Volume XXXVIII-5/W12

Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XXXVIII-5/W12, 25-30, 2011
www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XXXVIII-5-W12/25/2011/
doi:10.5194/isprsarchives-XXXVIII-5-W12-25-2011

CALIBRATION OF FULL-WAVEFORM ALS DATA BASED ON ROBUST INCIDENCE ANGLE ESTIMATION

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Keywords: ALS, Full-waveform, Calibration, Analysis, Modelling, Segmentation

Abstract. Full-waveform airborne laser scanning data has shown its potential to enhance available segmentation and classification approaches through the additional information it can provide. However, this additional information is unable to directly provide a valid physical representation of surface features due to many variables affecting the backscattered energy during travel between the sensor and the target. Effectively, this delivers a mis-match between signals from overlapping flightlines. Therefore direct use of this information is not recommended without the adoption of a comprehensive radiometric calibration strategy that accounts for all these effects. This paper presents a practical and reliable radiometric calibration routine by accounting for all the variables affecting the backscattered energy, including the essential factor of angle of incidence. A new robust incidence angle estimation approach has been developed which has proven capable of delivering a reliable estimation for the scattering direction of the individual echoes. The routine was tested and validated both visually and statistically over various land cover types with simple and challenging surface trends. This proved the validity of this approach to deliver the optimal match between overlapping flightlines after calibration, particularly by adopting a parameter which accounts for the angle of incidence effect.

Conference Paper (PDF, 1145 KB)

Citation: Abed, F. M., Mills, J. P., and Miller, P. E.: CALIBRATION OF FULL-WAVEFORM ALS DATA BASED ON ROBUST INCIDENCE ANGLE ESTIMATION, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XXXVIII-5/W12, 25-30, doi:10.5194/isprsarchives-XXXVIII-5-W12-25-2011, 2011.

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