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Rainfall-induced landslide event of May 2010 in the eastern part of the Czech Republic – case study of the recurrent Girová landslide

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More than 150 landslides originated in the eastern part of the region of the Flysch Outer Western Carpathians in the Czech Republic due to soil saturation caused by antecedent precipitation and long lasting, intensive rainfalls on 16–18 May 2010 (>300 mm as measured by some stations). As a consequence, a multitude of small failures originated, 88% of which were smaller than 104 m2. The instabilities included mainly shallow, small-scale and generally short travelling landslides with an exception of a kilometre-long rockslide that originated on Girová Mt. (the region of Jablunkov town) and represents one of the largest long-runout landslides in the history of the Czech Republic A majority of the May 2010 landslide events developed inside older (Holocene or historic) landslide terrains, which points to their spatial persistence and recurrent nature. In spite of the fact that the May 2010 landslide event was not as destructive as some previously activated landslides in the region of the Outer Western Carpathians (e.g. July 1997 event), it left many slope failures at the initial stage of their potential future reactivation. The Girová slope deformation, which has characteristics of a wedge-like translational rockslide, originated during several hours in the night from 18 to 19 May. The movement started just below the mountain ridge and affected deeply weathered claystone/mudstone-dominated flysch of the Magura Unit in the zone of the intersection of two normal faults dipping 250/50° and 110°/55°, respectively. Subsequent movements connected mainly with the collapse of the frontal part of rockslide accumulation lasted for several following days and terminated with major sliding on 22 May. The landslide destroyed ∼18 ha of forests and caused economic losses exceeding 0.5 million EUR. The Girová landslide represents a typical fault-related recurring slope instability which is nested in a deep-seated gravitational slope deformation (DSGSD) affecting a large portion of the mountain ridge. Geomorphic mapping, performed prior to this catastrophic landslide in 2005, evaluated the zone of the contemporary rockslide as susceptible to flow-like long-runout landslides. Morphology of the headscarp prior to the May 2010 landslide and an old, erosionally degraded landslide lobe situated approx. 500 m below the extremity of the May 2010 landslide suggest an existence of several long-runout Holocene/historical landslides preceding the recent event. Radiocarbon dating of these accumulations revealed that at least one Holocene long-runout landslide (7.4 cal ka BP) and several smaller slump-like failures (∼1.5 and ∼0.6 cal ka BP) had preceded the recent catastrophic failure. Long-term (>80 years) preparation of the May 2010 catastrophic failure in the form of concentrated creep in structurally preconditioned wedge-like zone was evidenced by deformed trees and tree-ring record.