Summary:

The research focused on the effects of river channels and landslides in their vicinity in the Polish flysch Carpathians. The main aim of the study was to determine the magnitude and extent of their impacts in the context of hydrometeorologic conditions and differences in area relief. The landslides and river channels selected for study purposes are located in the Beskidy (Bodaki and Sękówka landslides) and Foothill parts of the Carpathians (Boczkówka, Żabno, Leszczyny landslides). Both spatial and quantitative changes in the examined landslides were studied using aerial and terrestrial laser scanning and also via distance measurements between reference points using GPS RTK. The impacts of landslide activity on changes in the content of alluvial material in the study area were assessed using laser diffraction.

Research has shown that near-channel landslides triggered by ongoing fluvial erosion remain active with variable intensity determined by hydrometeorologic situations. High water stages activate colluvial material across landslide surfaces. The recording of spatial changes and quantitative changes across landslide area surfaces made it possible to identify two main types of colluvial displacement at high water stages: (1) delapsive (Sękówka, Boczkówka, Żabno), (2) detrusive and delapsive (Bodaki, Leszczyny). However, in between high water stages, colluvial material is triggered only in the foot section via delapsive displacement. A comparison of two hydrometeorologic events (May 2014, Oct. 2016) is provided in the study in relation to precipitation thresholds that serve as triggering points for landslides in the Polish flysch Carpathians and in other mountain areas in the world. Research has shown that levels of precipitation needed to trigger near-channel landslides are lower than those described in the literature – due to fluvial erosion effects.

Near-channel landslides affect river channels in the following ways: (1) by changing their width at landslide contact sites, (2) by changing the alluvial content in channel sections located downstream of landslides. Channel width changes in Beskidy area rivers occur in both directions via increases in channel width in flood-free periods and via decreases during flood events. On the other hand, the width and depth of river channels in foothill areas increase all the time, regardless of hydrometeorologic conditions. Changes in alluvial fraction content in channel sections downstream of landslides occur via increases in the loam and silt fraction in alluvial material found immediately downstream of landslides. This fraction declines with the increase in distance from the landslide and disappears entirely 200 to 450 meters downstream of the landslide.