Supplement of Atmos. Chem. Phys., 23, 3181–3193, 2023
https://doi.org/10.5194/acp-23-3181-2023-supplement

Atmospheric Chemistry and Physics
Open Access
EGU

Supplement of

Estimating hub-height wind speed based on a machine learning algorithm: implications for wind energy assessment

Boming Liu et al.

Correspondence to: Jianping Guo (jpguocams@gmail.com)

30

Table S1. Summary of the parameters used for machine learning algorithms.

Type of parameters	Name of parameters	Acronyms	Data sources
Input	Charnock coefficient	Char	ERA5
	Forecast surface roughness	FSR	ERA5
	Friction velocity	FV	ERA5
	Dew point	DP	ERA5
	Temperature	Temp	ERA5
	Pressure	Pres	ERA5
	Net solar radiation	Rn	ERA5
	Latent heat flux	LHF	ERA5
	Sensible heat flux	SHF	ERA5
	Surface wind speed	WS_{10}	Anemometer
	Surface wind direction	WD_{10}	Anemometer
	Wind speed at 300 m	WS_{300}	RWP
	Wind direction at 300 m	WD_{300}	RWP
Reference	Wind speed at 120 m	WS_{120}	RS
	Wind speed at 160 m	WS_{160}	RS
	Wind speed at 200 m	WS_{200}	RS

Figures:

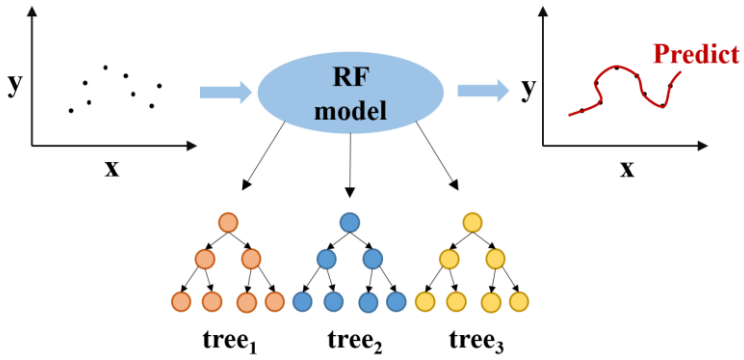

Figure S1. Schematic diagram of the random forest (RF) algorithms used to estimate wind speed.

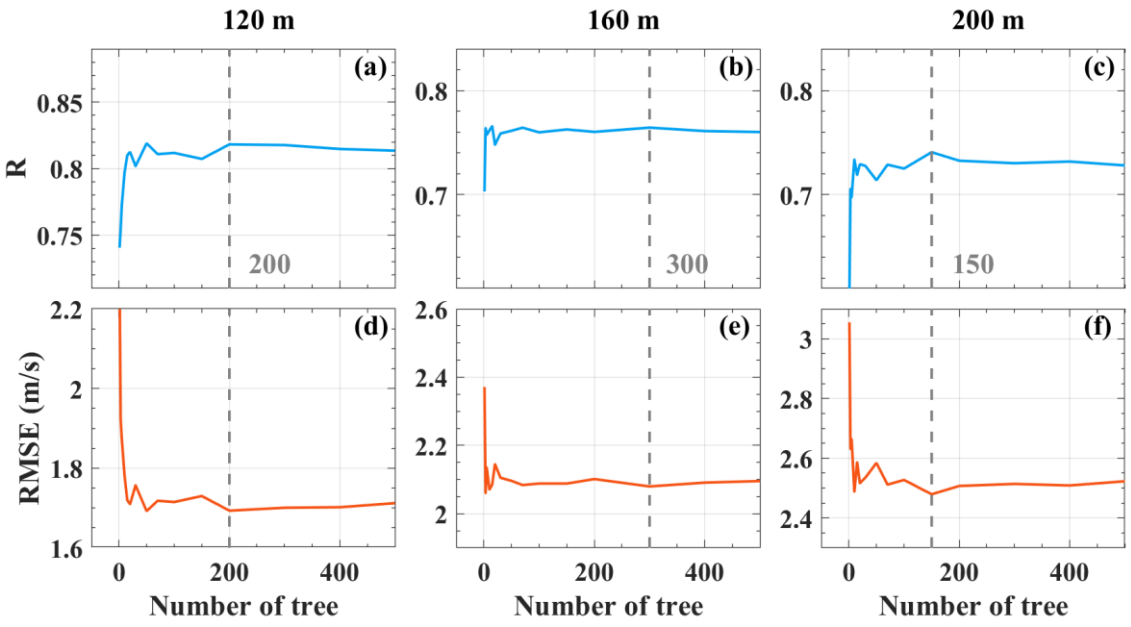

Figure S2. The parameter tuning process for RF model at (a, d) 120 m, (b, e) 160 m and (c, f) 200 m. The blue and red lines represent the variation of R and RMSE, respectively. The gray dotted lines and texts indicate the optimal parameters for their corresponding models.

45

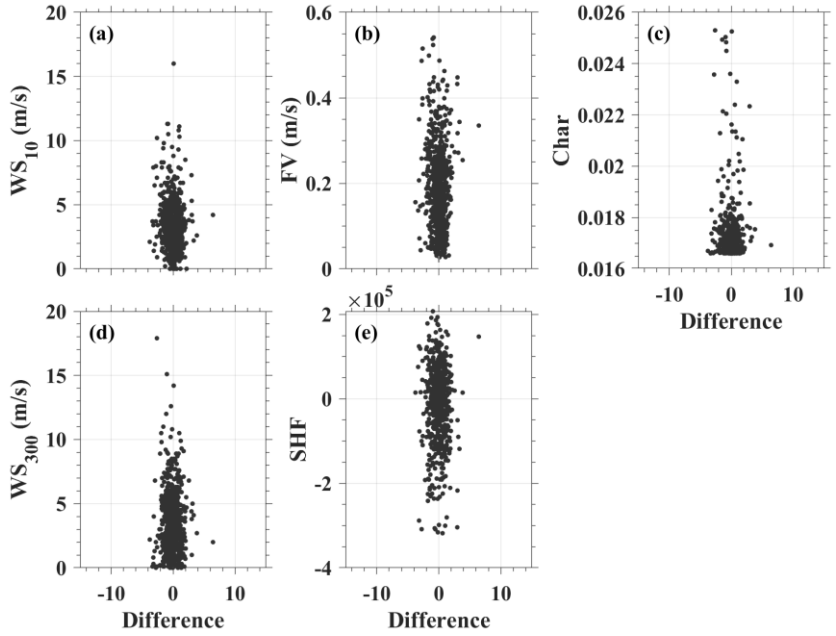

Figure S3. Scatter plots showing the difference of observed WS_{120} and estimated WS_{120} as a function of (a) WS_{10}, (b) FV, (c) Char, (d) WS_{300}, and (e) SHF.

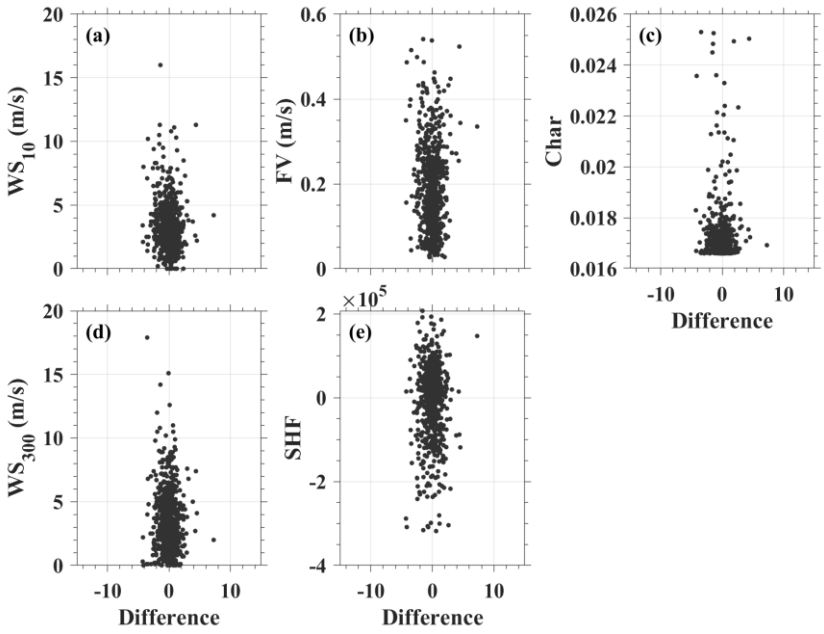

Figure S4. Similar to Fig. S3, but for the WS_{160}.

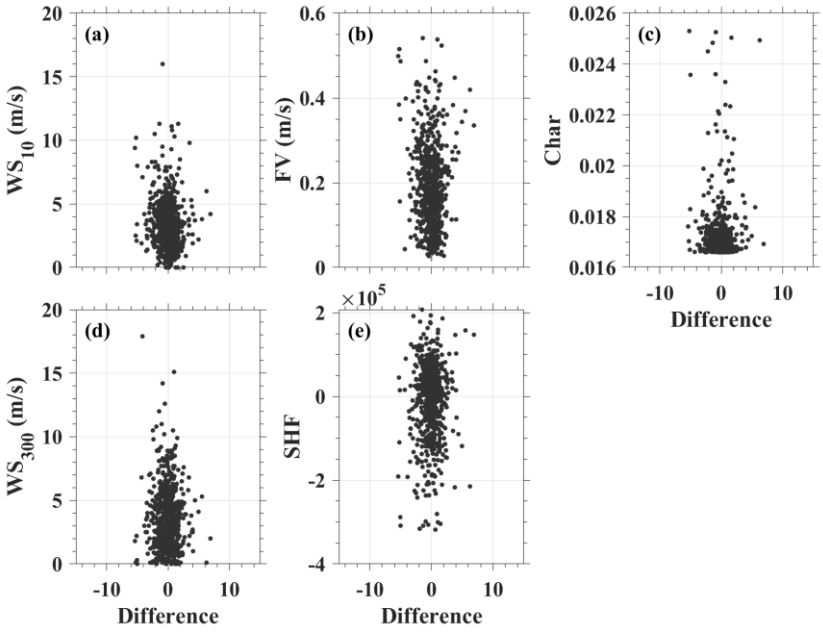

Figure S5. Similar to Fig. S3, but for the WS_{200}.

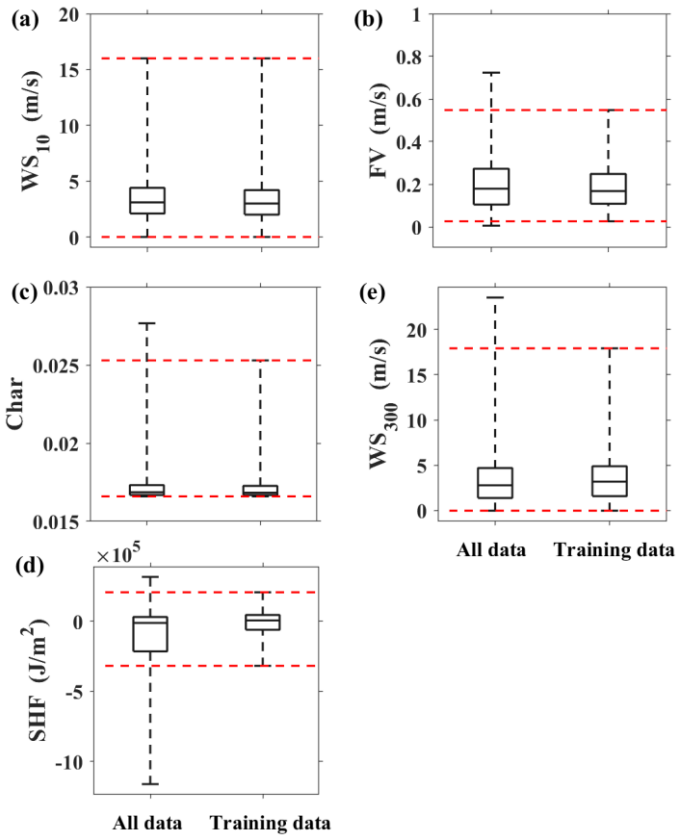

Figure S6. The box plot of (a) WS_{10}, (b) FV, (c) Char, (d) WS_{300}, and (e) SHF for different sample data set. The red dashed lines represent the maximum and minimum values of training data.

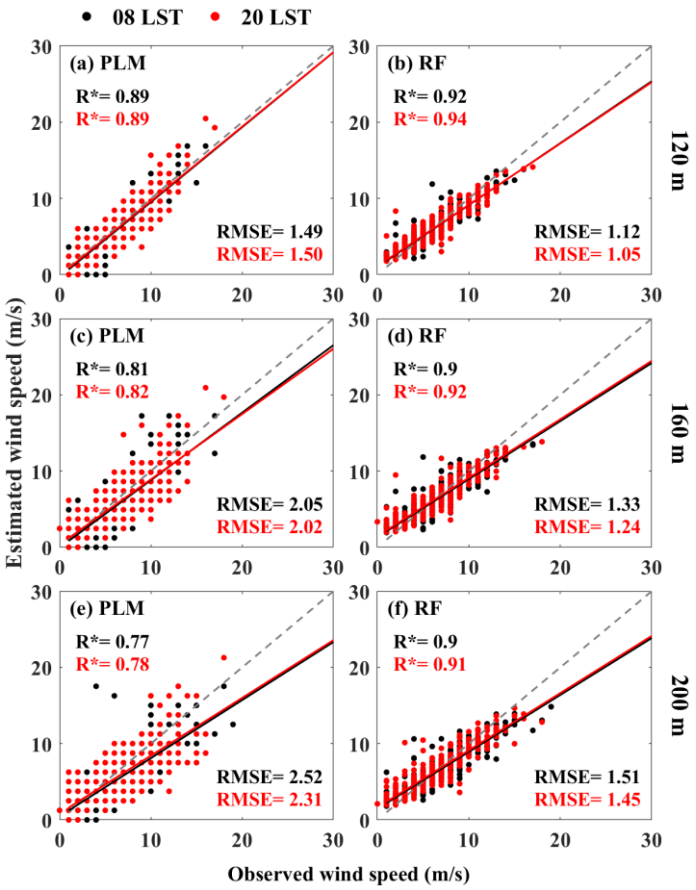

Figure S7. Comparisons between observed wind speed and estimated wind speed for (a, b, c) PLM and (d, e, f) RF at 120 m, 160 m and 200 m under different time. The red and black represent 0800 and 2000 local solar time, respectively. The asterisk indicates that the correlation coefficient (R) has passed the t-test at a confidence level of 95%.