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TLS System Specifications

All surveys were performed with a Riegl VZ-400 TLS. The instrument nominal specifications are listed below in Table 1. For more information from the manufacturer see Riegl LMS (2017).

Table 1: Instrument specifications for Riegl VZ-400 TLS.

Parameter	**Specification**
Accuracy	5 mm at 100 m scanning range
Precision	3 mm at 100 m scanning range
Minimum range	1.5 m
Laser beam divergence	0.3 mrad

TLS Survey Parameters

The survey was conducted on 2017-09-12. Fig. 1 shows the setup of scan positions at the survey site.

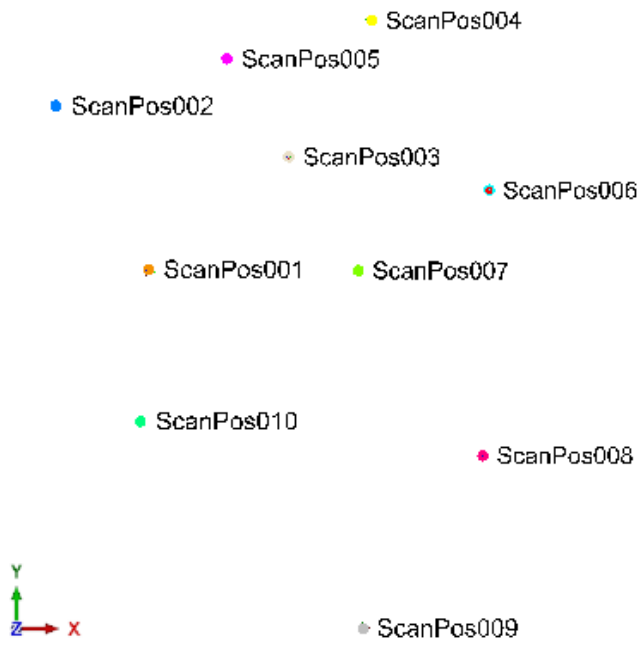

Figure 1: Setup of TLS scan positions on 2017-09-12.

TLS survey parameters are given in Table 2.

Table 2: TLS survey parameters.

Instrument	Riegl VZ-400
Resolution	0.017° / 3 mm at 10 m measurement range (horizontal and vertical point spacing)
Attributes	range, amplitude, RGB, scan position

TLS Data Pre-Processing

RGB coloring

The point clouds were colored using photo imagery recorded using a Nikon D300 mounted on top of the TLS. The camera was calibrated prior to the field campaign and RGB values were assigned to each point in the point cloud in the scanner-specific processing software RiSCAN Pro (Riegl LMS 2016).

Registration of scan position and georeferencing

The single scans were registered based on cylindrical reflectors placed at the edges of the study site. Georeferencing and the registration of scan positions for each study site and survey date is conducted in the scanner-specific processing software RiSCAN Pro (version 2.1.1, Riegl LMS 2016). Point clouds were georeferenced using Global Navigation Satellite System (GNSS) measurements in static phase observation mode, referenced to a local base station (Leica Geosystems 2012, Leica Geosystems 2015).

Statistical outlier filter

Spatially isolated points are removed from the data via a statistical outlier filter (Rusu and Cousins 2011) for which the number of neighbors is set to 10 and the standard deviation multiplier threshold to 1.0.

Final note

No further processing (e.g., correction, classification or filtering) was applied to the data other than the steps described above.

For further details and information on the analyses of ground surface elevation and relative heights (vegetation), please refer to the paper (Boike et al. 2018, Appendix H).

Data Format

Coordinate reference system:

Coordinates are given in UTM WGS84 Zone North 52 (EPSG 32652). Elevation is given above the WGS84 ellipsoid.

Units:

Meters, decibels

File format:

Point cloud in one tab-delimited ASCII file (txt)

Raster in geo-tif with cell size of 5 cm

Point cloud attributes:

X **Y** **Z**	3D coordinate of the laser measurement (WGS84 UTM 52N, EPSG 32652, height above WGS84 ellipsoid) [m]
R **G** **B**	RGB value assigned from true color photos taken by the camera mounted on the TLS [DN]
Range	Measurement distance of the point with respect to the laser beam origin (TLS instrument position) [m]
Amplitude	Amplitude of the returned laser intensity (LiDAR backscatter information) [dB] Note: The amplitude values in the data are not corrected or calibrated.
Scan position ID	ID of the scan position from which the laser measurement point originates [DN]

References

Leica Geosystems (2012). Leica Viva GNSS GS15 receiver: Datasheet. URL: http://w3.leica-geosystems.com/downloads123/zz/gpsgis/Viva%20GNSS/brochures-datasheet/Leica_Viva_GNSS_GS15 _receiver_DS_en.pdf (2018-03-20).

Leica Geosystems (2015). Leica Viva GS10: Datasheet. URL: http://www.leica-geosystems.us/downloads123/zz/gpsgis/Viva%20GNSS/brochures-datasheet/Leica_Viva_GNSS_GS10_receiver_DS_en.pdf (2018-03-20).

Riegl LMS GmbH (2017). Laser Measurement Systems: Datasheet RIEGL VZ-400. URL: http://www.riegl.com/uploads/tx_pxpriegldownloads/10_DataSheet_VZ-400_2017-06-14.pdf (2018-03-20).

Riegl LMS GmbH (2018). Operating & Processing Software: RiSCAN PRO for RIEGL 3D Laser Scanners [version: 2.1.1]. URL: http://www.riegl.com/uploads/tx_pxpriegldownloads/11_DataSheet_RiSCAN-PRO_2016-09-19_01.pdf (2018-03-20).

Rusu, R. B. and Cousins, S.: 3D is here: Point Cloud Library (PCL), in: IEEE International Conference on Robotics and Automation (ICRA), Shanghai, China, 2011.