ANALYSIS OF FULL-WAVEFORM ALS DATA BY SIMULTANIOUSLY ACQUIRED TLS DATA: TOWARDS AN ADVANCED DTM GENERATION IN WOODED AREAS

M. Doneus[*a b] C. Briese[a c] N. Studnicka[d]

[b] University of Vienna, Department for Prehistoric and Medieval Archaeology, Franz-Kleingasse 1, A-1190, Vienna, Austria

[d] RIEGL, Laser Measurement Systems GmbH, Riedenburgstraße 48, A-3580, Horn, Austria

[c] Institute of Photogrammetry and Remote Sensing of the Vienna University of Technology, Christian Doppler Laboratory for Spatial Data from Laser Scanning and Remote Sensing, Gußhausstraße 27 - 29, A-1040, Vienna, Austria

[a] Ludwig Boltzmann Institute, Archaeological Prospection and Virtual Archaeology, Franz-Kleingasse 1, A-1190, Vienna, Austria

Technical Commission VII Symposium 2010

KEY WORDS: Archaeology, Analysis, Combination, LIDAR, Laser scanning, Aerial, Terrestrial, Full-waveform

ABSTRACT:

Airborne laser scanning (ALS, also referred to as airborne LIDAR) is a widely used data acquisition method for topographic modelling. In archaeology, it has revolutionised prospection of forested areas. Here, especially full-waveform (FWF) ALS systems show considerable advantages for the generation of digital terrain models (DTM) in vegetated areas, as the FWF-information (e.g. echo width) can improve classification of ALS data into terrain and off-terrain points, resulting in greater DTM quality and higher potential for the subsequent archaeological interpretation. FWF-ALS displays a high potential, but is still in its infancy (in contrast to conventional ALS sensors FWF-ALS is just available since a few years). One key topic to be investigated is the complex interaction of the laser beam with different types of vegetation cover. An in-depth understanding of the FWF-information is essential to enhance the quality of the DTM and to allow a reliable automated interpretation of the acquired data. To study the interaction of ALS and the resulting FWF-information with a vegetation complex, part of a forest was scanned by airborne and terrestrial laser scanning (Riegl LMS-Q680 and Riegl VZ-400). The combined data acquisition took place simultaneously on a calm day. Using tachymetry, the data sets were geo-referenced and the differences between the ALS and TLS data sets were minimized by an adjustment using planar control and tie patches. Based on the TLS dataset, the position of the derived ALS echoes are studied and the additionally derived FWF-parameters are investigated. This analysis allows to increase the knowledge of the interaction of the laser beam with the different surface elements and allows to estimate the potential for methods for advanced DTM generation. Based on this knowledge a high quality DTM can be determined which allows an advanced interpretation of archaeological structures which are present on the terrain surface.

TOPIC: Lidar and laser scanning
ALTERNATIVE TOPIC: Data fusion and data assimilation