Supplementary Information for "Revisiting the contribution of transpiration to global terrestrial evapotranspiration"

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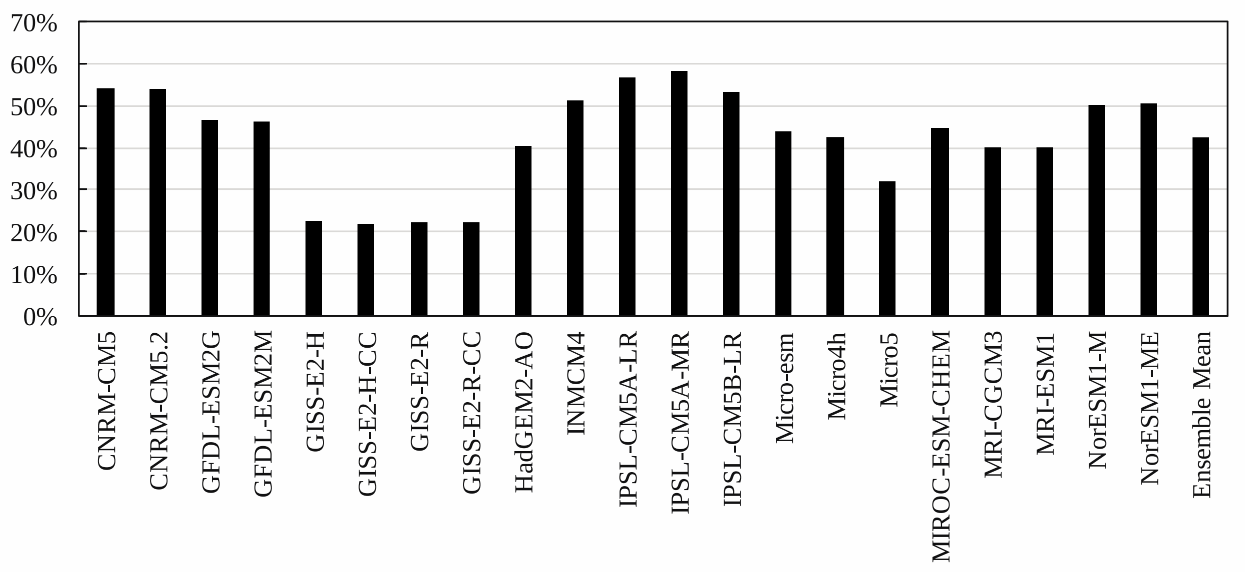

Figure S1. *T/(E+T+I)* estimated from 22 models in *CMIP5*.

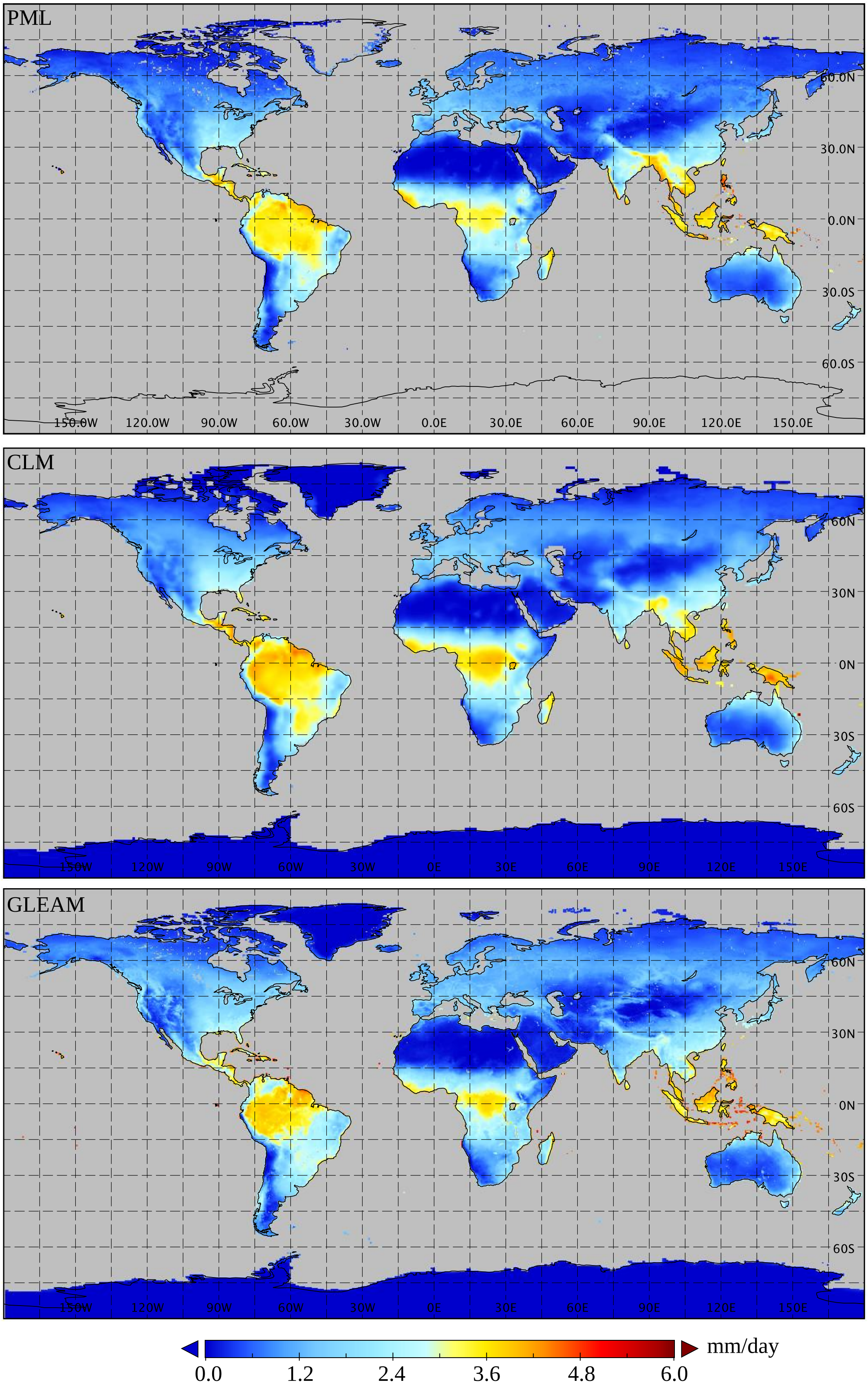

Figure S2. *ET* estimated from *PML*, *CLM* and *GLEAM* (mean of 2004-2010).

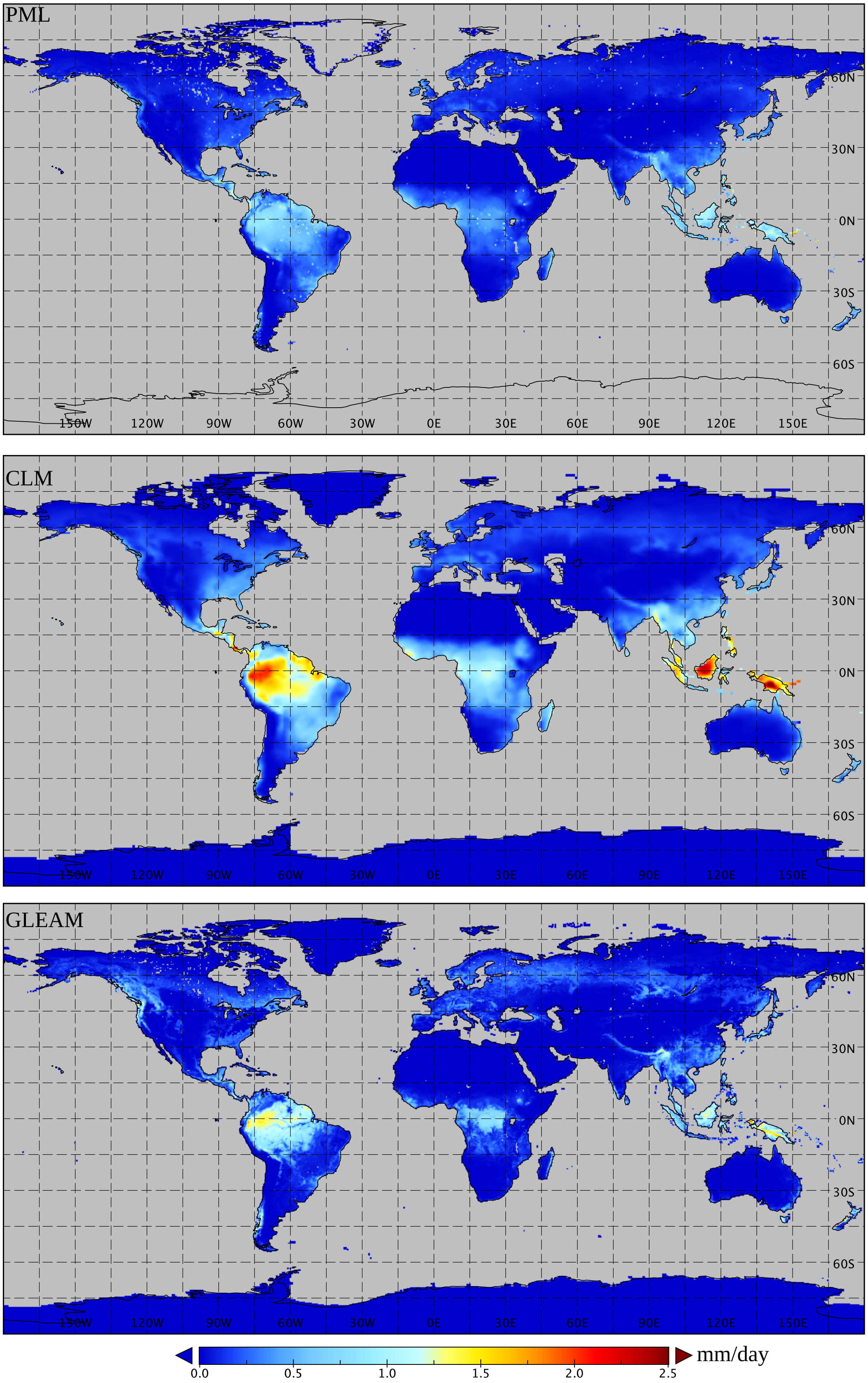

Figure S3. *I* estimated from *PML*, *CLM*, *GLEAM* (mean of 2004-2010).

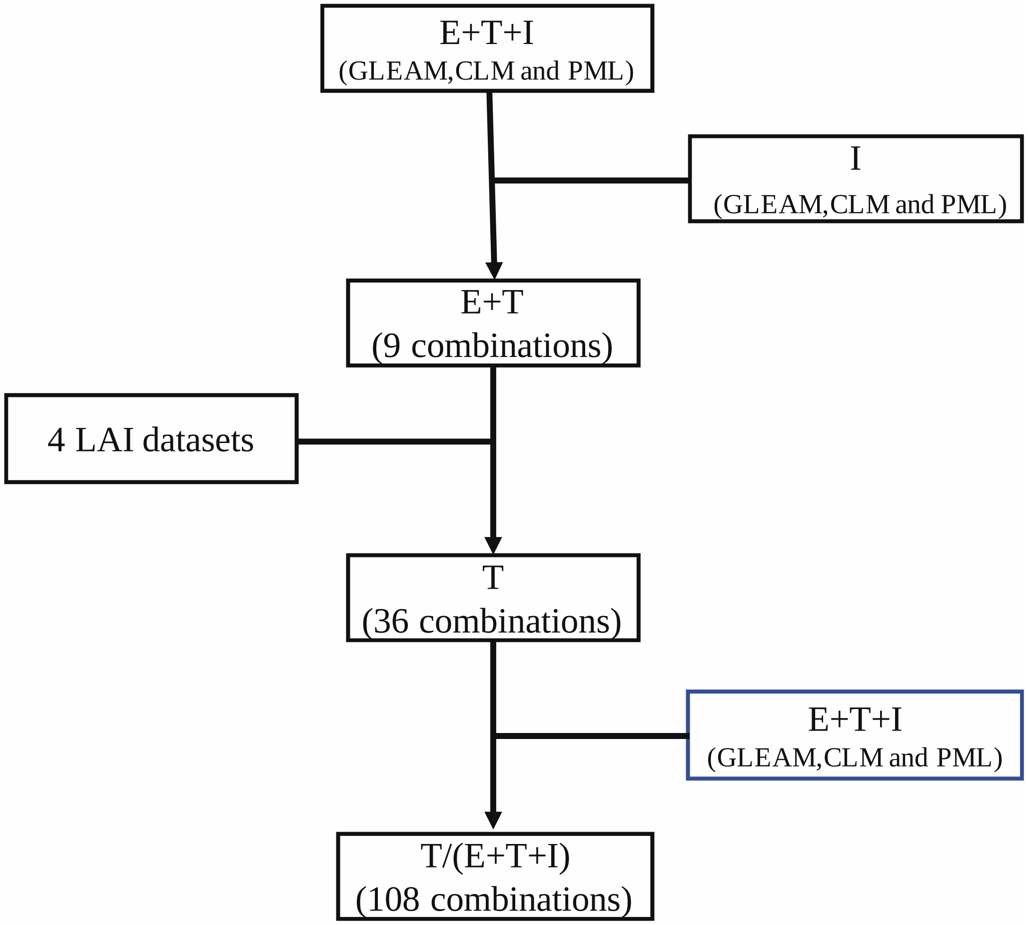

Figure S4. Flow diagram of our *ET* partitioning method.

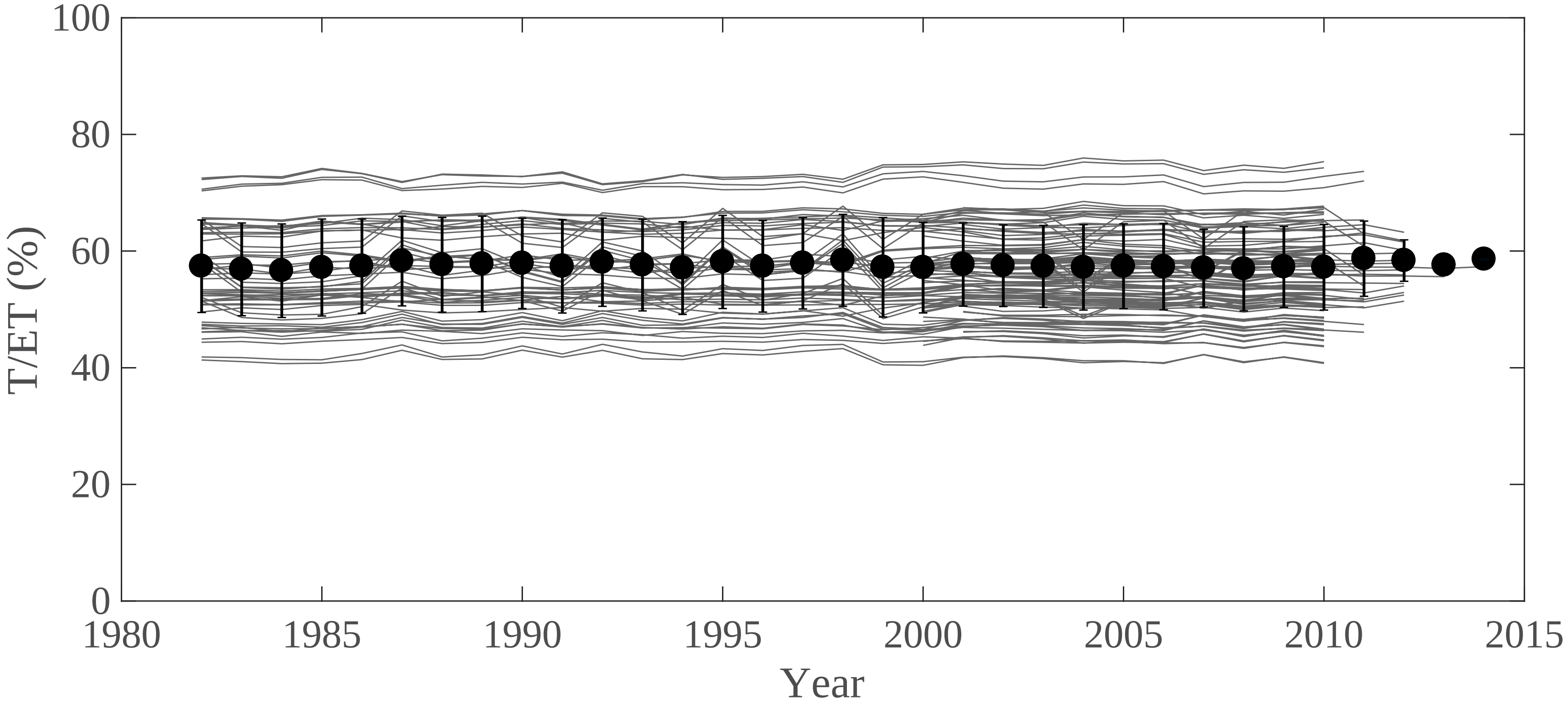

Figure S5. Year-to-year variation of T/(E+T+I) estimated from the 108 ensemble members (grey lines). The filled circles with error bar is the ensemble mean and its standard deviation.

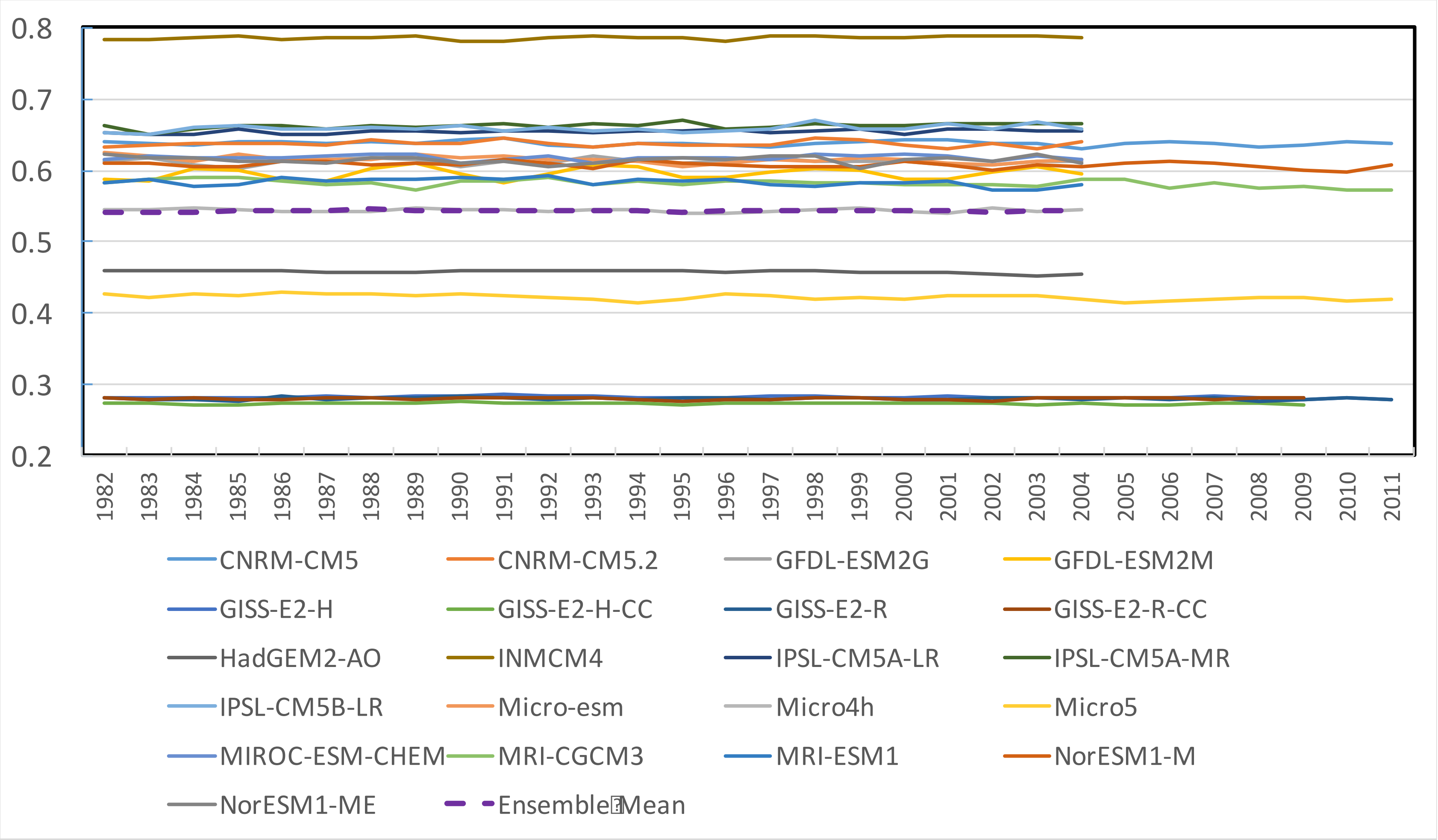

Figure S6. Year-to-year variation of *T/(E+T+I)* estimated from *CMIP5*.

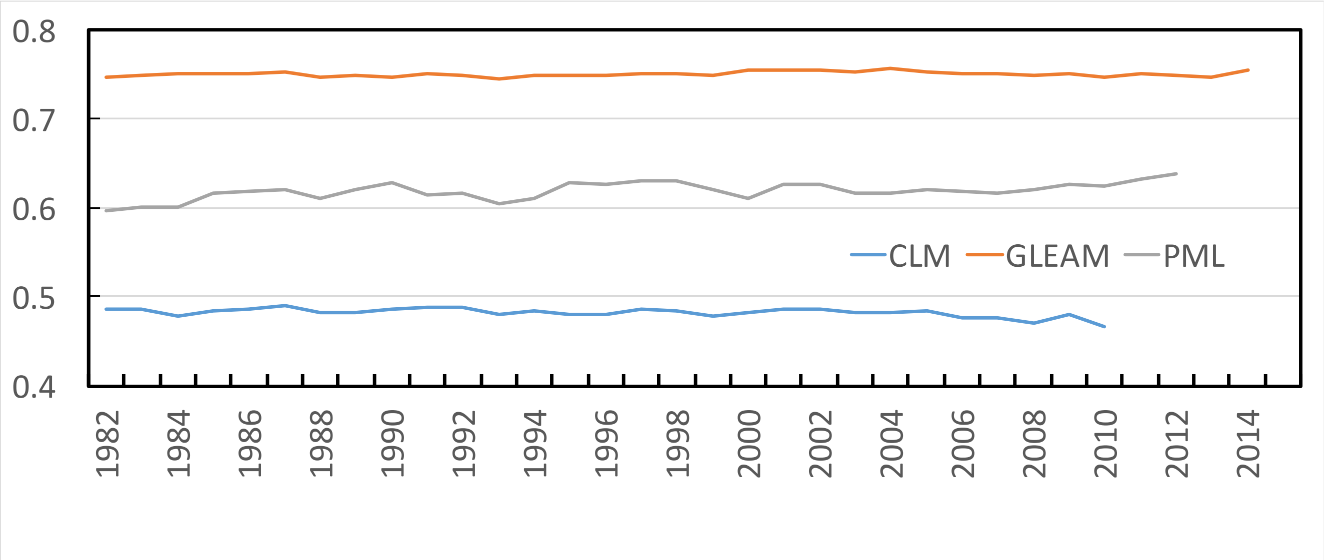

Figure S7. Year-to-year variation of *T/(E+T+I)* estimated from *CLM*, *GLEAM* and *PML*.

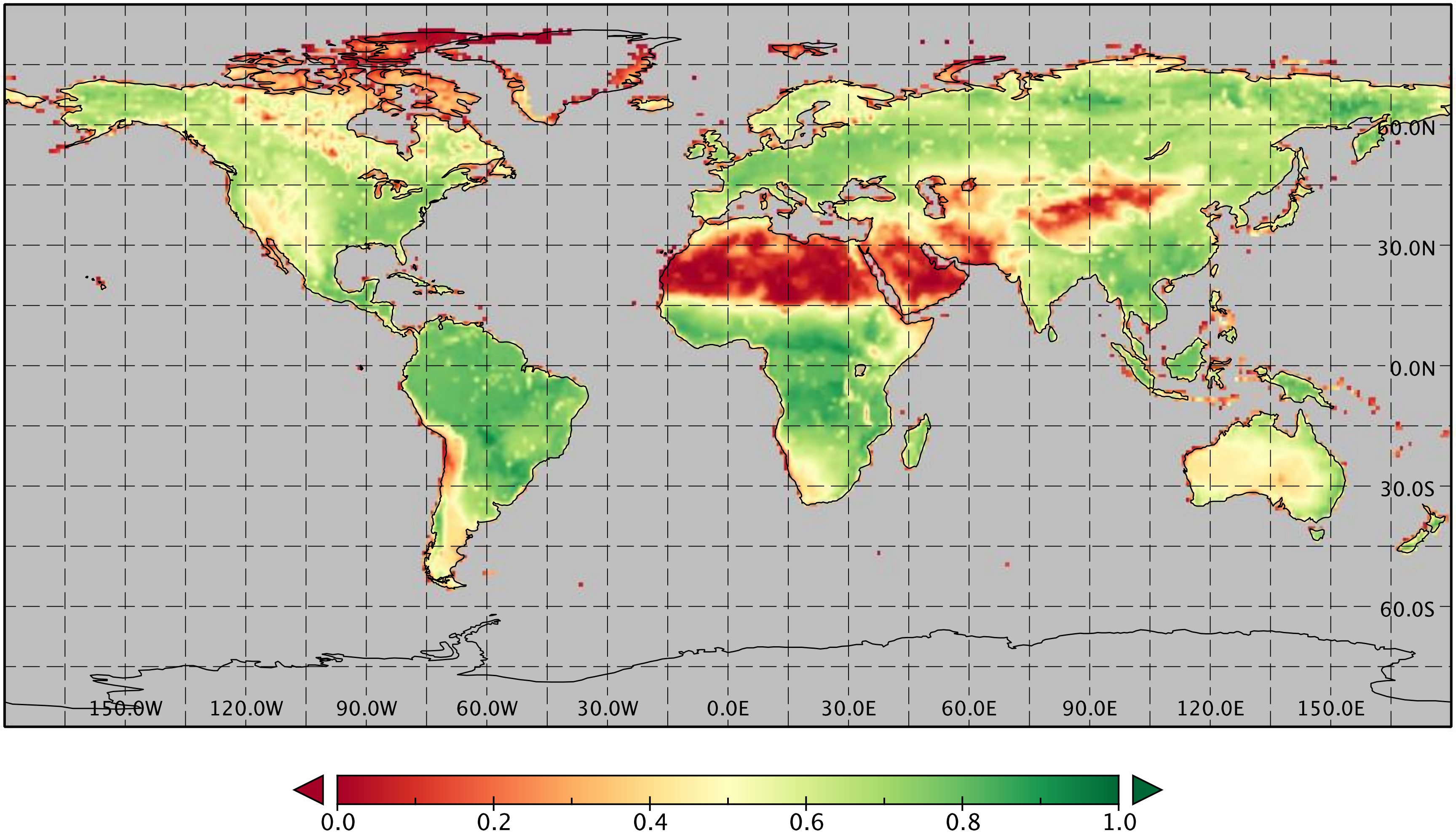

Figure S8. The ensemble means of *T/(E+T)* ratio using different data sources for *ET*, *I* and *LAI*, with a total of 108 different data source permutations.

Table S1. Published studies used in the LAI regression analysis.

Study	Latitude	Longitude	Measurement methods				Measurement year	Ecosystems
			E	*T*	*I*	*E*+*T*+*I*		
Broad leave forests								
Wilson et al. [2000]	36.0	-84.3	Eddy covariance			Eddy covariance	1998	Oak, maple and hickory
Wilson et al. [2001]	36.0	-84.3	Eddy covariance	Sap flow	-	Eddy covariance	1998-1999	Oak, gum and maple
Kelliher et al. [1992]	-42.1	172.2	Lysimeter	Sap flow	-	Eddy covariance	1991	Beech
Mitchell et al. [2009]	-32.3	117.9	Portable ventilated evaporation dome	Sap flow	Precipitation – throughfall-stemflow	-	2006-2007	Eucalypt woodlands
Granier et al. [2000]	48.7	7.1	-	Sap flow	Precipitation – throughfall-stemflow	Eddy covariance	1995	Beech

Oishi et al. [2008]	37.0	-79.1	Eddy covariance	Sap flow	Precipitation – throughfall-stemflow	Eddy covariance	2002-2005	Oak and hickory
Tang et al. [2006]	46.2	89.4	-	Sap flow	-	Eddy covariance	2002-2003	Sugar maple
Roupsard et al. [2006]	-15.4	167.2	-	Sap flow	-	Eddy covariance	2003	Coconut palms
Mitchell et al. [2012]	-36.68	146.65	Portable evaporation dome	Sap flow	Precipitation – throughfall-stemflow	-	2008-2009	Eucalypt
Barbour et al. [2005]	43.2	170.3	-	Sap flow	-	Eddy covariance	2001	Mixed conifer–broad-leaved forest
Herbst et al. [2008]	51.45	-1.27	-	Sap flow	Precipitation – throughfall-stemflow	Eddy covariance	2006-2007	Oak and birch
Liu et al. [2015]	12.50	23.12	-	Sap flow	-	Eddy	2003-2011	Schima

						covariance		superba and chinensis
Needle leave forests								
Diawara et al. [1991]	44.7	-0.8	-	Sap flow		Eddy covariance	1988	Pines
Jian et al. [2015]	35.6	104.7	Micro-lysimeters	Sap flow	Precipitation – throughfall-stemflow	-	2009-2013	Pines
Unsworth et al. [2004]	45.8	-122.0	Eddy covariance	Sap flow	-	Eddy covariance	1998-1999	Hemlock and red cedar
Benyon and Doody [2015]	-37.8	140.8	mini-lysimeters	Sap flow	Precipitation – throughfall-stemflow	-	1969-2007	Pinus and Eucalyptus
Tsuruta et al. [2016]	34°96′	136.0	weighing lysimeters	-	-	Eddy covariance	2001-2007	Japanese cypress
Oren et al. [1998]	32.9	80.0	-	Sap flow	-	Eddy covariance	1994	Loblolly pine

Raz-Yaseef et al. [2012]	31.4	35.0	Chamber	Sap flow	-	Eddy covariance	2003-2007	Pinus
Simonin et al. [2007]	35.3	-111.6	Chamber	Sap flow	-	local water balance	2002-2003	Pine
Domec et al. [2012]	35.1	76.11	Automatic chambers	Sap flow	Precipitation – throughfall-stemflow	Eddy covariance	2007-2009	Pine
Lin et al. [2012]	29.3	101.5	Isotope	Sap flow	Precipitation – throughfall-stemflow	Eddy covariance	2008-2009	Fabri forest
Sun et al. [2014]	36.4	139.6	Weighing lysimeters	-	Precipitation – throughfall-stemflow	Granier method	2011	Japanese cypress
Jansson et al. [1999]	60.5	17.3	-	Sap flow	-	Eddy covariance	1994	Scots pine
Berkelhammer et al. [2016]	40.03	−105.55	Isotope	Isotope	-	Isotope	2010-2011	Pine

Shrubs and grasses								
Stannard and Weltz [2006]	29.8	52.8	Portable chamber	Portable chamber	-	Eddy covariance		Mesquite and Ocatillo
Gibbens et al. [1996]	32.6	-106.8	Microlysimeters	-	-	Energy balance	1991-1992	Grama, Creosotebush, Tobosa, Tarbush and Mesquite
Dugas et al. [1996]	32.8	-106.8	Microlysimeters	-	-	Energy balance	1991-1992	Grama, Creosotebush, Tobosa, Tarbush and Mesquite
Li et al. [2015]	43.5	116.5	Chamber	-	-	Eddy covariance	-	Stipa grandis
Yepez et al. [2003]	31.7	-110.9	Isotope	Isotope	-	Isotope	2001	Wrightii, Spreng, Lepidium thurberi Wooton and Chenopodium

								album
Xu et al. [2008]	30.9	103.0	Isotope	Isotope	-	Isotope	2006	Cystopteris montana
Yepez et al. [2005]	31.8	-110.9	Isotope	Isotope	-	Isotope	2003	Heteropogon contortus
Good et al. [2014]	0.3	36.9	Isotope	Isotope	-	Isotope	2011	Cynodon genus
Wang et al. [2010]	-	-	Isotope	Isotope	-	Isotope	2008	Mesquite
Wang et al. [2015]	36.1	140.1	Isotope	Isotope	-	Isotope	2011	Solidago altissima, Miscant- hus sinensis and Imperata cylindrica
Allen and Grime [1995]	13.23	2.23	-	Sap flow		Eddy covariance	1990	Annual herbs and grasses
Zhao et al. [2016]	39.35	100.1	Micro-lysimeters	Sap flow	Precipitation – throughfall-	Energy balance	2008-2010	alligonum mongolicum and Nitraria sphaerocarpa

					stemflow			and annual herbs
Cavanaugh et al. [2011]	31.90	-110.84	-	Sap flow	-	Eddy covariance	2008	Creosotebush
Crops								
Allen [1990]	35.9	37.1	Micro-lysimetry	-	-	Water balance	1986	Barley
Ashktorab et al. [1994]	38.54	-121.75	Lysimeter	-	-	Large weighing lysimeter	1984	Tomato
Ham et al. [1990]	33.6	-101.8	-	Sap flow	-	Energy balance	1989	Cotton
Wallace et al. [1993]	13.2	2.3	Soil lysimeters	Automatic diffusion porometer		Eddy covariance	1985	Neem
Massman and Ham [1994]	33.6	-101.8	-	Sap flow	-	Energy balance	1989	Cotton
Ham and Heilman [1991]	33.6	-101.8	-	Sap flow	-	Energy balance	1989	Cotton
Gutiérrez and Meinzer [1994]	21.9	-154.5	-	Sap flow	-	Energy balance	1991	Coffee

Sepaskhah and Ilampour [1995]	29.8	52.8	Microlysimeter	-	-	Local water balance	1990	Cowpeas
Sadras et al. [1991]	36.43	145.23	Microlysimeter	-	-	Local water balance	1988	Sunflower
Yunusa et al. [2004]	-34.2	142.0	Microlysimeter	Sap flow	-	Energy balance	1995	Vineyard
Sauer et al. [2007]	41.9	-93.6	-	Sap flow	-	Eddy covariance	2004	Soybean
Jara et al. [1998]	46.2	-119.7	Microlysimeter	Sap flow	-	Energy balance	1993	Corn
Eastham et al. [1999]	-32.13	117.16	Microlysimeter	-	-	Ventilated chambers	1990-1991	Wheat and lupin
Sakuratani [1987]	36.0	140.1	-	Transpiration-measuring probe	-	Energy balance	1981-1983	Soybean
Zhang et al. [2002]	37.9	114.7	Microlysimeters	-	-	Weighing lysimeters	1998-1999	Wheat
Eberbach and Pala [2005]	35.6	37.1	Microlysimetric	-	-	Local water balance	1996-1997	Wheat

Yunusa et al. [1997]	34.22	142.03	Microlysimeters	Sap flow	-	-	1994-1995	Sultana grapevines
Herbst et al. [1996]	54.1	10.25	Mini-lysimeter	Porometer	-	Energy balance	1985	Cotton
Harrold et al. [1959]	-	-	Weighing lysimeters	Weighing lysimeters	-	Weighing lysimeters	1941	Corn
Lascano et al. [1987]	32.57	-106.75	Microlysimeters	-	-	Local water balance	1985	Cotton
Villegas et al. [2015]	-	-	Lysimeters	Sap flow	-	Lysimeters	2008	Mesquite
Aouade et al. [2016]	31.68	-7.38	Isotope	Isotope	-	Isotope	2011-2013	Wheat
Wei et al. [2015]	36.0	140.1	Isotope	Isotope	-	Isotope	2013-2014	Paddy field
Wen et al. [2016]	38.9	100.3	Isotope	Isotope	-	Isotope	2012	Maize
Wetland								
Wei et al. [2015]	36.0	140.1	Isotope	Isotope	-	Isotope	2013-2014	Paddy field

Brown [1981]	29.66	-82.30	Dome	Chambers	-	-	1976-1977	Cypress domes and floodplain forest
Aouade et al. [2016]	31.68	-7.38	Isotope	Isotope	-	Isotope	2011-2013	Wheat

Table S2 *IGBP* categories and the land classes used in this study.

Type code	Definitions	New classes	Percent of vegetated area (%)
1	Evergreen Needle leave Forests	Needle leave Forests	11.87
3	Deciduous Needle leave Forests		
2	Evergreen Broad leave Forests	Broad leave Forests	10.09
4	Deciduous Broad leave Forests		
5	Mixed Forests	Mixed Forests	7.52
6	Closed Shrub lands	Scrublands and Grasslands	52.98
7	Open Shrub lands		
8	Woody Savannas		
9	Savannas		
10	Grasslands		
16	Barren or Sparsely Vegetated		
11	Permanent Wetlands	Wetlands	0.68
12	Croplands	Croplands	16.86
14	Cropland/Natural Vegetation Mosaic		
13	Urban and Built-Up	Others	-
15	Permanent Snow and Ice		
17	Unclassified		
0	Water surface		

Table S3. Global synthesis of *LAI* control on *E+T* partitioning.

Vegetation Class	*LAI* regression	Correlations (R^2)	*T/(E+T)* (*LAI*=1)	*T/(E+T)* (*LAI*=3)	*T/(E+T)* (*LAI*=6)
Broad leave forests	$0.64LAI^{0.15}$	0.48	0.64	0.76	0.84
Needle leave forests	$0.48LAI^{0.32}$	0.43	0.48	0.68	0.85
Mixed forests	$0.52LAI^{0.26}$	0.46	0.52	0.69	0.83
Shrubs and Grasses	$0.69LAI^{0.28}$	0.54	0.69	0.94	1.0
Crops	$0.66LAI^{0.18}$	0.87	0.66	0.80	0.91
Wetlands	$0.65LAI^{0.21}$	0.69	0.65	0.82	0.95

Table S4. The globally averaged *T/(E+T+I)* ratio using different data sources for *ET*, *I* and *LAI*.

ET	T (different combination in Equation 1)			*T/(E+T+I)* (%)
	ET	*I*	*LAI*	
PML	*PML*	*CLM*	*Improved LAI*	51.5%
GLEAM	*PML*	*CLM*	*Improved LAI*	46.2%
CLM	*PML*	*CLM*	*Improved LAI*	46.2%
PML	*PML*	*GLEAM*	*Improved LAI*	59.6%
GLEAM	*PML*	*GLEAM*	*Improved LAI*	53.4%
CLM	*PML*	*GLEAM*	*Improved LAI*	53.3%
PML	*PML*	*PML*	*Improved LAI*	58.2%
GLEAM	*PML*	*PML*	*Improved LAI*	52.1%
CLM	*PML*	*PML*	*Improved LAI*	52.1%
PML	*PML*	*CLM*	*GIMMS3g*	58.4%
GLEAM	*PML*	*CLM*	*GIMMS3g*	52.3%
CLM	*PML*	*CLM*	*GIMMS3g*	52.9%
PML	*PML*	*GLEAM*	*GIMMS3g*	65.9%
GLEAM	*PML*	*GLEAM*	*GIMMS3g*	59.0%
CLM	*PML*	*GLEAM*	*GIMMS3g*	59.7%
PML	*PML*	*PML*	*GIMMS3g*	64.5%
GLEAM	*PML*	*PML*	*GIMMS3g*	57.8%

CLM	*PML*	*PML*	*GIMMS3g*	58.5%
PML	*PML*	*CLM*	*GLASS*	52.5%
GLEAM	*PML*	*CLM*	*GLASS*	47.1%
CLM	*PML*	*CLM*	*GLASS*	47.1%
PML	*PML*	*GLEAM*	*GLASS*	60.8%
GLEAM	*PML*	*GLEAM*	*GLASS*	54.6%
CLM	*PML*	*GLEAM*	*GLASS*	54.5%
PML	*PML*	*PML*	*GLASS*	59.4%
GLEAM	*PML*	*PML*	*GLASS*	53.3%
CLM	*PML*	*PML*	*GLASS*	53.2%
PML	*PML*	*CLM*	*GLOMAPLAI*	47.9%
GLEAM	*PML*	*CLM*	*GLOMAPLAI*	42.9%
CLM	*PML*	*CLM*	*GLOMAPLAI*	43.4%
PML	*PML*	*GLEAM*	*GLOMAPLAI*	54.8%
GLEAM	*PML*	*GLEAM*	*GLOMAPLAI*	49.1%
CLM	*PML*	*GLEAM*	*GLOMAPLAI*	49.6%
PML	*PML*	*PML*	*GLOMAPLAI*	53.9%
GLEAM	*PML*	*PML*	*GLOMAPLAI*	48.3%
CLM	*PML*	*PML*	*GLOMAPLAI*	48.9%
PML	*GLEAM*	*CLM*	*Improved LAI*	54.7%
GLEAM	*GLEAM*	*CLM*	*Improved LAI*	49.0%

CLM	*GLEAM*	*CLM*	*Improved LAI*	49.0%
PML	*GLEAM*	*GLEAM*	*Improved LAI*	63.7%
GLEAM	*GLEAM*	*GLEAM*	*Improved LAI*	57.0%
CLM	*GLEAM*	*GLEAM*	*Improved LAI*	57.0%
PML	*GLEAM*	*PML*	*Improved LAI*	62.5%
GLEAM	*GLEAM*	*PML*	*Improved LAI*	56.0%
CLM	*GLEAM*	*PML*	*Improved LAI*	56.0%
PML	*GLEAM*	*CLM*	*GIMMS3g*	63.7%
GLEAM	*GLEAM*	*CLM*	*GIMMS3g*	57.0%
CLM	*GLEAM*	*CLM*	*GIMMS3g*	57.6%
PML	*GLEAM*	*GLEAM*	*GIMMS3g*	73.2%
GLEAM	*GLEAM*	*GLEAM*	*GIMMS3g*	65.5%
CLM	*GLEAM*	*GLEAM*	*GIMMS3g*	66.2%
PML	*GLEAM*	*PML*	*GIMMS3g*	72.4%
GLEAM	*GLEAM*	*PML*	*GIMMS3g*	64.7%
CLM	*GLEAM*	*PML*	*GIMMS3g*	65.4%
PML	*GLEAM*	*CLM*	*GLASS*	55.9%
GLEAM	*GLEAM*	*CLM*	*GLASS*	50.2%
CLM	*GLEAM*	*CLM*	*GLASS*	50.1%
PML	*GLEAM*	*GLEAM*	*GLASS*	65.3%
GLEAM	*GLEAM*	*GLEAM*	*GLASS*	58.6%

CLM	*GLEAM*	*GLEAM*	*GLASS*	58.5%
PML	*GLEAM*	*PML*	*GLASS*	64.0%
GLEAM	*GLEAM*	*PML*	*GLASS*	57.5%
CLM	*GLEAM*	*PML*	*GLASS*	57.4%
PML	*GLEAM*	*CLM*	*GLOMAPLAI*	51.1%
GLEAM	*GLEAM*	*CLM*	*GLOMAPLAI*	45.8%
CLM	*GLEAM*	*CLM*	*GLOMAPLAI*	46.3%
PML	*GLEAM*	*GLEAM*	*GLOMAPLAI*	58.9%
GLEAM	*GLEAM*	*GLEAM*	*GLOMAPLAI*	52.7%
CLM	*GLEAM*	*GLEAM*	*GLOMAPLAI*	53.3%
PML	*GLEAM*	*PML*	*GLOMAPLAI*	58.3%
GLEAM	*GLEAM*	*PML*	*GLOMAPLAI*	52.2%
CLM	*GLEAM*	*PML*	*GLOMAPLAI*	52.8%
PML	*CLM*	*CLM*	*Improved LAI*	58.0%
GLEAM	*CLM*	*CLM*	*Improved LAI*	52.0%
CLM	*CLM*	*CLM*	*Improved LAI*	52.0%
PML	*CLM*	*GLEAM*	*Improved LAI*	66.6%
GLEAM	*CLM*	*GLEAM*	*Improved LAI*	59.6%
CLM	*CLM*	*GLEAM*	*Improved LAI*	59.6%
PML	*CLM*	*PML*	*Improved LAI*	66.0%
GLEAM	*CLM*	*PML*	*Improved LAI*	59.1%

CLM	*CLM*	*PML*	*Improved LAI*	59.1%
PML	*CLM*	*CLM*	*GIMMS3g*	65.8%
GLEAM	*CLM*	*CLM*	*GIMMS3g*	58.9%
CLM	*CLM*	*CLM*	*GIMMS3g*	59.6%
PML	*CLM*	*GLEAM*	*GIMMS3g*	74.9%
GLEAM	*CLM*	*GLEAM*	*GIMMS3g*	67.0%
CLM	*CLM*	*GLEAM*	*GIMMS3g*	67.8%
PML	*CLM*	*PML*	*GIMMS3g*	74.6%
GLEAM	*CLM*	*PML*	*GIMMS3g*	66.8%
CLM	*CLM*	*PML*	*GIMMS3g*	67.5%
PML	*CLM*	*CLM*	*GLASS*	59.6%
GLEAM	*CLM*	*CLM*	*GLASS*	53.5%
CLM	*CLM*	*CLM*	*GLASS*	53.4%
PML	*CLM*	*GLEAM*	*GLASS*	68.5%
GLEAM	*CLM*	*GLEAM*	*GLASS*	61.4%
CLM	*CLM*	*GLEAM*	*GLASS*	61.4%
PML	*CLM*	*PML*	*GLASS*	67.9%
GLEAM	*CLM*	*PML*	*GLASS*	60.9%
CLM	*CLM*	*PML*	*GLASS*	60.8%
PML	*CLM*	*CLM*	*GLOMAPLAI*	53.3%
GLEAM	*CLM*	*CLM*	*GLOMAPLAI*	47.7%

CLM	*CLM*	*CLM*	*GLOMAPLAI*	48.2%
PML	*CLM*	*GLEAM*	*GLOMAPLAI*	60.7%
GLEAM	*CLM*	*GLEAM*	*GLOMAPLAI*	54.4%
CLM	*CLM*	*GLEAM*	*GLOMAPLAI*	55.0%
PML	*CLM*	*PML*	*GLOMAPLAI*	60.6%
GLEAM	*CLM*	*PML*	*GLOMAPLAI*	54.3%
CLM	*CLM*	*PML*	*GLOMAPLAI*	54.9%

Table S5 Comparison of *I/(E+T+I)* observed from site measurements (*M*), derived from *GLEAM (G), CLM (C) and PML(P)*. The simulation result was weighted by the fraction of bare soil per 0.25-degree pixel aggregated from the 200-meter resolution of the MODIS vegetation continuous fields.

Study	Vegetation type	*LAT*	*LON*	*I/ET (M)*	*I/ET (G)*	*I/ET (C)*	*I/ET (P)*
Mitchell et al. [2012]	Mixing forests	-36.67	146.67	20%	18%	12%	12%
Oishi et al. [2008]	Broad-leaf forests	37.0	-79.1	30%	1%	28%	16%
Roupsard et al. [2006]	Needle-leaf forests	56.0	9.3	40%	21%	-	30%
Kumagai et al. [2014]	Mixing forests	33.1	130.7	46%	33%	46%	57%
Sun et al. [2014]	Broad leaf forests	36.4	139.6	54%	60%	-	-

Reference

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