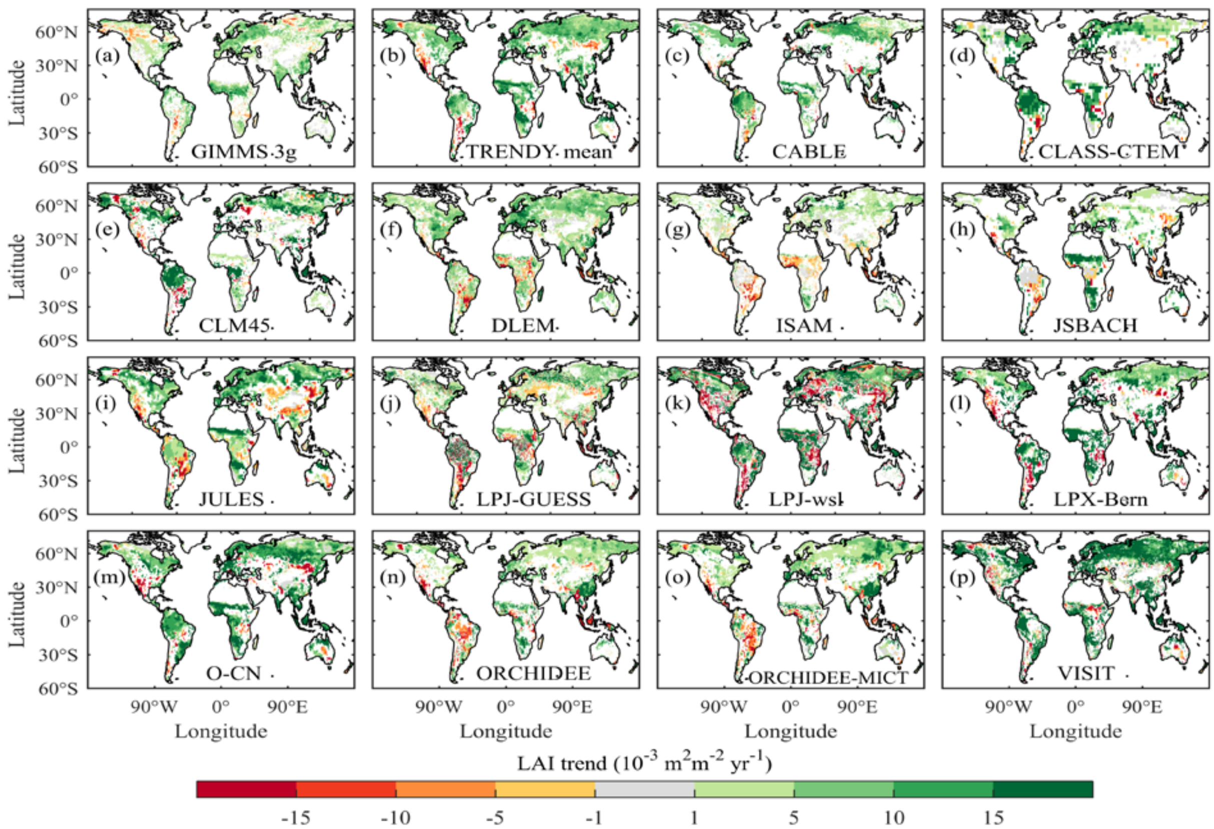

Figure S5. Spatial distributions of the LAI trend. (a-b) show the result of remote sensing data and the ensemble mean of TRENDY models. (c-p) show the results of TRENDY models.

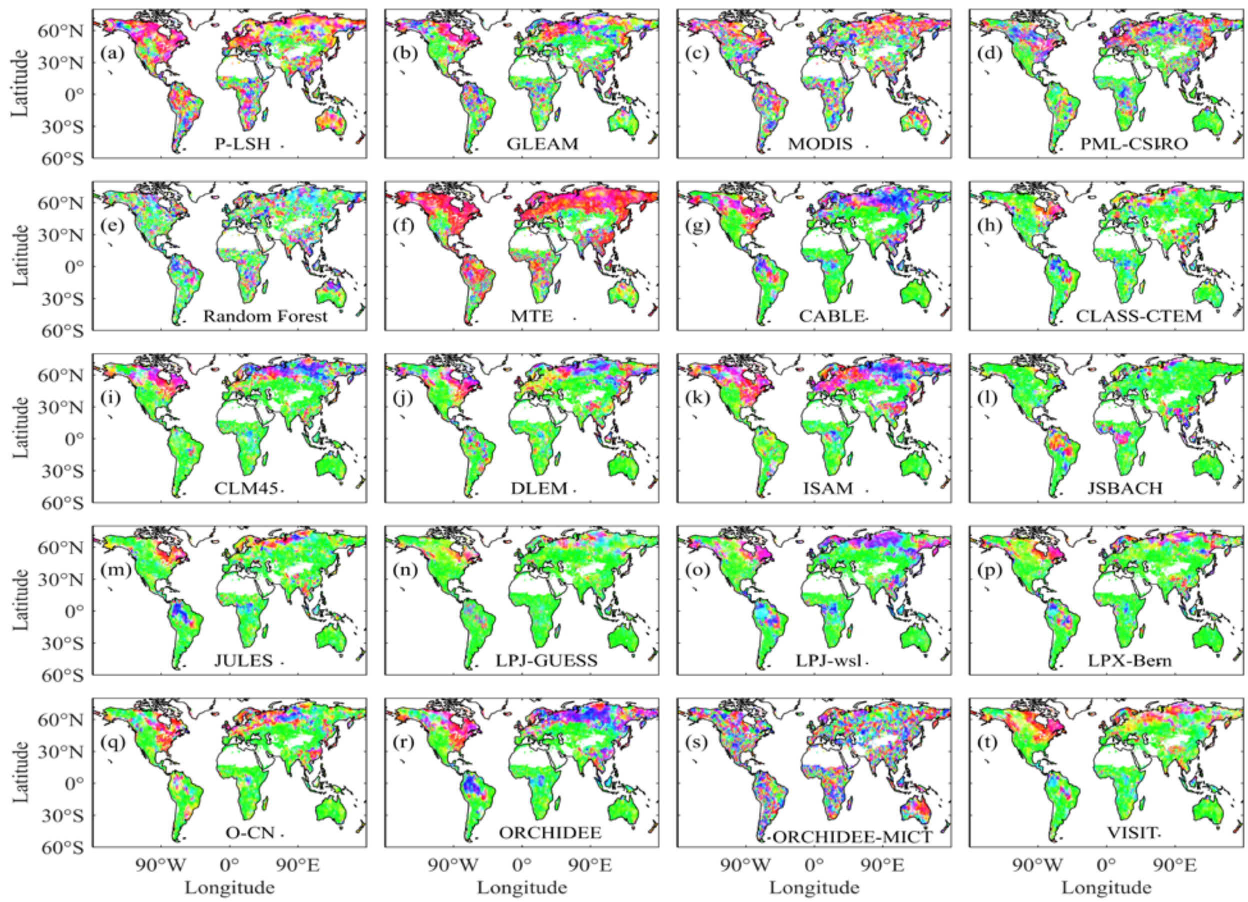

Fig S6. Spatial distributions of environmental controls on inter-annual variation of ET derived from (a-d) remote sensing-based physical models, (e-f) machine learning algorithm, and (g-t) TRENDY LSMs. (The legend is the same with that in Figure 6).

Table S1. Summary of global ET estimates given by different models

Datasets	Global terrestrial ET		Temporal extent	Barren included	References
	(mm / yr)	($\times 10^3 km^3$/yr)			
SRB PM	562	73	1984-2007	Yes	Vinukollu et al. (2011)
SRB PT	470	61	1984-2007		
SRB SEBS	514	67	1984-2007		
SRB_{qc} PM	592	77	1984-2007		
SRB_{qc} PT	497	65	1984-2007		
SRB_{qc} SEBS	562	73	1984-2007		
Mean of 15 GSWP-2 models	488		1986-1995	Yes	Dirmeyer et al. (2006)
Mean of 4 reanalysis data	563		1989-1995	Yes	Mueller et al. (2013)
Mean of 29 LSMs	423		1989-1995		
Mean of 29 LSMs, 4reanalysis and 7 diagnostic products	493		both 1989-1995 and 1989-2005		
Remote sensing and reanalysis	485		1985-1989 2000-2004	Yes	Trenberth et al. (2009)
Mean of 4 LSMs, 3 reanalysis and 5 diagnostic products	~579		1994	Unknown	Jimenez et al., (2011)
Mean of 6 diagnostic products	606		1989-1995	No	Mueller et al. (2011)
Mean of 19 LSMs	544				
Mean of 5 reanalysis products	631				
Mean of 19 LSMs, 6 diagnostic and 5 reanalysis products	569				
Mean of 11 IPCC AR4 GCMs	602				
NCEP RS PM	539		1983-2006	No	Zhang et al. (2010)
JULES		~65	1950-2000	Unknown	Alton et al. (2009)
Mean of 6 diagnostic products		~75	1982-2011	No	Zeng et al. (2018)
SVM-merged algorithm	472		2003-2005	Yes	Yao et al. (2017)
WB-MTE	593	71	1982-2009	No	Zeng et al. (2014)
WB-based empirical model	604		1982-2009	No	Zeng et al. (2012)
MODIS new algorithm		63	2000-2006	No	Mu et al. (2011)
MODIS old algorithm		46	2000-2006	No	Mu et al. (2007)
Empirical model	452		1985-1995	Yes	Wang and Liang (2008)
RF		72.9	2001-2011	No	This paper
MTE		64.3			
P-LSH		72.5			
GLEAM		67.5			
MODIS		63.8			
PML-CSIRO		63.1			
CABLE		63.5			
CLASS-CTEM		68.7			
CLM45		68.9			
DLEM		62.3			
ISAM		67.2			

JSBACH	64.4
JULES	75.7
LPJ-GUESS	65.4
LPJ-wsl	50.7
LPX-Bern	50.7
OCN	69.4
ORCHIDEE	65.9
ORCHIDEE-MICT	70.8
VISIT	62.2

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