Supplementary Information

Allometric Scaling and Resource Limitations Model of Tree Heights: Part 3. Model Optimization and Testing over Continental China. *Remote Sensing*, 2014, *6*, 3533-3553

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S1. List of Abbreviations

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ASRL	Allometric Scaling and Resource Limitations
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
CMDSSS	China Meteorological Data Sharing Service System
CONNA	Continental China
DEM	Digital Elevation Model
DBH	Diameter at Breast Height
GDEM	Global Digital Elevation Map
GLA14	GLAS Level-2 Land Surface Altimetry

GLAS	Geoscience Laser Altimeter System
H_{ASRL}	Predicted Height from optimized ASRL model
H_{GLAS}	Measured Height from valid GLAS waveform data
H_{NFI}	Measured Height from NFI
LC	Land Cover
MODIS	Moderate Resolution Imaging Spectroradiometer
MRE	Mean Relative Error
NFI	National Forest Inventory
SD	Standard Deviation
SFA	State Forestry Administration
VCF	Vegetation Continuous Fields

S2. Figures S1–S5

Figure S1. Geographical distribution of meteorological stations used for climatic variable construction (n = 754; in red color) and site-specific evaluation (n = 14; in blue color). The CMDSSS provides meteorological observations from these stations for a temporal period of 1951–2007. Forested lands are depicted in green color.
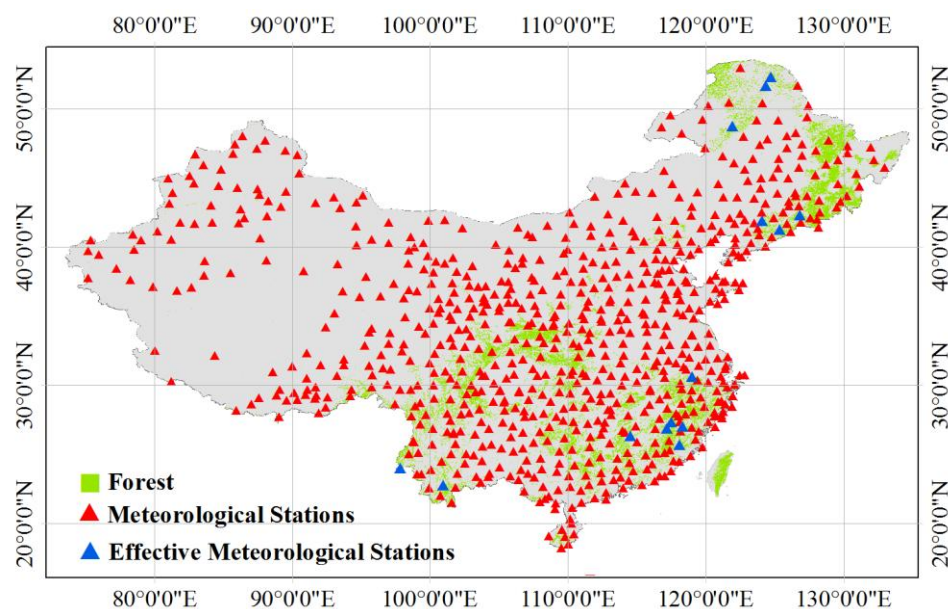
Figure S2. Distribution of maximum tree heights derived from (**a**) the valid GLAS shots and (**b**) the NFI dataset at a 1km spatial resolution. The GLAS altimetry was generated after filtering invalid GLAS shots and correcting topographic effects [S1]. The NFI tree heights were estimated using the allometric relationships between field-measured DBH and height (surveyed by the SFA [S2–S4]). Note that the NFI map is limited over the northeastern regions of CONNA since we considered the forested lands over the effective climate zones.


(a)

(b)
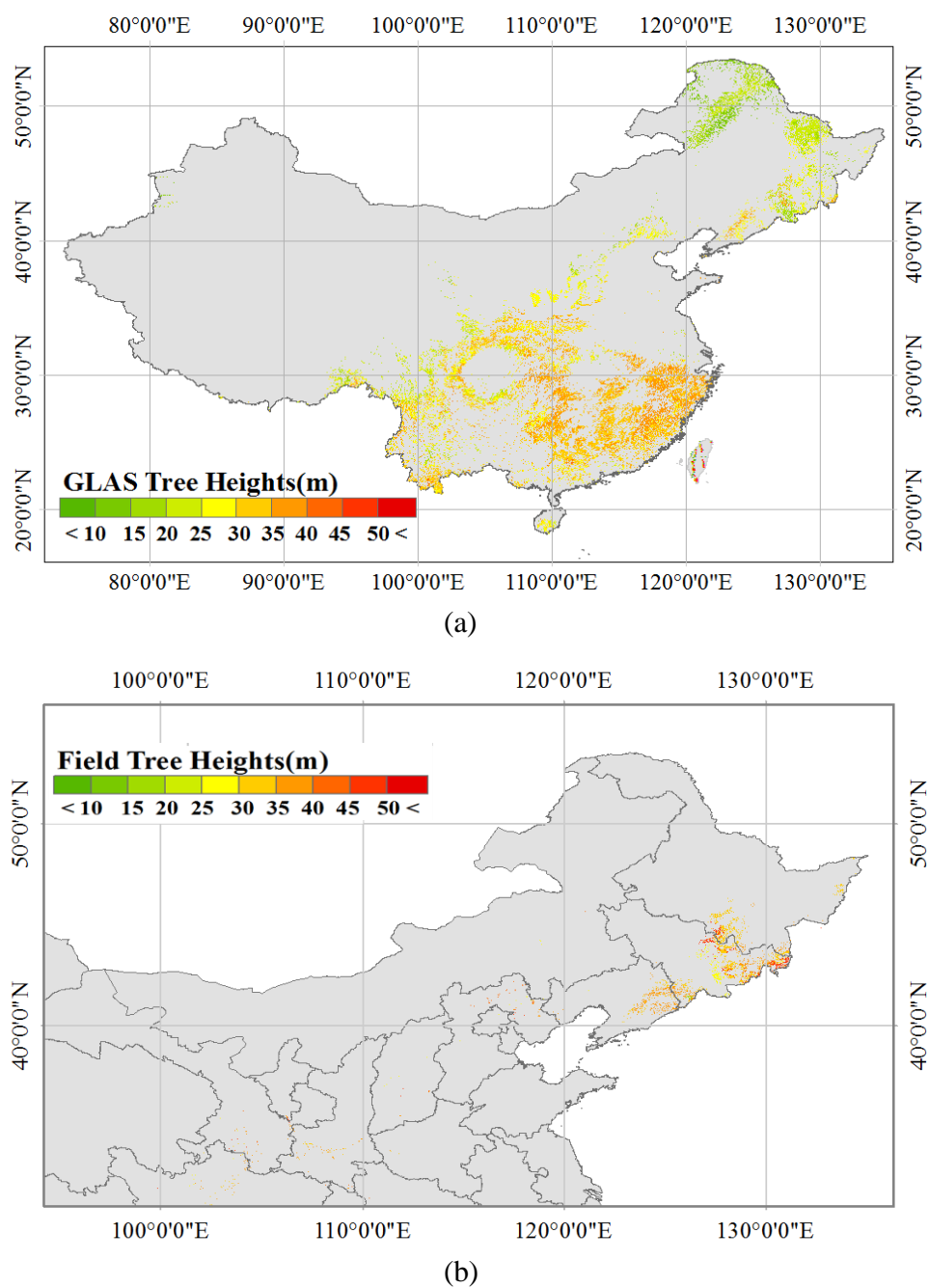
Figure S3. Distribution of relative errors for site-specific simulations of the optimized ASRL model: (**a**) two-fold cross validation and (**b**) bootstrapping validation. The MRE (dotted line) and SD of relative errors are notated in each plot.


(a)   (b)
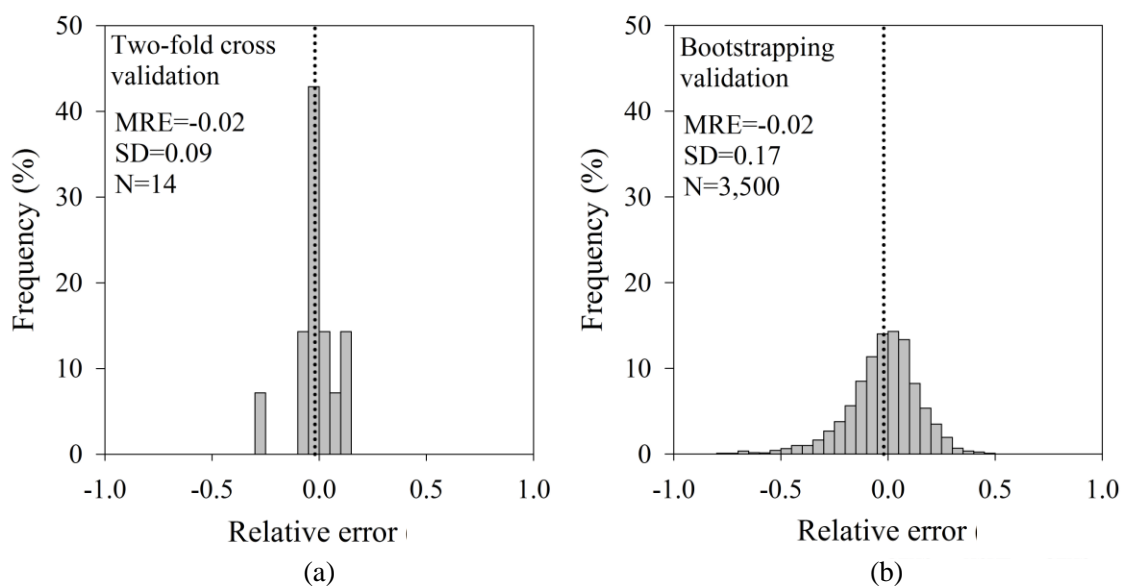
Figure S4. Distribution of relative errors for continental-scale simulations of the optimized ASRL model: (**a**) two-fold cross validation with GLAS observations and (**b**) one-to-one validation with field measurements. The MRE (dotted line) and SD of relative error are notated in each plot.

(a)   (b)
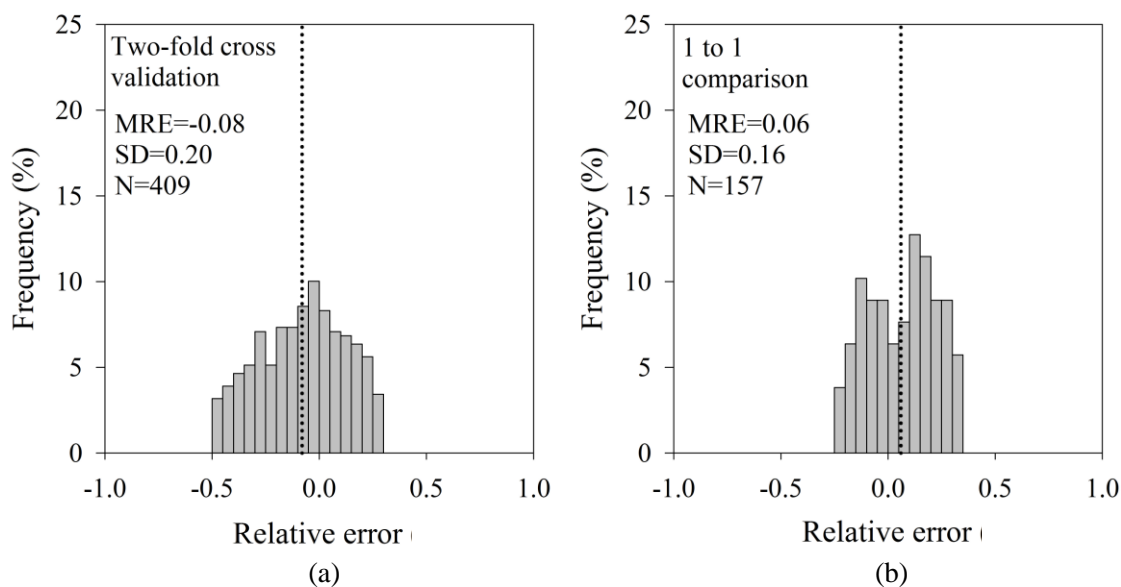
Figure S5. Spatial distribution of prediction errors of the optimized ASRL model: comparisons against (**a**) test GLAS dataset ($H_{ASRL} - H_{GLAS}$), and (**b**) field measurements ($H_{ASRL} - H_{NFI}$). Note that the NFI map is limited over the northeastern regions of CONNA since we considered the forested lands over the effective climate zones.
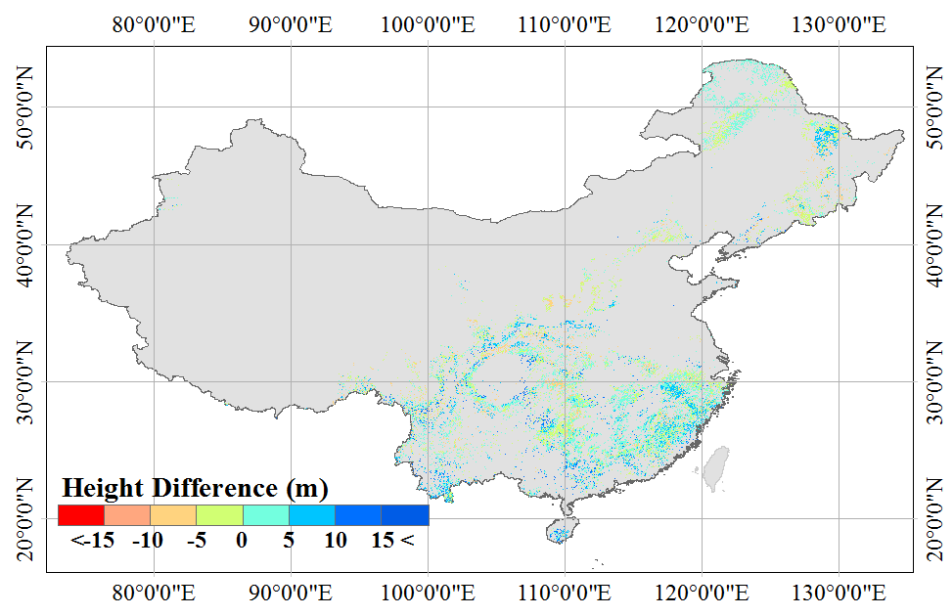
(a)
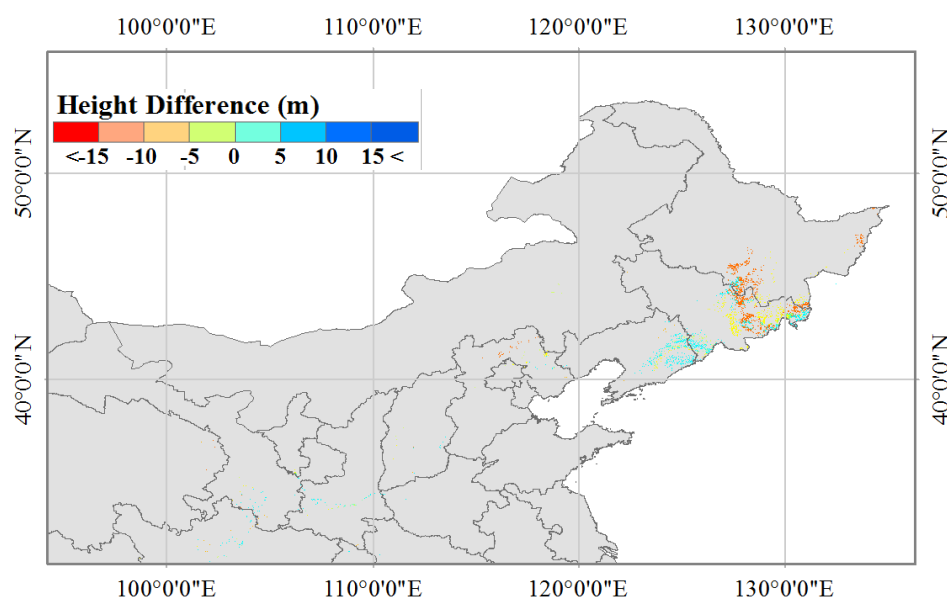
(b)

S3. Table S1

Table S1. List of datasets to derive the valid GLAS tree heights. Ancillary data (LC, VCF, DEM, and slope) were used to filter invalid GLAS shots and to correct topographic effects.

Data	Source	Spatial Resolution	Acquisition Year
GLAS	GLA14 [S5]	70 m (Circular footprint)	2003–2006 (Only in May–October)
LC	MODIS MCD12Q1 [S6]	500 m	2005
VCF	MODIS MOD44B [S6]	250 m	2005
DEM	ASTER GDEM V2 [S6]	30 m	2011
Slope	Derived from ASTER GDEM V2 [S7]	30 m	2011

Reference

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