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Possibilities for the use of drone data in geomorphological analysis of river deltas, based on the delta of Jeziorsko Reservoir

The annual lowering of the water level in Jeziorsko Lake in autumn and spring provides an opportunity to observe interesting changes related to bottom morphology and riverbed evolution, especially in the unstabilized northern part of the delta. This is the period when about 50% of the bottom is exposed. During this period, it is possible to observe and analyse changes shaped by water currents. The aim of this study is to prove the usefulness of carrying out photogrammetric flights using drones to analyse the evolution of deltas of water reservoirs. The muddy and boggy wetland of the exposed bottom of Jeziorsko Lake poses a problem for ground surveys, so unmanned aerial vehicles were used to conduct the research. The surveys produced four orthophotos at intervals ranging from a few days to several months in succession, thus depicting the exposed section of the unstabilized delta. Initial observations of the photogrammetric imaging revealed variability of morphological forms of the bottom of Jeziorsko Lake, which is visible in overlapping parts of the imaging. In particular, a dynamic evolution of riverbeds draws attention. Changes in their positions reached up to about 1.5 m in two days. Other observations include changes in water level, increased overgrowing of exposed fragments of the bottom by vegetation in the period from the end of April. The study also revealed increased anthropogenic activity, which may lead to degradation of the frequented area, especially where lowering of the water level revealed

peninsulas facilitating access from the shore. Nadir aerial photographs in jpg format were used for the analysis. The photogrammetric flights were conducted at altitudes of 110–120 m AGL (above ground level). The photographs were then processed in Dji Terra and Agisoft Metashape photogrammetric software in order to create an orthophoto map. The GPS navigation system ensures the accuracy of geolocation of the photographs, the measurement of which was additionally corrected using the RTK system. Location correction using the RTK system was necessary so that the survey without any photopoints could be carried out with as much precision as possible. The decision not to measure the photopoints on the surface of the mapped area was made because it was not possible to set up measuring points on the optimum surface of the study and the study was conducted over unstable ground.