Supplementary for

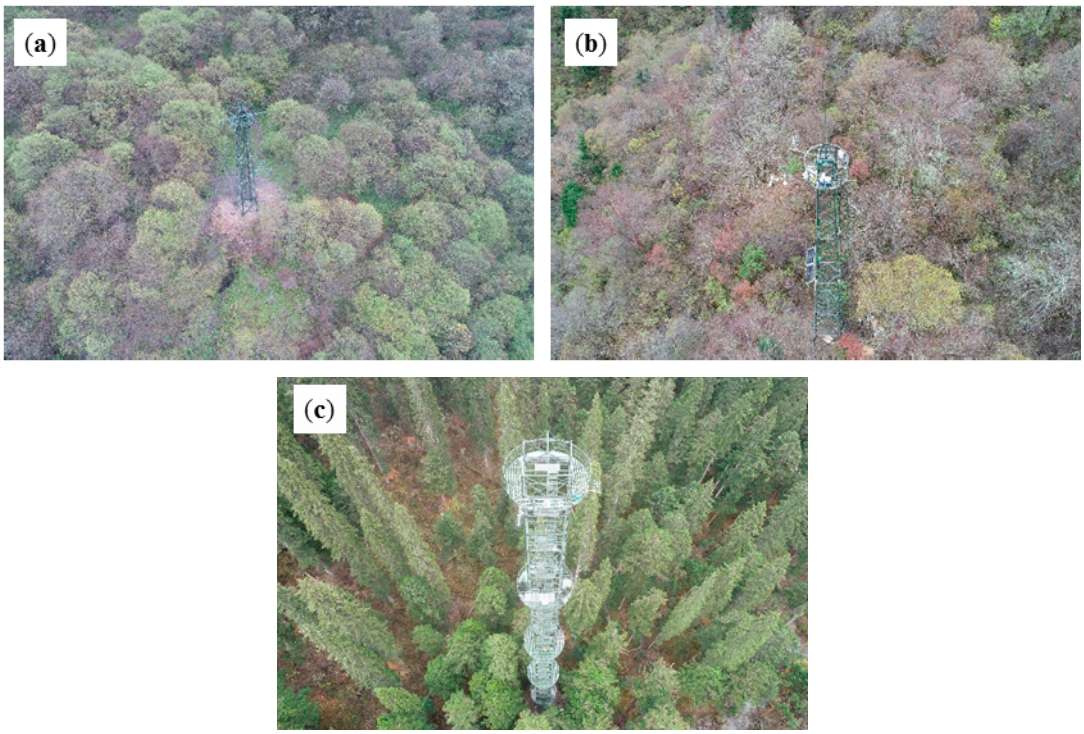
Comparing Three Remotely Sensed Approaches for Simulating Gross Primary Productivity over Mountainous Watersheds: A Case Study in the Wanglang National Nature Reserve, China

Xinyao Xie [1,2], Ainong Li [1,*], Huaan Jin [1], Jinhu Bian [1], Zhengjian Zhang [1,2] and Xi Nan [1]

[1] Research Center for Digital Mountain and Remote Sensing Application, Institute of Mountain Hazards and Environment, Chinese Academy of Sciences, Chengdu 610041, China; xinyaoxie@imde.ac.cn (X.X.); jinhuaan@imde.ac.cn (H.J.); bianjinhu@imde.ac.cn (J.B.); zhangzj@imde.ac.cn (Z.Z.); nanxi@imde.ac.cn (X.N.)

[2] University of Chinese Academy of Sciences, Beijing 100049, China

* Correspondence: ainongli@imde.ac.cn



Supplementary Figure S1. Observation towers of shrubland (a), MF (b), and ENF (c) over Wanglang National Nature Reserve.

Supplementary Table S1. Main model parameter values used for different vegetation types in this work.

Parameter	Model	Values					Reference
		ENF	DBF	MF	SHR	GRA	
ε_{mtotal} ($gC\ MJ^{-1}$)	MOD17	1.11	1.3	1.18	0.89	1.52	[1]
$T_{min\text{-}min}$ (°C)	MOD17, TL-LUE, MTL-LUE	-8	-8	-8	-8	-8	[1]
$T_{min\text{-}max}$ (°C)	MOD17, TL-LUE, MTL-LUE	8.31	7.94	8.5	10.1	12.02	[1]
VPD_{min} (hPa)	MOD17, TL-LUE, MTL-LUE	41	41	41	41	41	[1]
VPD_{max} (hPa)	MOD17, TL-LUE, MTL-LUE	9.3	9.3	9.3	9.3	9.3	[1]
Ω	TL-LUE, MTL-LUE, BEPS, BTL	0.6	0.8	0.7	0.8	0.9	[1]
ε_{msun} ($gC\ MJ^{-1}$)	TL-LUE, MTL-LUE	0.61	0.62	0.66	0.47	0.89	[1]
ε_{mshd} ($gC\ MJ^{-1}$)	TL-LUE, MTL-LUE	1.91	2.17	1.84	1.9	2.82	[1]
α	TL-LUE, MTL-LUE	0.15	0.18	0.17	0.19	0.23	[2]
m_{TG} ($gC\ m^{-2}\ 8d^{-1}$)	TG	466	355	305	267	472	[3]
m_{MTG} ($gC\ m^{-2}\ 8d^{-1}$)	MTG	492	340	310	430	505	[3]
Tn (°C)	TG, MTG	-10	2.5	0	0	0	[4]
To (°C)	TG, MTG	27	27	24	30	27	[4]
Tm (°C)	TG, MTG	50	50	50	50	50	[4]
Maximum carboxylation at 25 °C ($\mu mol\ m^{-2}\ s^{-1}$)	BEPS, BTL	62.8	59.9	51.7	59.5	90.3	[5]
Specific leaf area ($m^2\ kg^{-1}C$)	BEPS, BTL	20	26.5	24	28.7	30	[6]
Leaf water potential at stomatal closure ($-M\ Pa$)	BEPS, BTL	2.3	2.1	2.3	4.2	2.7	[6]
Maximum stomatal conductance ($mm\ s^{-1}$)	BEPS, BTL	2	4.5	3.6	4	10	[6]
Snowmelt temperature coefficient ($mm\ d^{-1}°C^{-1}$)	BEPS, BTL	2.2	1	1.5	2	1	[6]

Supplementary Equation (S1). Calculation of the standardized index of annual GPP

The standardized index of annual GPP at pixel i can be calculated from the annual GPP ($AGPP_j$) as:

$$AGPP_{Stand\,i} = \frac{AGPP_i - AGPP_{ave}}{AGPP_{std}}$$

where $AGPP_i$ represents the annual GPP value of pixel i, which was sumed from those daily (i.e., MOD17, TL-LUE, MTL-LUE, BEPS, and BTL) or 8-day (i.e., TG and MTG) estimates during DOY 1-273 in 2020; $AGPP_{ave}$ and $AGPP_{std}$ represents the average and standard deviation values of all the pixels over Wanglang Reserve.

References:

1. Zhou, Y., et al., *Global parameterization and validation of a two-leaf light use efficiency model for predicting gross primary production across FLUXNET sites.* Journal of Geophysical Research-Biogeosciences, 2016. **121**(4): p. 1045-1072.
2. Wu, X.C., et al., *Performance of Linear and Nonlinear Two-Leaf Light Use Efficiency Models at Different Temporal Scales.* Remote Sensing, 2015. **7**(3): p. 2238-2278.
3. Xie, X. and A. Li, *Development of a topographic-corrected temperature and greenness model (TG) for improving GPP estimation over mountainous areas.* Agricultural and Forest Meteorology, 2020. **295**: p. 108193.
4. Dong, J.Q., et al., *Robustness and Uncertainties of the "Temperature and Greenness" Model for Estimating Terrestrial Gross Primary Production.* Scientific Reports, 2017. **7**: p. 8.
5. He, L.M., et al., *Diverse photosynthetic capacity of global ecosystems mapped by satellite chlorophyll fluorescence measurements.* Remote Sensing of Environment, 2019. **232**: p. 10.
6. Liu, Y., et al., *Satellite-derived LAI products exhibit large discrepancies and can lead to substantial uncertainty in simulated carbon and water fluxes.* Remote Sensing of Environment, 2018. **206**: p. 174-188.