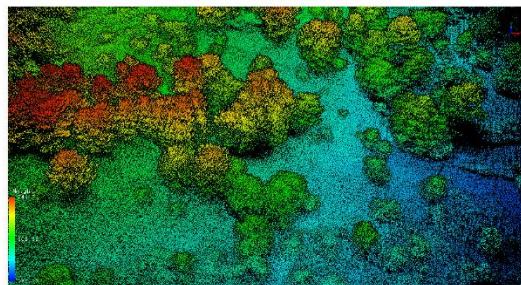


## Supplementary Material

Table S1. Technical characteristics of the low-density Lidar data (LiDAR PNOA) and the high-density LiDAR (LidarPod) for each site.

Sites	scan angle rank	point density: all returns/last only	spacing: all returns/last only	nº points	covered area (Ha)	Center X	Center Y
Low-density LiDAR (PNOA)							
Site 1	± 16	2.35 - 1.78	0.65 - 0.75	2793509	3.72	319775.4	4453642.75
Site 2	± 22	1.35 - 1.29	0.86 - 0.88	1501363	4.14	325248.03	4451699.97
Site 3	± 20	1.36 - 1.36	0.86 - 0.86	1983052	2.56	326556.81	4459364.99
Site 4	± 9	1.21 - 1.21	0.91 - 0.91	2210719	1.55	325577.92	4459904.16
Site 5	± 19	1.47 - 1.12	0.83 - 0.94	2680782	1.98	323834.3	4458283.65
Site 6	± 15	2.17 - 2.15	0.68 - 0.68	2674201	2.66	324781.82	4459137.48
High-density LiDAR (LidarPod)							
Site 1	± 30	604.6 - 61.7	0.04 - 0.13	18359176			
Site 2	± 30	378.9 - 16.9	0.05 - 0.24	20236369			
Site 3	± 30	1269.8 - 66.0	0.03 - 0.12	33965327			
Site 4	± 30	342.7 - 15.1	0.05 - 0.26	5514338			
Site 5	± 30	536.5 - 73.1	0.04 - 0.12	15746292			
Site 6	± 30	726.8 - 28.3	0.04 - 0.19	19864236			

**a) Before correction**



**b) After correction**

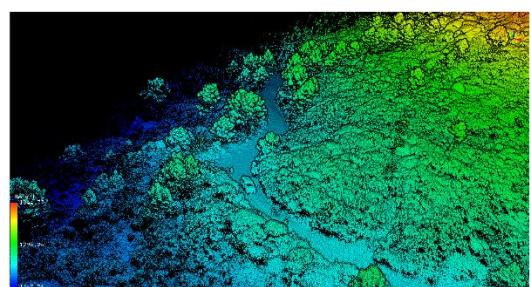
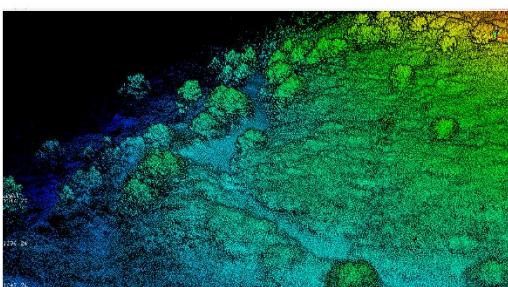
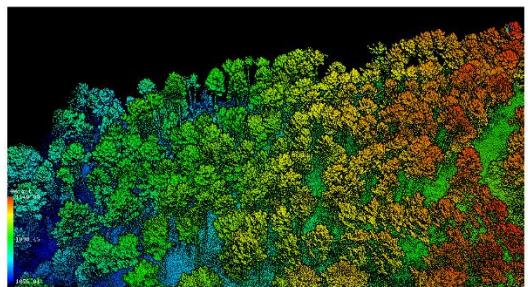
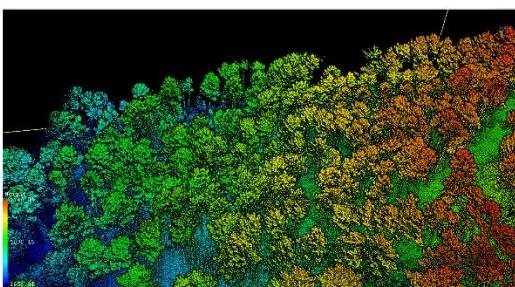
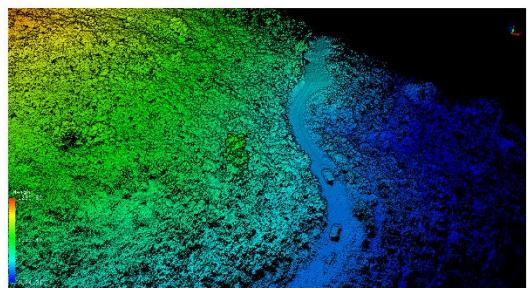
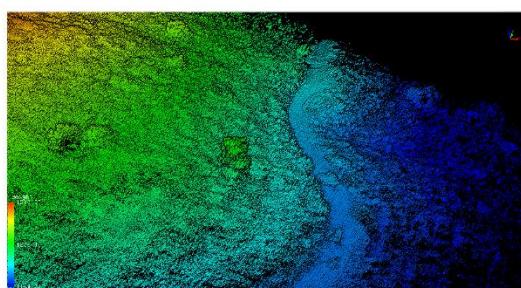
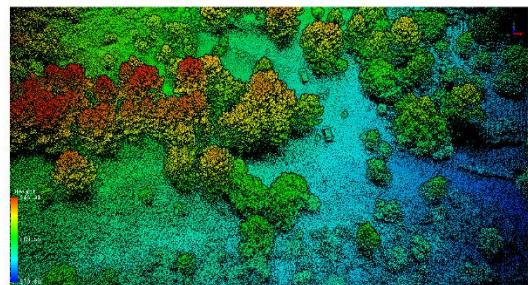


Figure S1. Clouds of points from high-density LiDAR data before (left panel) and after (right panel) correction of the boresight misalignment.

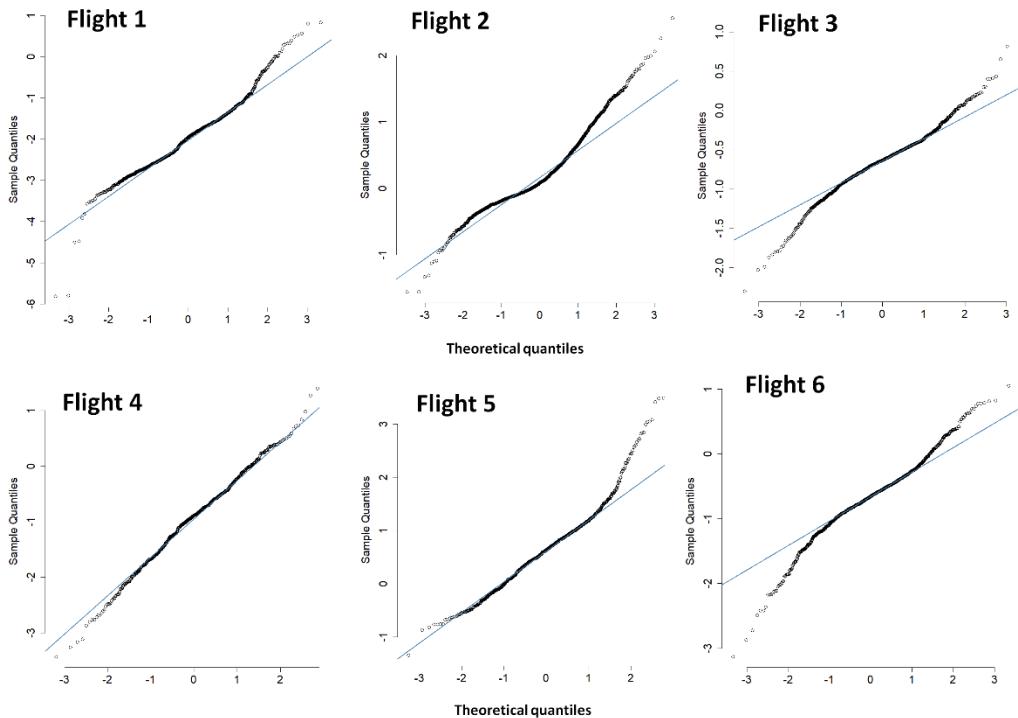


Figure S2. Normal Q-Q graph for the distribution of the uncorrected elevation differences between the low-density LiDAR and the benchmark high-resolution LiDAR derived DEMs using the best filtering algorithm.

Table S2. Mean and standard deviation of uncorrected elevation errors (i.e., DEMs of differences) measured by the percentile 50<sup>th</sup> ( $P_{50}$ ) grouping by sites (Sites), classification filters, interpolation methods and spatial resolutions. Letters indicated significant differences within groups according to the Dunn's post-hoc test with a significant level of  $p < 0.05$ .

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6						
CSF	-2.38 ± 0.02	a	-0.07 ± 0.01	a	-1.64 ± 0.01	a	-1.88 ± 0.01	a	0.58 ± 0.01	a	-1.79 ± 0.01	a
DEF	<b>-1.98 ± 0.01</b>	<b>b</b>	0.08 ± 0.01	b	<b>-0.63 ± 0.01</b>	<b>b</b>	<b>-0.88 ± 0.01</b>	<b>b</b>	0.65 ± 0.02	a	<b>-0.68 ± 0.02</b>	<b>b</b>
PMF	-2.09 ± 0.01	ab	0.01 ± 0.01	ab	-0.80 ± 0.01	ab	-1.21 ± 0.01	ab	0.58 ± 0.01	a	-0.94 ± 0.01	a
SF	-2.02 ± 0.01	ab	0.08 ± 0.01	b	-0.71 ± 0.01	ab	-1.05 ± 0.01	ab	<b>0.58 ± 0.01</b>	<b>a</b>	-0.78 ± 0.01	ab
SW2	-2.08 ± 0.01	ab	<b>0.01 ± 0.01</b>	<b>ab</b>	-0.68 ± 0.01	b	-1.05 ± 0.02	b	0.59 ± 0.02	a	-0.79 ± 0.02	ab
WILD	-1.99 ± 0.01	b	0.08 ± 0.01	ab	-0.80 ± 0.01	ab	-1.22 ± 0.03	ab	0.63 ± 0.01	a	-0.91 ± 0.01	ab
IDW	-2.09 ± 0.19	a	0.02 ± 0.06	a	-0.87 ± 0.39	a	-1.23 ± 0.35	a	0.59 ± 0.03	a	-0.99 ± 0.41	a
KRIG40	-2.09 ± 0.21	a	0.03 ± 0.06	a	-0.88 ± 0.38	a	-1.21 ± 0.35	a	0.61 ± 0.03	a	-0.98 ± 0.42	a
TIN	-2.09 ± 0.19	a	0.03 ± 0.06	a	-0.88 ± 0.38	a	-1.21 ± 0.35	a	0.61 ± 0.03	a	-0.98 ± 0.41	a
2m	-2.09 ± 0.14	a	0.03 ± 0.06	a	-0.88 ± 0.36	a	-1.21 ± 0.33	a	0.59 ± 0.03	a	-0.99 ± 0.39	a
5m	-2.09 ± 0.13	a	0.03 ± 0.06	a	-0.86 ± 0.35	a	-1.22 ± 0.29	a	0.59 ± 0.03	a	-0.99 ± 0.39	a

Table S3. Mean and standard deviation of uncorrected elevation errors (i.e., DEMs of differences) measured by the normalized median absolute deviation (NMAD) grouping by sites (Sites), classification filters, interpolation methods and spatial resolutions. Letters indicated significant differences within groups according to the Dunn's post-hoc test with a significant level of  $p < 0.05$ .

	<b>Site 1</b>	<b>Site 2</b>	<b>Site 3</b>	<b>Site 4</b>	<b>Site 5</b>	<b>Site 6</b>						
CSF	1.07 ± 0.00	a	0.56 ± 0.01	a	1.09 ± 0.01	a	1.00 ± 0.03	a	0.94 ± 0.01	a	0.75 ± 0.01	a
DEF	<b>0.69 ± 0.02</b>	a	0.36 ± 0.01	ab	<b>0.28 ± 0.03</b>	b	<b>0.70 ± 0.04</b>	b	0.58 ± 0.03	ab	<b>0.38 ± 0.03</b>	b
PMF	0.71 ± 0.00	a	0.33 ± 0.01	ab	0.41 ± 0.01	ab	0.92 ± 0.02	ab	0.56 ± 0.02	ab	0.43 ± 0.00	ab
SF	<b>0.69 ± 0.01</b>	a	0.38 ± 0.00	ab	0.34 ± 0.00	ab	0.79 ± 0.01	ab	0.57 ± 0.02	ab	0.43 ± 0.03	ab
SW2	<b>0.69 ± 0.02</b>	a	<b>0.28 ± 0.00</b>	b	0.32 ± 0.01	ab	0.78 ± 0.02	ab	<b>0.52 ± 0.04</b>	b	0.41 ± 0.02	ab
WILD	0.72 ± 0.00	a	0.45 ± 0.01	ab	0.42 ± 0.02	ab	0.90 ± 0.02	ab	0.68 ± 0.01	ab	0.52 ± 0.02	ab
IDW	0.77 ± 0.15	a	0.39 ± 0.10	a	0.48 ± 0.3	a	0.85 ± 0.09	a	0.66 ± 0.14	a	0.50 ± 0.12	a
KRIG40	0.75 ± 0.16	a	0.40 ± 0.10	a	0.47 ± 0.31	a	0.84 ± 0.11	a	0.63 ± 0.17	a	0.48 ± 0.14	a
TIN	0.76 ± 0.15	a	0.39 ± 0.09	a	0.47 ± 0.31	a	0.85 ± 0.14	a	0.63 ± 0.16	a	0.48 ± 0.14	a
2m	0.75 ± 0.14	a	0.39 ± 0.09	a	0.46 ± 0.26	a	0.84 ± 0.11	a	0.63 ± 0.15	a	0.48 ± 0.13	a
5m	0.76 ± 0.14	a	0.39 ± 0.09	a	0.47 ± 0.28	a	0.84 ± 0.11	a	0.64 ± 0.14	a	0.48 ± 0.13	a

Table S4. Mean and standard deviation of uncorrected elevation errors (i.e., DEMs of differences) measured by the root mean square error (RMSE) grouping by sites (Sites), classification filters, interpolation methods and spatial resolutions. Letters indicated significant differences within groups according to the Dunn's post-hoc test with a significant level of  $p < 0.05$ .

	<b>Site 1</b>	<b>Site 2</b>	<b>Site 3</b>	<b>Site 4</b>	<b>Site 5</b>	<b>Site 6</b>						
CSF	3.19 ± 0.15	a	0.75 ± 0.02	a	1.86 ± 0.01	a	2.04 ± 0.01	a	1.31 ± 0.01	a	1.90 ± 0.01	a
DEF	<b>2.14 ± 0.08</b>	b	0.52 ± 0.01	ab	<b>0.74 ± 0.01</b>	b	<b>1.19 ± 0.03</b>	b	0.97 ± 0.02	ab	<b>0.82 ± 0.05</b>	b
PMF	2.58 ± 0.02	ab	0.43 ± 0.01	ab	1.01 ± 0.01	ab	1.53 ± 0.01	ab	0.89 ± 0.01	ab	1.11 ± 0.01	ab
SF	2.23 ± 0.08	ab	0.53 ± 0.01	ab	0.87 ± 0.01	ab	1.39 ± 0.01	ab	0.93 ± 0.01	ab	0.91 ± 0.02	ab
SW2	2.44 ± 0.07	ab	<b>0.41 ± 0.01</b>	b	0.86 ± 0.03	ab	1.40 ± 0.02	ab	<b>0.80 ± 0.01</b>	b	0.98 ± 0.03	ab
WILD	2.37 ± 0.05	ab	0.61 ± 0.01	ab	1.04 ± 0.02	ab	1.55 ± 0.02	ab	1.14 ± 0.01	ab	1.14 ± 0.03	ab
IDW	2.58 ± 0.41	a	0.54 ± 0.11	a	1.08 ± 0.4	a	1.53 ± 0.28	a	1.01 ± 0.18	a	1.17 ± 0.38	a
KRIG40	2.45 ± 0.38	a	0.54 ± 0.13	a	1.06 ± 0.41	a	1.51 ± 0.29	a	1.01 ± 0.19	a	1.13 ± 0.40	a
TIN	2.44 ± 0.35	a	0.54 ± 0.13	a	1.05 ± 0.41	a	1.51 ± 0.3	a	1.01 ± 0.19	a	1.13 ± 0.40	a
2m	2.49 ± 0.36	a	0.55 ± 0.12	a	1.08 ± 0.39	a	1.53 ± 0.27	a	1.01 ± 0.18	a	1.15 ± 0.35	a
5m	2.49 ± 0.36	a	0.54 ± 0.12	a	1.06 ± 0.38	a	1.52 ± 0.27	a	1.01 ± 0.18	a	1.14 ± 0.37	a

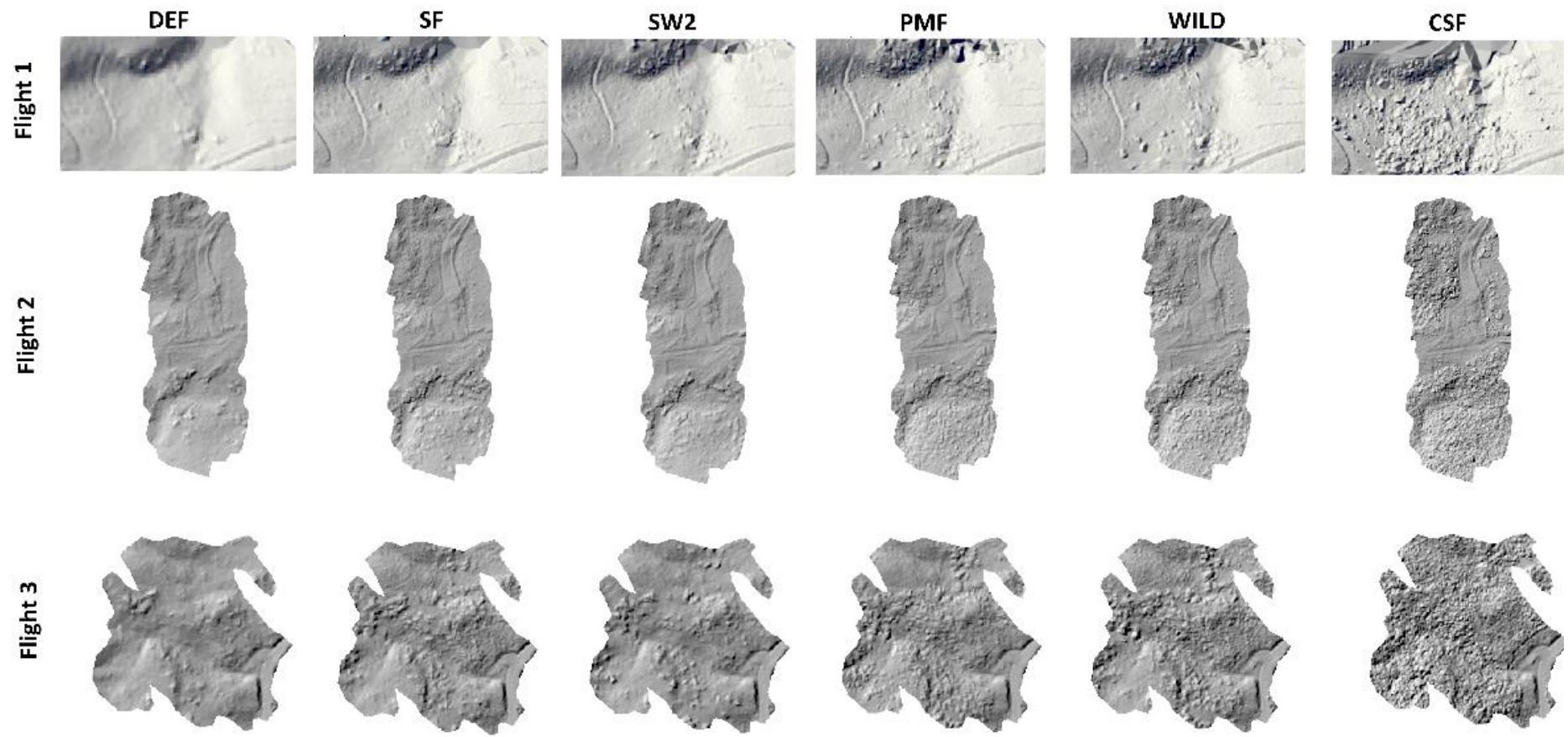


Figure S3. Hillshades at 1 m (for better visualization) of DEMs derived from high-density LiDAR data (LidarPod) using different classification filters: TIN densification with: default parameters (DEF), SIOSE-Forest (SF), Switch2 (SW2) and Wilderness (WILD); and the morphological filter, “Progressive Morphological Filter” (PMF) and the segmentation-based one, the “Cloth Simulation Filter” (CSF).

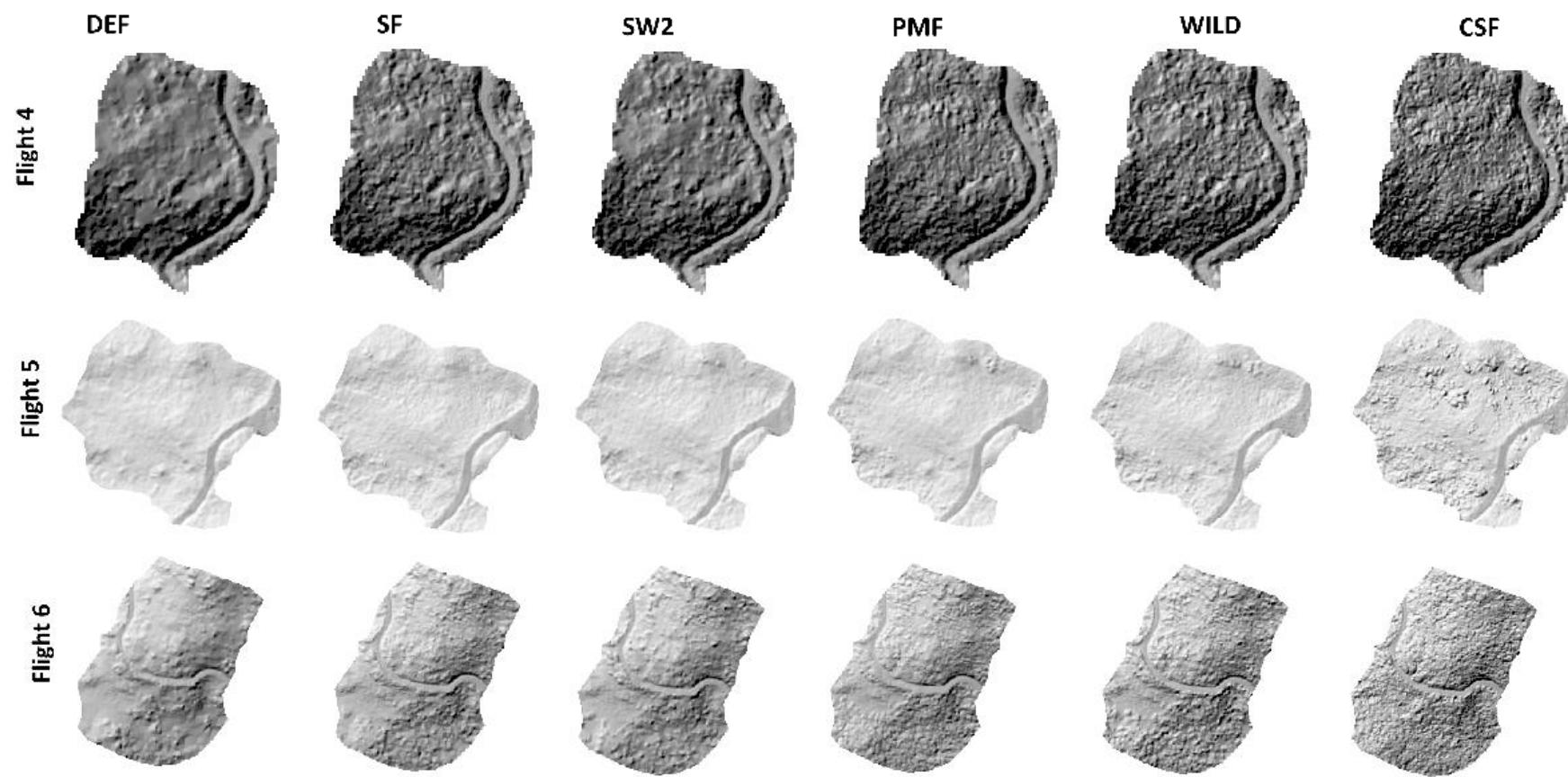


Figure S3 (continued)

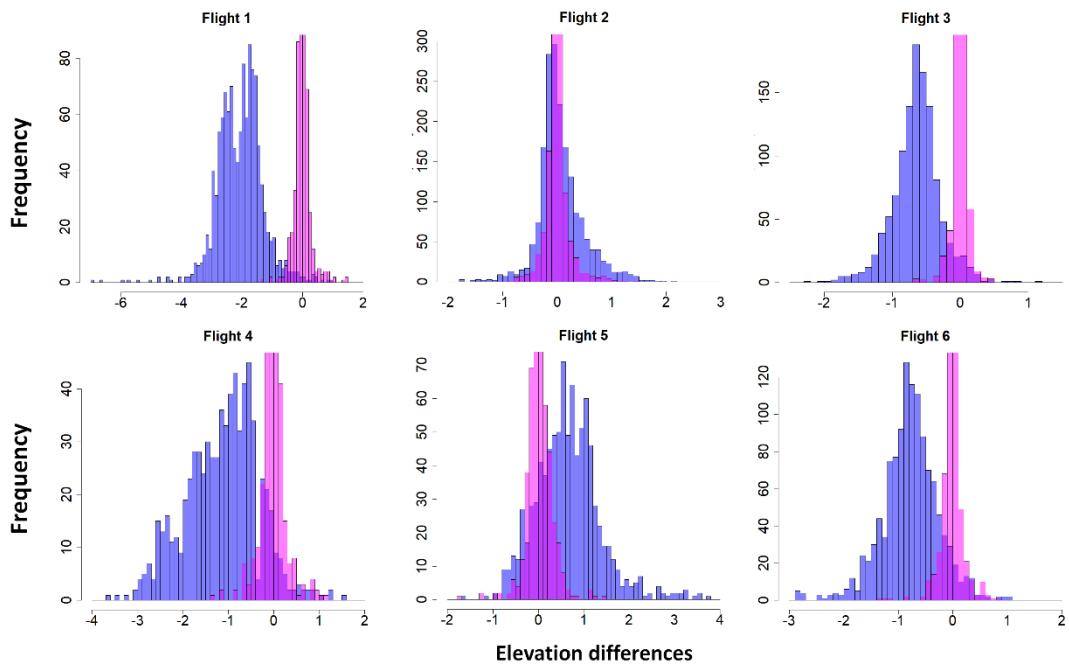


Figure S4. Histograms of the elevation differences between low- and high-density DEMs before correction (purple) and after correction (pink). DEMs were derived using the best filtering algorithm, the TIN interpolation method and at 5 m pixel resolution.

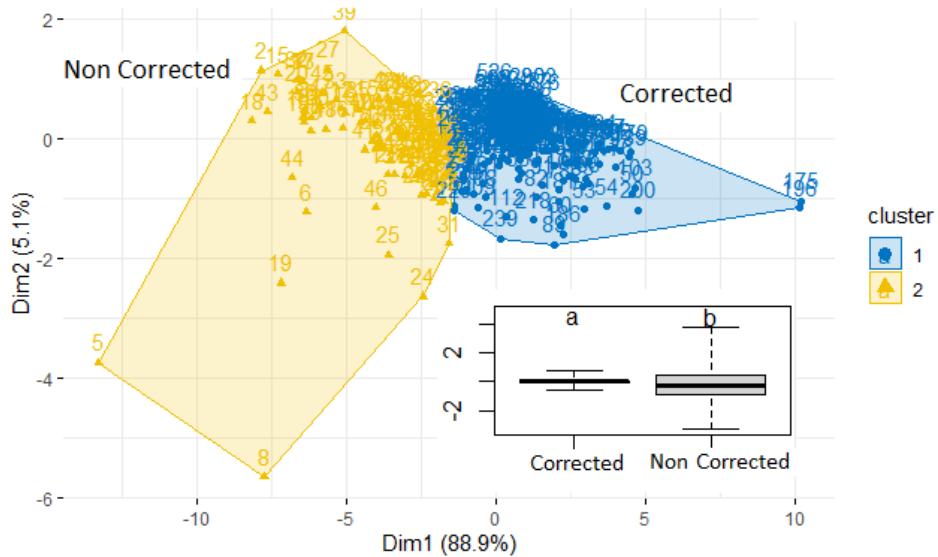


Figure S5. Cluster K-means of the elevation differences between low- and high-density LiDAR derived DEMs before and after correction using a sample of random points. The inset figure represents the statistical differences between non-corrected and corrected elevation errors by using the Kruskal-Wallis Dunn Test.

Table S5. Mean and standard deviation of corrected elevation errors (i.e., DEMs of differences) measured by the percentile 50<sup>th</sup> ( $P_{50}$ ) grouping by sites (Sites), classification filters, interpolation methods and spatial resolutions. Letters indicated significant differences within groups according to the Dunn's post-hoc test with a significant level of  $p < 0.05$ .

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6						
CSF	-0.091 ± 0.01	a	0.012 ± 0.001	a	-0.020 ± 0.004	a	-0.015 ± 0.005	a	0.015 ± 0.001	a	0.011 ± 0.001	ab
DEF	-0.014 ± 0.01	ab	-0.010 ± 0.001	b	<b>-0.004 ± 0.001</b>	ab	-0.002 ± 0.007	ab	-0.013 ± 0.003	a	-0.010 ± 0.001	a
PMF	-0.011 ± 0.01	ab	-0.008 ± 0.001	ab	-0.006 ± 0.002	ab	0.004 ± 0.001	b	-0.013 ± 0.002	a	-0.003 ± 0.006	ab
SF	<b>-0.001 ± 0.01</b>	ab	-0.006 ± 0.001	ab	-0.006 ± 0.001	ab	<b>-0.001 ± 0.005</b>	ab	-0.014 ± 0.003	a	<b>-0.002 ± 0.001</b>	ab
SW2	-0.003 ± 0.01	ab	<b>-0.001 ± 0.001</b>	ab	-0.009 ± 0.001	ab	-0.006 ± 0.011	ab	<b>-0.011 ± 0.003</b>	a	-0.008 ± 0.001	ab
WILD	0.022 ± 0.01	b	-0.002 ± 0.001	ab	0.012 ± 0.003	b	-0.009 ± 0.001	ab	-0.013 ± 0.003	a	0.013 ± 0.004	b
IDW	-0.011 ± 0.04	a	-0.005 ± 0.008	a	-0.007 ± 0.006	a	-0.008 ± 0.006	a	-0.008 ± 0.003	a	-0.006 ± 0.007	a
KRIG40	-0.021 ± 0.04	a	-0.004 ± 0.008	a	-0.007 ± 0.006	a	-0.004 ± 0.006	a	-0.011 ± 0.006	a	-0.003 ± 0.011	a
TIN	-0.018 ± 0.04	a	-0.005 ± 0.007	a	-0.008 ± 0.009	a	-0.002 ± 0.009	a	-0.013 ± 0.006	a	-0.004 ± 0.011	a
2m	-0.016 ± 0.04	a	-0.004 ± 0.007	a	-0.007 ± 0.007	a	-0.005 ± 0.007	a	-0.011 ± 0.007	a	-0.004 ± 0.007	a
5m	-0.004 ± 0.01	a	-0.005 ± 0.007	a	0.004 ± 0.006	b	-0.001 ± 0.004	a	-0.005 ± 0.012	b	0.001 ± 0.001	a

Table S6 Mean and standard deviation of corrected elevation errors (i.e., DEMs of differences) measured by normalized median absolute deviation (NMAD) grouping by sites (Sites), classification filters, interpolation methods and spatial resolutions. Letters indicated significant differences within groups according to the Dunn's post-hoc test with a significant level of  $p < 0.05$ .

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6						
CSF	0.14 ± 0.02	a	0.07 ± 0.01	a	0.41 ± 0.59	a	0.09 ± 0.01	a	0.14 ± 0.02	a	0.06 ± 0.01	a
DEF	0.08 ± 0.03	a	0.08 ± 0.01	a	<b>0.04 ± 0.01</b>	a	0.10 ± 0.02	a	0.07 ± 0.02	a	0.07 ± 0.01	a
PMF	0.07 ± 0.02	a	<b>0.06 ± 0.01</b>	a	0.05 ± 0.01	a	0.10 ± 0.01	a	<b>0.06 ± 0.01</b>	a	0.07 ± 0.01	a
SF	<b>0.06 ± 0.02</b>	a	<b>0.06 ± 0.01</b>	a	<b>0.04 ± 0.01</b>	a	<b>0.08 ± 0.01</b>	a	<b>0.06 ± 0.01</b>	a	<b>0.05 ± 0.01</b>	a
SW2	0.08 ± 0.03	a	0.07 ± 0.01	a	0.05 ± 0.01	a	0.10 ± 0.02	a	0.07 ± 0.02	a	0.08 ± 0.01	a
WILD	0.07 ± 0.02	a	0.07 ± 0.01	a	0.05 ± 0.01	a	0.08 ± 0.02	a	0.08 ± 0.01	a	0.06 ± 0.01	a
IDW	0.11 ± 0.03	a	0.08 ± 0.01	a	0.23 ± 0.42	a	0.11 ± 0.01	a	0.10 ± 0.03	a	0.08 ± 0.01	a
KRIG40	<b>0.06 ± 0.03</b>	b	<b>0.06 ± 0.01</b>	b	<b>0.04 ± 0.01</b>	a	<b>0.08 ± 0.01</b>	b	<b>0.07 ± 0.03</b>	a	<b>0.05 ± 0.01</b>	b
TIN	0.07 ± 0.03	ab	0.07 ± 0.01	ab	0.05 ± 0.01	a	0.09 ± 0.01	ab	0.08 ± 0.03	a	0.06 ± 0.01	ab
2m	0.32 ± 0.11	a	0.27 ± 0.03	a	0.27 ± 0.09	a	0.42 ± 0.07	a	0.24 ± 0.04	a	0.36 ± 0.08	a
5m	<b>0.08 ± 0.03</b>	b	<b>0.07 ± 0.01</b>	b	<b>0.10 ± 0.25</b>	b	<b>0.09 ± 0.01</b>	b	<b>0.08 ± 0.03</b>	b	<b>0.06 ± 0.01</b>	b

Table S7. Mean and standard deviation of uncorrected elevation errors (i.e., DEMs of differences) measured by the root mean square error (RMSE) grouping by sites (Sites), classification filters, interpolation methods and spatial resolutions. Letters indicated significant differences within groups according to the Dunn's post-hoc test with a significant level of  $p < 0.05$ .

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6						
CSF	0.69 ± 0.16	a	0.29 ± 0.01	ab	1.09 ± 1.44	a	0.24 ± 0.04	a	0.42 ± 0.02	a	0.13 ± 0.01	a
DEF	<b>0.22 ± 0.06</b>	ab	0.22 ± 0.01	ab	<b>0.09 ± 0.01</b>	a	0.19 ± 0.04	a	<b>0.20 ± 0.03</b>	a	0.18 ± 0.01	a
PMF	0.47 ± 0.01	ab	<b>0.15 ± 0.01</b>	a	0.14 ± 0.04	a	0.25 ± 0.08	a	0.22 ± 0.03	a	<b>0.15 ± 0.04</b>	a

SF	<b>0.22 ± 0.06</b>	b	0.19 ± 0.01	ab	<b>0.09 ± 0.02</b>	a	<b>0.13 ± 0.02</b>	a	0.21 ± 0.02	a	<b>0.15 ± 0.01</b>	a
SW2	0.25 ± 0.04	ab	0.19 ± 0.01	ab	0.11 ± 0.02	a	0.22 ± 0.03	a	0.21 ± 0.03	a	0.18 ± 0.02	a
WILD	0.41 ± 0.02	ab	0.43 ± 0.03	b	0.11 ± 0.01	a	0.19 ± 0.02	a	0.38 ± 0.01	a	0.16 ± 0.01	a
IDW	0.44 ± 0.23	a	0.25 ± 0.08	a	0.57 ± 1.07	a	0.24 ± 0.06	a	0.29 ± 0.09	a	0.17 ± 0.03	a
KRIG40	<b>0.35 ± 0.19</b>	a	0.25 ± 0.11	a	<b>0.11 ± 0.05</b>	a	<b>0.17 ± 0.03</b>	a	<b>0.25 ± 0.11</b>	a	<b>0.14 ± 0.02</b>	a
TIN	0.34 ± 0.16	a	0.25 ± 0.11	a	0.14 ± 0.08	a	0.21 ± 0.05	a	0.28 ± 0.11	a	0.16 ± 0.02	a
2m	0.55 ± 0.22	a	0.37 ± 0.13	a	0.45 ± 0.58	a	0.49 ± 0.08	a	0.38 ± 0.14	a	0.41 ± 0.11	a
5m	<b>0.38 ± 0.19</b>	a	<b>0.25 ± 0.11</b>	a	<b>0.27 ± 0.62</b>	b	<b>0.21 ± 0.06</b>	a	<b>0.27 ± 0.11</b>	b	<b>0.16 ± 0.03</b>	a

Table S8. GAMs (with linear terms) for each site using as response variable the uncorrected vertical errors derived from the **CSF classification filter** (keeping fixed the interpolation method [TIN] and the spatial resolution [5 m]) and as explanatory ones the site conditions. Estimated coefficients and p values of the site variables as well as the adjusted R<sup>2</sup> and the percentage of deviance explained by the models are given. In bold, there are highlighted the site variables statistically significant ( $p < 0.05$ ).

CSF	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
(Intercept)	35.929	0.00	10.616	0.34	24.480	0.30
ELEVATION	<b>-0.054</b>	<b>0.00</b>	-0.015	0.42	-0.031	0.20
SLOPE	<b>-0.092</b>	<b>0.00</b>	0.002	0.90	-0.002	0.96
CHM	0.036	0.35	-0.004	0.87	0.122	0.79
DIST_REDPP	0.012	0.09	<b>-0.005</b>	<b>0.01</b>	<b>0.011</b>	<b>0.00</b>
Adj. R <sup>2</sup>	0.294		0.147		0.177	
% deviance explained	36%		20%		27%	
				0.384		0.094
						-0.048
					50%	
					20%	
						5%

Table S9. GAMs (with linear terms) for each site using as response variable the uncorrected vertical errors derived from the **TIN-DEF classification filter** (keeping fixed the interpolation method [TIN] and the spatial resolution [5 m]) and as explanatory ones the site conditions. Estimated coefficients and p values of the site variables as well as the adjusted R<sup>2</sup> and the percentage of deviance explained by the models are given. In bold, there are highlighted the site variables statistically significant ( $p < 0.05$ ).

DEF	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
(Intercept)	30.901	0.00	-21.788	0.04	9.826	0.43
ELEVATION	<b>-0.047</b>	<b>0.00</b>	<b>0.040</b>	<b>0.03</b>	-0.014	0.28
SLOPE	<b>-0.041</b>	<b>0.04</b>	-0.025	0.10	0.012	0.48
CHM	<b>-0.110</b>	<b>0.00</b>	<b>-0.054</b>	<b>0.03</b>	0.371	0.14
DIST_REDPP	<b>0.023</b>	<b>0.00</b>	0.003	0.12	<b>0.006</b>	<b>0.00</b>
Adj. R <sup>2</sup>	0.488		0.119		0.238	
% deviance explained	53%		18%		33%	
				0.476		0.077
						0.038
					57%	
					19%	
						13%

Table S10. GAMs (with linear terms) for each site using as response variable the uncorrected vertical errors derived from the **PMF classification filter** (keeping fixed the interpolation method [TIN] and the spatial resolution [5 m]) and as explanatory ones the site conditions. Estimated

coefficients and p values of the site variables as well as the adjusted R<sup>2</sup> and the percentage of deviance explained by the models are given. In bold, there are highlighted the site variables statistically significant ( $p < 0.05$ ).

PMF	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	
(Intercept)	28.595	0.00	-10.410	0.29	1.651	0.91	-15.294	0.66	14.636	0.62	-20.901	0.10
ELEVATION	<b>-0.044</b>	<b>0.00</b>	0.020	0.24	-0.006	0.71	0.007	0.76	-0.010	0.78	0.018	0.10
SLOPE	<b>-0.052</b>	<b>0.01</b>	-0.022	0.12	-0.001	0.96	0.038	0.23	-0.028	0.38	0.004	0.78
CHM	<b>-0.050</b>	<b>0.06</b>	<b>-0.044</b>	<b>0.05</b>	0.032	0.91	<b>-1.257</b>	<b>0.02</b>	-0.024	0.44	0.051	0.51
DIST_REDPP	<b>0.019</b>	<b>0.00</b>	0.001	0.68	<b>0.007</b>	<b>0.00</b>	0.006	0.48	-0.003	0.69	<b>-0.007</b>	<b>0.01</b>
Adj. R <sup>2</sup>	0.384		0.059		0.183		0.593		0.090		0.069	
% deviance explained	44%		12%		28%		67%		20%		16%	

Table S11. GAMs (with linear terms) for each site using as response variable the uncorrected vertical errors derived from the **TIN-SF classification filter** (keeping fixed the interpolation method [TIN] and the spatial resolution [5 m]) and as explanatory ones the site conditions. Estimated coefficients and p values of the site variables as well as the adjusted R<sup>2</sup> and the percentage of deviance explained by the models are given. In bold, there are highlighted the site variables statistically significant ( $p < 0.05$ ).

SF	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	
(Intercept)	25.136	0.00	-16.062	0.11	5.617	0.66	-64.742	0.12	22.378	0.48	-16.755	0.16
ELEVATION	<b>-0.040</b>	<b>0.00</b>	0.030	0.09	-0.009	0.47	0.036	0.19	-0.019	0.60	0.014	0.16
SLOPE	<b>-0.038</b>	<b>0.05</b>	-0.010	0.50	0.006	0.73	0.033	0.42	-0.004	0.91	-0.003	0.84
CHM	<b>-0.066</b>	<b>0.02</b>	<b>-0.041</b>	<b>0.07</b>	0.319	0.21	-0.343	0.53	-0.033	0.24	0.015	0.84
DIST_REDPP	<b>0.019</b>	<b>0.00</b>	0.002	0.32	<b>0.006</b>	<b>0.00</b>	<b>0.022</b>	<b>0.04</b>	-0.001	0.88	<b>-0.006</b>	<b>0.03</b>
Adj. R <sup>2</sup>	0.332		0.057		0.222		0.444		0.062		0.036	
% deviance explained	39%		12%		31%		55%		17%		13%	

Table S12. GAMs (with linear terms) for each site using as response variable the uncorrected vertical errors derived from the **TIN-SW2 classification filter** (keeping fixed the interpolation method [TIN] and the spatial resolution [5 m]) and as explanatory ones the site conditions. Estimated coefficients and p values of the site variables as well as the adjusted R<sup>2</sup> and the percentage of deviance explained by the models are given. In bold, there are highlighted the site variables statistically significant ( $p < 0.05$ ).

SW2	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	
(Intercept)	18.270	0.01	-16.042	0.11	25.572	0.06	-59.589	0.19	35.310	0.26	-12.387	0.28
ELEVATION	<b>-0.031</b>	<b>0.00</b>	0.030	0.09	<b>-0.030</b>	<b>0.04</b>	0.035	0.23	-0.034	0.34	0.011	0.28
SLOPE	-0.025	0.22	-0.016	0.31	0.012	0.44	0.025	0.52	-0.008	0.81	0.012	0.39
CHM	-0.045	0.10	<b>-0.044</b>	<b>0.05</b>	<b>0.752</b>	<b>0.01</b>	-0.384	0.54	-0.033	0.30	0.051	0.46
DIST_REDPP	<b>0.019</b>	<b>0.00</b>	0.002	0.32	<b>0.006</b>	<b>0.00</b>	<b>0.018</b>	<b>0.04</b>	0.002	0.79	<b>-0.006</b>	<b>0.02</b>
Adj. R <sup>2</sup>	0.291		0.069		0.320		0.388		0.074		0.083	
% deviance explained	35%		13%		40%		50%		18%		17%	

Table S13. GAMs (with linear terms) for each site using as response variable the uncorrected vertical errors derived from the **TIN-WILD classification filter** (keeping fixed the interpolation method [TIN] and the spatial resolution [5 m]) and as explanatory ones the site conditions. Estimated coefficients and p values of the site variables as well as the adjusted R<sup>2</sup> and the percentage of deviance explained by the models are given. In bold, there are highlighted the site variables statistically significant ( $p < 0.05$ ).

WILD	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
(Intercept)	21.650	0.00	-15.966	0.11	10.827	0.50
ELEVATION	<b>-0.036</b>	<b>0.00</b>	0.029	0.09	-0.015	0.37
SLOPE	-0.020	0.29	-0.007	0.59	0.006	0.79
CHM	-0.023	0.37	-0.030	0.18	0.508	0.15
DIST_REDPP	<b>0.019</b>	<b>0.00</b>	0.001	0.42	<b>0.006</b>	<b>0.03</b>
Adj. R <sup>2</sup>	0.274	0.047	0.174	0.566	0.133	0.041
% deviance explained	34%	11%	27%	65%	24%	13%

Table S14. GAMs (with linear terms) for each site using as response variable the corrected vegetation height changes (2014-2019) and as explanatory one the vertical errors of DEMs developed using different classification filters (keeping fixed the interpolation method [TIN] and the spatial resolution [5 m]). **Estimated coefficients** of the vertical errors of DEMs are given. In bold, there are highlighted the coefficients of the vertical errors statistically significant ( $p < 0.05$ ).

Coeff. Vertical errors	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
CSF	-0.07	-0.04	-0.48	0.29	1.26	0.08
DEF	0.15	-1.08	<b>-1.58*</b>	<b>0.51</b>	1.0	0.28
PMF	0.34	-1.09	-0.46	<b>0.48</b>	1.4	<b>0.35</b>
SF	0.46	-1.19	-0.59	<b>0.55</b>	1.27	<b>0.52</b>
SW2	0.29	-0.81	-1.07	<b>0.55</b>	-1.86	0.26
WILD	0.58	-0.82	-0.26	<b>0.53</b>	0.08	<b>0.59</b>

Table S15. GAMs (with linear terms) for each site using as response variable the corrected vegetation height changes (2014-2019) and as explanatory one the vertical errors of DEMs developed using different classification filters (keeping fixed the interpolation method [TIN] and the spatial resolution [5 m]). **The percentage of deviance explained** by the vertical errors of DEMs is given.

Deviance explained	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
CSF	0.36%	0.02%	7.63%	16.10%	4.50%	1.70%
DEF	0.24%	4.46%	13.90%	29.70%	1.61%	4.26%
PMF	0.83%	2.76%	1.54%	26.30%	2.20%	11.10%
SF	1.59%	5.52%	2.59%	40.20%	2.04%	17.20%
SW2	0.47%	1.62%	5.36%	43.80%	0.92%	6.63%
WILD	2.33%	4.01%	0.78%	37.10%	1.70%	29.80%

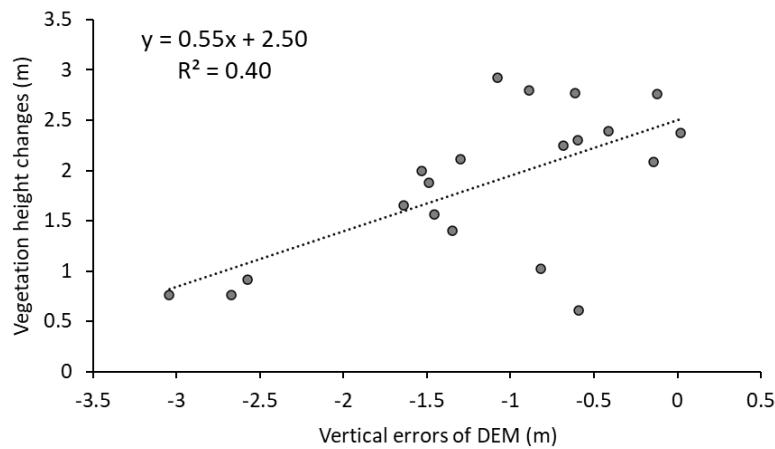


Figure S6. Scatterplot of the relationship between the vegetation height changes (2014-2019) occurred in site 4 and the vertical errors of the DEM built using the **TIN-SF** classification filter (interpolation method [TIN] and the spatial resolution [5 m]).

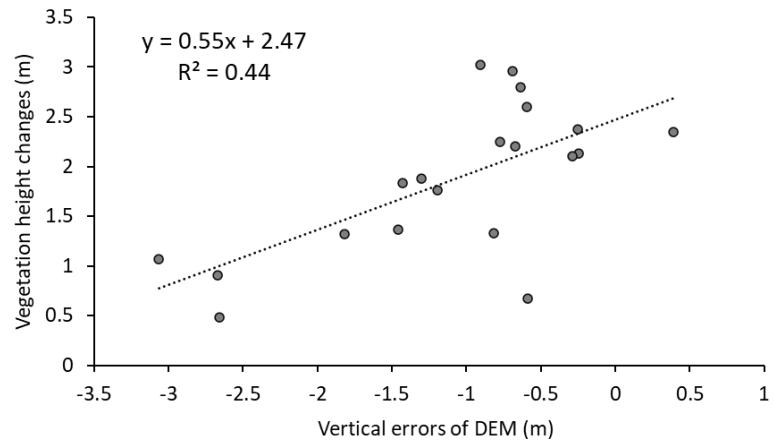


Figure S7. Scatterplot of the relationship between the vegetation height changes (2014-2019) occurred in site 4 and the vertical errors of the DEM built using the **TIN-SW2** classification filter (interpolation method [TIN] and the spatial resolution [5 m]).