

Supplementary Information

Table S1: Expanded summary of model performance. NA values represent those models that performed best with a non-segmented pattern or where segmented and Gaussian models were not applicable. R^2 , Coefficient of determination; RMSE, Root mean square error. Elev, elevation; $T_{\text{MeanMaxSummer}}$, mean of summer maximum temperature; $T_{\text{MeanMinGS}}$, mean of minimum temperatures in growing season; LGS, Length of Growing Season (n. of days); $\text{Prec}_{\text{AccAnnual}}$, annual accumulated precipitation; $\text{Prec}_{\text{AccSummer}}$, Summer accumulated precipitation.

System	Model	R2						RMSE					
		Elev	$T_{\text{MeanMaxSummer}}$	$T_{\text{MeanMinGS}}$	LGS	$\text{Prec}_{\text{AccAnnual}}$	$\text{Prec}_{\text{AccSummer}}$	Elev	$T_{\text{MeanMaxSummer}}$	$T_{\text{MeanMinGS}}$	LGS	$\text{Prec}_{\text{AccAnnual}}$	$\text{Prec}_{\text{AccSummer}}$
Alps	Linear	0.53	0.01	0.06	0	0.09	0.41	1.8	3.28	2.16	3	1.48	2.01
	Segmented	0.78	0.81	0.72	0.82	0.24	0.76	1.22	1.44	1.19	1	1.35	1.28
	Gaussian	0.8	0.81	0.7	0.76	0.14	0.73	1.16	1.45	1.22	2	1.44	1.36
Pyrenees	Linear	0.4	0.09	0.02	0.05	0.28	0.41	1.35	3.63	2.3	2	3.28	2.41
	Segmented	0.71	0.85	0.58	0.5	0.85	NA	1.28	1.45	1.51	1	1.51	NA
	Gaussian	0.68	NA	0.42	0.36	0.81	NA	1.87	NA	1.77	2	1.66	NA
Carpathian	Linear	0.58	0.55	0.64	0.58	NA	0.43	2.1	1.97	1.72	2	NA	1.86
	Segmented	0.85	0.85	0.83	0.86	NA	0.44	1.22	1.12	1.17	1	NA	1.83
	Gaussian	0.88	0.85	0.87	0.88	0.36	0.45	1.1	1.11	1.05	1	1.47	1.83
Caucasus	Linear	0.46	0.27	0.07	0.4	0.23	0.26	3.55	4	2.78	3	3.45	2.49
	Segmented	0.92	0.9	0.74	0.9	NA	0.36	1.3	1.42	1.47	1	NA	2.32
	Gaussian	0.9	0.88	0.75	0.85	NA	0.44	1.48	1.58	1.43	2	NA	2.15

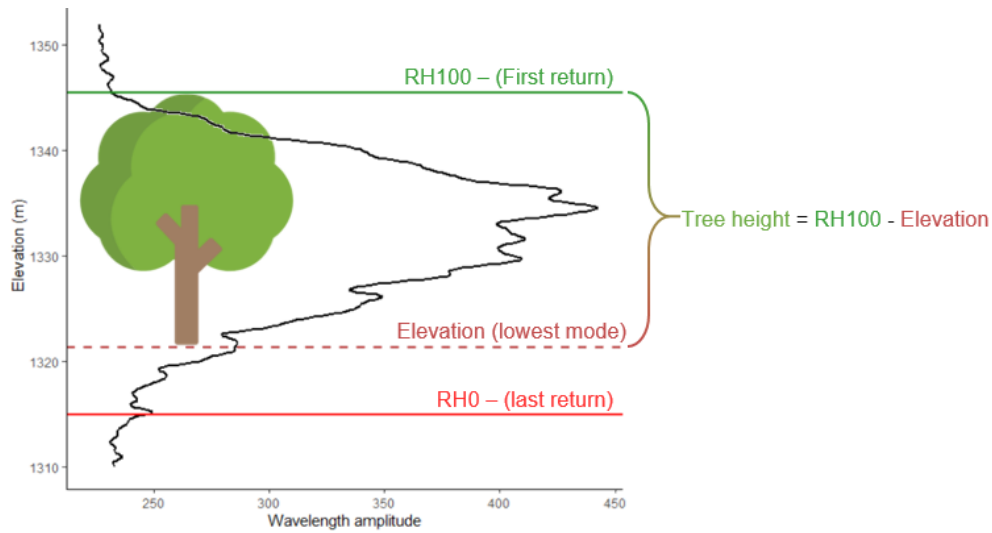


Figure ED1: Procedure outline for height estimation with GEDI data.

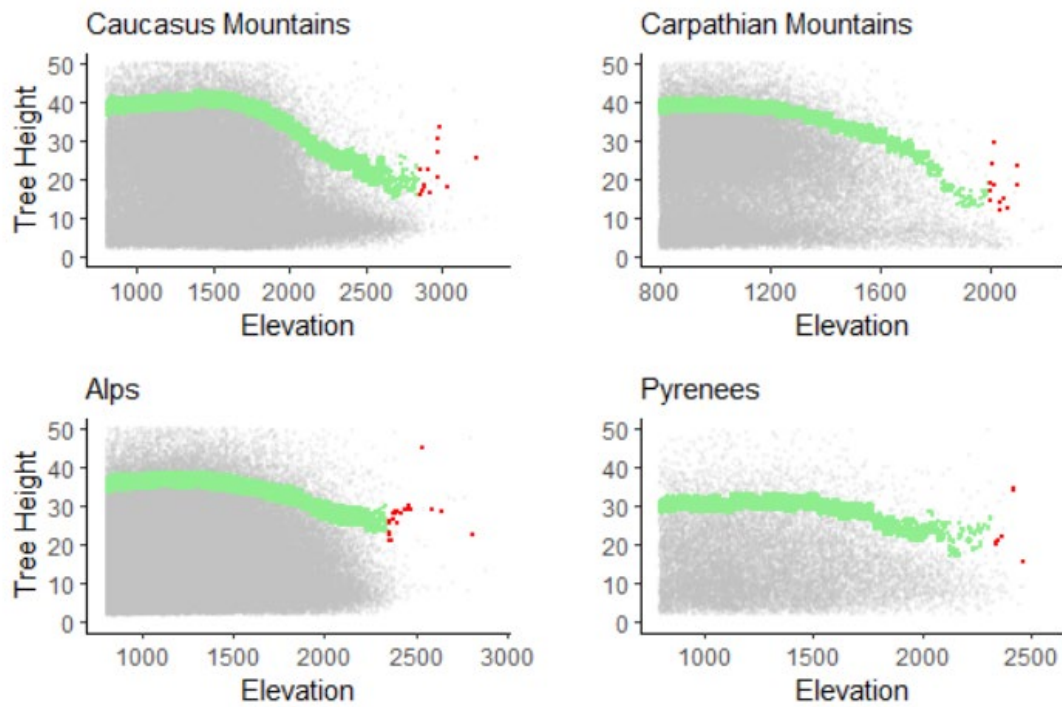


Figure ED2: Example of the histogram noise removal procedure. Here, we remove 0.1% of points located at higher altitudes (red color). The noise in these regions may be induced by snow cover or topographical complexity.