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Erratum

Erratum: Zielewska-Büttner, K.; Adler, P.; Ehmann, M.; Braunisch, V. Automated Detection of Forest Gaps in Spruce Dominated Stands Using Canopy Height Models Derived from Stereo Aerial Imagery. *Remote Sens.* 2016, *8*, 175

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The authors would like to correct Tables 6 and 8 and the relevant text of this article [1] as follows, as the column values in the tables were unintentionally exchanged. Please also note an updated correspondence E-mail.

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Abstract: Forest gaps are important structural elements in forest ecology to which various conservation-relevant, photophilic species are associated. To automatically map forest gaps and detect their changes over time, we developed a method based on Digital Surface Models (DSM) derived from stereoscopic aerial imagery and a LiDAR-based Digital Elevation Model (LiDAR DEM). Gaps were detected and delineated in relation to height and cover of the surrounding forest comparing data from two public flight campaigns (2009 and 2012) in a 1023-ha model region in the Northern Black Forest, Southwest Germany. The method was evaluated using an independent validation dataset obtained by visual stereo-interpretation. Gaps were automatically detected with an overall accuracy of 0.90 (2009) and 0.82 (2012). However, a very high user's accuracy of more than 0.95 (both years) was counterbalanced by a producer's accuracy of 0.84 (2009) and 0.72 (2012) as some gaps were not automatically detected. Accuracy was mainly dependent on the shadow occurrence and height of the surrounding forest with producer's accuracies dropping to 0.70 (2009) and 0.52 (2012) in high stands (>8 m tree height). As one important step in the workflow, the class of open forest, an important feature for many forest species, was delineated with a very good overall accuracy of 0.92 (both years) with uncertainties occurring mostly in areas with intermediate canopy cover. Presence of complete or partial shadow and geometric limitations of stereo image matching were identified as the main sources of errors in the method performance, suggesting that images with a higher overlap and resolution and ameliorated image-matching algorithms provide the greatest potential for improvement.

3.3.1. Mapping Accuracy

The comparison of automatic gap-detection with the visually identified gaps revealed good agreement (Tables 5 and 6) with an overall accuracy of 0.90 and 0.82 in 2009 and 2012, respectively,

and corresponding Kappa values of 0.80 and 0.66. User's accuracies greater than 0.96 show that almost all automatically detected gaps were correctly classified. However, a fraction of the visually identified gaps were not captured during the automated mapping process, which is reflected in omission errors of 0.16 (2009) and 0.28 (2012). Method performance for the "non-gap" areas showed an opposite pattern with producer's accuracies greater than user's accuracies.

Table 6. Mapping accuracies of automatically generated gaps derived from a comparison with the results of visual interpretation (accessed with 95% confidence interval (CI)).

	Producer's Accuracy	User's Accuracy	Producer's Accuracy	User's Accuracy	Kappa	Overall Accuracy
	Gap	Gap	"Non-Gap"	"Non-Gap"		with 95% CI
2009	0.84	0.97	0.97	0.84	0.80	0.90
2012	0.72	0.96	0.96	0.73	0.66	0.82

3.3.2. Variables Affecting Mapping Accuracy

Despite similar user's accuracies of 0.96–0.98 and overall accuracies higher than 0.79, producer's accuracy in high forest was much lower than in low forest with 0.70 in 2009 and 0.52 in 2012 (Tables 7 and 8).

Table 8. Accuracy of the automated mapping of gap and "non-gap" areas assessed visually (with 95% of confidence interval (CI)) in low forest (LF) and high forest (HF) in 2009 and 2012.

	Forest Height Class	Producer's Accuracy	User's Accuracy	Producer's Accuracy	User's Accuracy	Kappa	Overall Accuracy
		Gap	Gap	"Non-Gap"	"Non-Gap"		with 95% CI
2009	LF	0.93	0.98	0.89	0.68	0.73	0.93
	HF	0.70	0.98	0.98	0.87	0.73	0.88
2012	LF	0.85	0.98	0.94	0.59	0.93	0.86
	HF	0.52	0.96	0.96	0.76	0.84	0.79

We apologize for any inconvenience caused to the readers by these changes. The changes do not affect the scientific results. The manuscript will be updated and the original will remain available on the article webpage.

References

1. Zielewska-Büttner, K.; Adler, P.; Ehmann, M.; Braunisch, V. Automated detection of forest gaps in spruce dominated stands using canopy height models derived from stereo aerial imagery. *Remote Sens.* **2016**, *8*, 175. [CrossRef]