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Remarks on Evolution of Deep-Seated Translational landslides in the Silesian Nappe, Outer Western Carpathians (Czech Republic)

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Deep-seated translational landslides are recently one of typical manifestations of the Silesian Nappe gravitational disintegration in the Moravskoslezske Beskydy Mts. (NE Moravia, Czech Republic) and represent potential hazard in the area. The Silesian Nappe consists of monoclinal beds of alternating shale, sandstone and conglomerate dipping generally about 10˚ to SSE; the relief culminates at 1,324 m a.s.l. (Lysa Mt.), the lowest parts are about 400 m a.s.l. (towns of Roznov p.R. or Ostravice). Therefore, the translational landslides occur mostly on the southern, southeastern or eastern slopes of the mountain ridges, due to consequent failure to bedding. These slides cover areas about 0.5-2 km^2. Usually, the shape of the translational slides uses to be much better clear in their upper parts than in the accumulation parts. Their activity is now relatively low; the present movements and displacements are generally of creep-type. The direct movement measurements are provided for the pseudokarst caves in the crown areas of the Pustevny landslide (Cyrilka cave) and Knehyne landslide (Knehyne cave).

The paper is focused on analysis of structural aspects and evolution of the failure of two deep-seated translational landslides (i.e. the Visalaje and Pustevny landslides). The main tools of interdisciplinary approach were detailed geomorphic mapping, Structural Geologic Measurements (SGM) in erosional cut or in the caves (e.g., joint and fold analysis), Ground-Penetrating Radar (GPR) profiling, radiocarbon dating and numerical back-analyses by means of Finite Differences Method (FDM), Flac 5.0 code

(Itasca 2005).

The present ground-surface shape is blocky near the crown and hummocky in the lower part at both of the localities. The block-surface has relatively sharp edges; the blocks are usually not back-tilted and are surrounded by trenches along tension cracks. Up to several-meters-high pressure ridges developed in the accumulation areas. As verified by SGM and GPR, the pressure ridges have internal structure of folded flysch rock (anticlines) or complicated “nappe-like” structure near the foot of the landslide, even though, the original structure of the bedrock was monoclinal before the slope failure. The failures, as supported by radiocarbon dating, are of the Late Glacial or Holocene age.

Initial conditions and evolution of the Pustevny landslide were analyzed by means of FDM. Three modes of ground water level geometry as a result of different climatic conditions (0, 10 and 20 meters below the ground surface), seismic tremors and the slope geometry change due to erosion were the main potential active factors to be taken in account. The evolution of displacements, velocities, effective and total stresses, shear-strain increments and character of the material yielding were the principal aspects of the analysis.