Water storage capacity of the natural river valley - how sedge communities influence it. Case study of Upper Biebrza Basin (Poland) based on ALS and TLS data

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The exact determination of water storage capacity in river valley is an important issue for hydrologists, ecologist and flood modellers. In case of natural river valley, the dense and complexity vegetation of the natural ecosystems can influence the proper identification of the water storage. Methods considered to be sufficient in other cases (urbanized, agricultural) may not produce correct results. Sedge communities in natural river valleys form characteristic tussocks, built from the species roots, other organic material and silt or mud. They are formed due to partial flooding during the inundation, so the plants can survive in hard, anaerobic conditions. They can growth even up to 0.5 meters, which is not so visible due to very dense vegetation in the valleys. These tussocks form a microtopography or a river valley. Currently, the most commonly used technology to register the terrain topography is an Airborne Laser Scanning (ALS), but in the case of the tussocks and the dense vegetation it generates high errors on elevation in the areas of the sedges (Carex appropinquata). This study concerns the Upper Biebrza Valley which is located in the northeastern Poland. For purpose of our work we used Terrestrial Laser Scanner (TLS) technology to determine microtopography of selected fields. Before measurements, the green part of the sedge was cut in selected measurements fields. It make possible to register only tussocks shape. Next, step was collection of the airborne ALS data of the valley with density of 8 points/sq m. The experimental field was divided on two sub-fields: one was cut and scanned using TLS before ALS collection, while the second after. Data collected as ALS and the TLS were then compared. The accuracy of the ALS data depends on the land cover of an area, while TLS accuracy is around 2 millimeters (when georeferenced it depends on the accuracy of reference points – in our case it was made using GPS RTK which gave us accuracy of few centimeters). The analysis shown that differences between ALS measurements and TLS on leaf free area is on average of 5 centimeters, while on areas which were not mowed it grows up to 0,5 m. Thanks to this studies we were able to determine water storage possibilities of valley while considering the tussocks shape.