

Figure S1. The comparison of instantaneous albedo and weighted daily average albedo in for the entire 2003 to 2005 period at Changbaishan (CBS), Qianyanzhou (QYZ), Dinghushan (DHS), Yucheng (YC) and Haibei (HB). 2004 to 2005 at Neimeng (NM), and Dangxiong (DX) sites. The red line is the linear fit line, the dotted line is the 1:1 line.

Table S1. The input data which include MODIS Land product and China Meteorological Forcing data used in this study. The names of these dataset, the used parameters, the time steps and the spatial resolution is shown below.

Data source	Data name	Used parameter	Time step	Spatial resolution	Purpose
MODIS Land Product	MOD11C1	Land Surface Temperature /Emissivity	daily	0.05 degree	Used as T_s in Eq. (15) to Calculate net radiation and Calculate air temperature with NDVI by VI-TS method
	MOD09CMG	Surface Reflectance	daily	0.05 degree	Used as ϵ_s in Eq. (15) to Calculate net radiation
	MCD43C3	Albedo	16-day	0.05 degree	Used as albedo in Eq. (15) to Calculate net radiation
	MOD13C1	NDVI	16-day	0.05 degree	Calculating air temperature with Ts by VI-TS method
	MCD12C1	Land cover	yearly	0.05 degree	Calculating the vegetation coverage Identifying the land surface cover to determine the parameter scheme resistances
China Meteorological Forcing Dataset	Srad	shortwave radiation	3-hourly	0.1degree	Used as R_d Eq. (15) to Calculate the net radiation

Table S2. Flux tower measurement sites with the longitudes, latitudes, altitudes, land cover types, climate types and the time period of the measurements data used.

Flux tower	Lon. (°E)	Lat. (°N)	Altitude (m)	Land cover	Footprint (m)	Climate	Time period
Changbaishan	128.1	42.4	738	Forest	181 to 3070	Monsoon temperate continental climate	2003-2005
Qianyanzhou	115.06	26.74	102	Forest	120 to 1655	Subtropical monsoon climate	2003-2005
Dinghushan	112.53	23.17	240	Forest	129 to 1908	Monsoon humid climate	2003-2005
Yucheng	116.57	36.83	28	Cropland	16 to 190	Semi-humid monsoon climate	2003-2005
Haibei	101.32	37.62	3190	Grassland	19 to 195	Plateau continental climate	2003-2005
Neimeng	116.67	43.53	1200	Grassland	19 to 195	Temperate arid and semiarid continental climate	2004-2005
Dangxiong	91.07	30.5	4350	Grassland	27 to 163	Plateau monsoon climate	2004-2005

Table S3. Four independent gridded ET products

Product name	Temporal resolution	Spatial resolution	Time period	Theory	Reference
MOD16	Monthly	1 km	2001-2013	Penman- Moteith	Mu et al (2007, 2011)
AVHRR	Monthly	1 degree	2001-2006	Priestly- Taylor	Zhang et al., (2006, 2010)
GBAF	Monthly	0.5 degree	2001-2008	Machine learning	Jung et al., (2006, 2010)
VIC	Daily	0.25 degree	2001-2012	Water balance	Zhang et al., (2014a, 2014b)

Pearson's correlation coefficient is calculated as:

$$r = \frac{\sum(X-\bar{X})(Y-\bar{Y})}{\sqrt{\sum(X-\bar{X})^2\sum(Y-\bar{Y})^2}} \quad (\text{Equation S1})$$

r is the Pearson's correlation coefficient; X is the estimated variable; \bar{X} is the average of X ; Y is the observed variable; \bar{Y} is the average of Y .

Root Mean Square Error:

$$RMSE = \sqrt{\frac{\sum_{i=1}^N (X_i - Y_i)^2}{N}} \quad (\text{Equation S2})$$

$RMSE$ is the Root Mean Square Error; N is the sample size.

The relative error is calculated as:

$$RE = \frac{X-Y}{Y} \times 100\% \quad (\text{Equation S3})$$

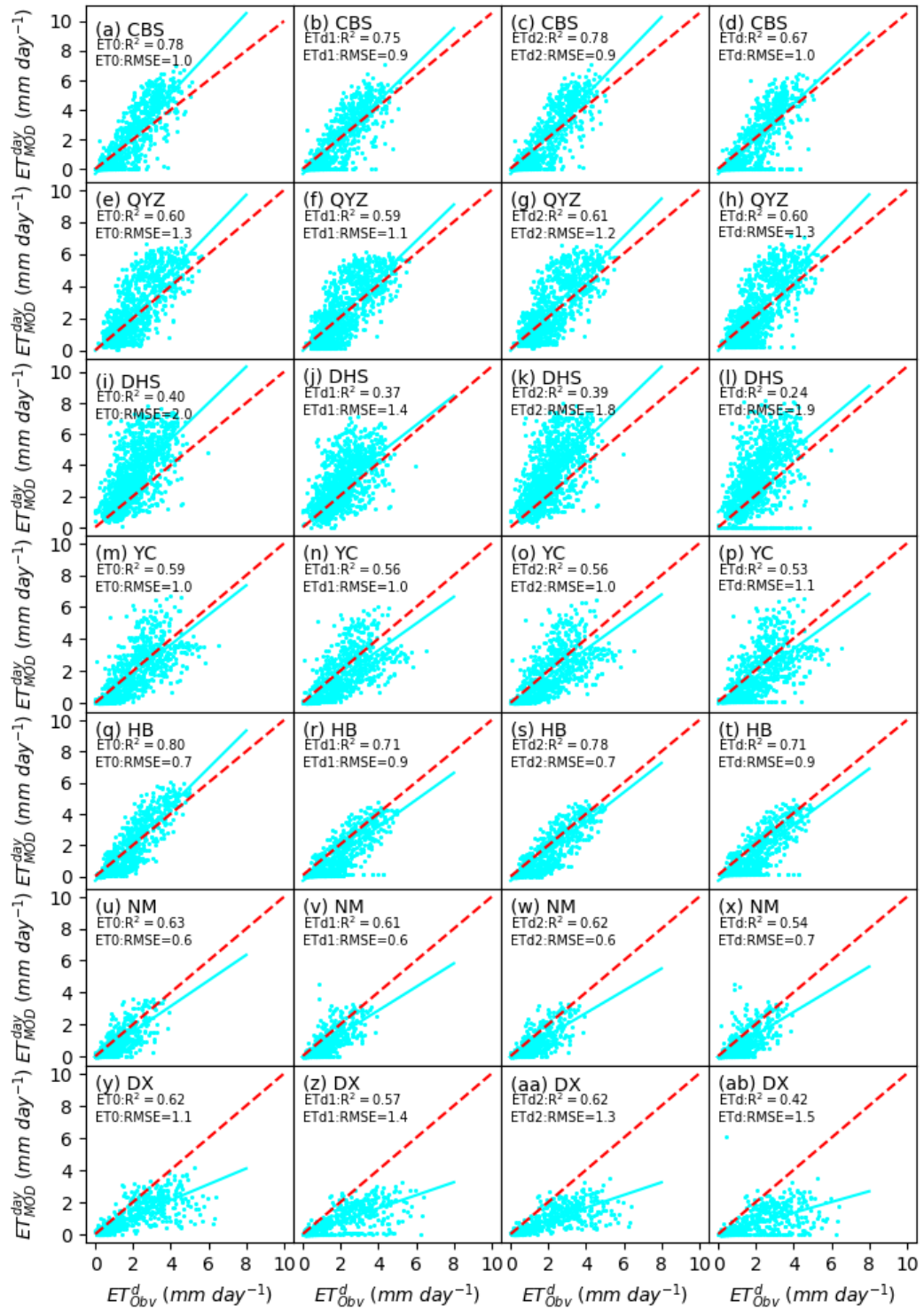


Figure S2. Scatter plots of satellite-based model simulated daily ET0, ETd1, ETd2 and ETd (the blue dots) plotted against the observed measurements (ET^d_{Obv}) for the entire 2003 to 2005 period at Changbaishan (CBS), Qianyanzhou (QYZ), Dinghushan (DHS), Yucheng (YC) and Haibei (HB). 2004 to 2005 at Neimeng (NM), and Dangxiong (DX) sites. The blue line is the linear fit line, the red dotted line is the 1:1 line.

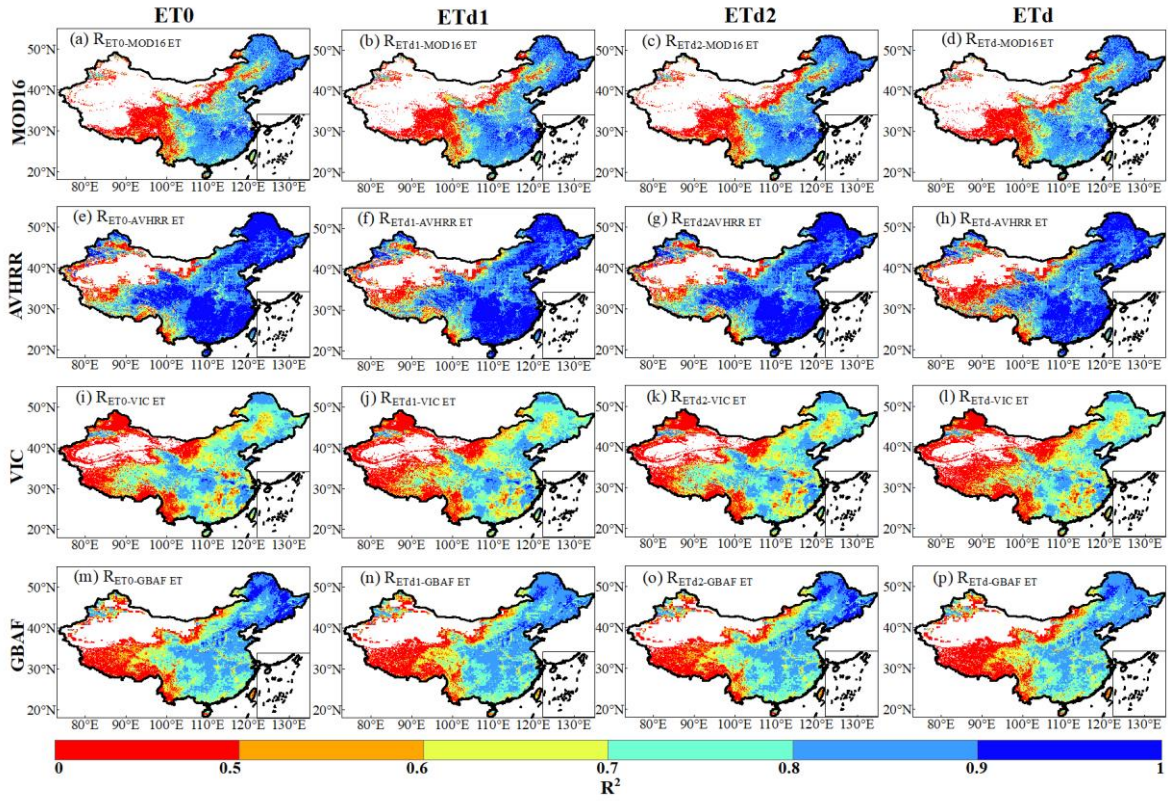


Figure S3. Maps of the R^2 between ET0, ETd1, ETd2, ETd and gridded ET products of (a–d) MOD16, (e–h) AVHRR, (i–l) VIC, and (m–p) GBAF. The per-grid R^2 between ET0, ETd1, ETd2, ETd and MOD16 (AVHRR, VIC, and GBAF) over China were computed using 156 (72, 144, and 96) samples during the period of 2001 to 2013 (2001 to 2006, 2001 to 2012, and 2001 to 2008), when the ET data are available.

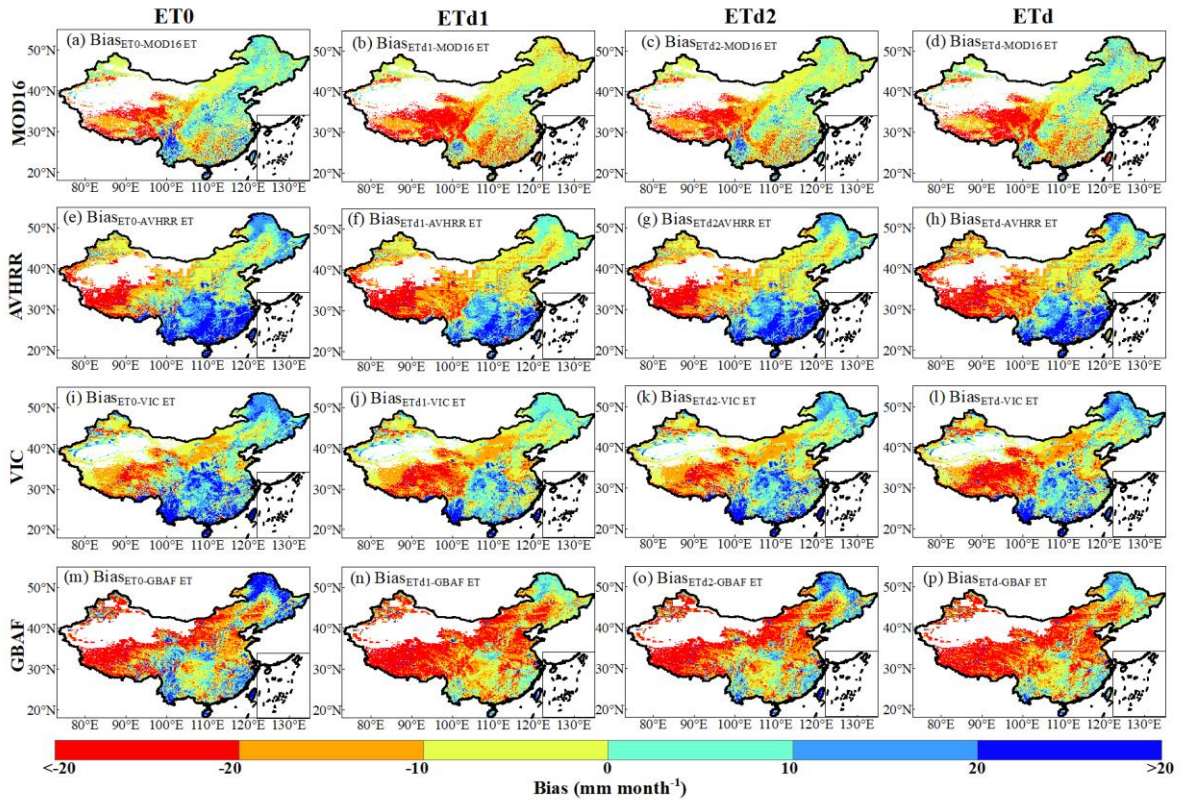


Figure S4. Maps of the bias (Bias) between ET0, ETd1, ETd2, ETd and gridded ET products of (a–d) MOD16, (e–h) AVHRR, (i–l) VIC, and (m–p) GBAF. The per-grid bias between ET0, ETd1, ETd2, ETd and MOD16 (AVHRR, VIC, and GBAF) over China were computed using 156 (72, 144, and 96) samples during the period of 2001 to 2013 (2001 to 2006, 2001 to 2012, and 2001 to 2008), when the ET data are available.