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Dendrochronological records of debris flow activity in a mid-mountain forest zone (the Eastern Sudetes Mountains)

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Debris flow activity is very often investigated using tree ring analysis in high mountain environment. Abrupt tree ring width reduction and growth release, scars as well as the ages of adventitious roots are commonly used as dendrochronological markers in this type of study. However, no studies have investigated of debris flows activity located in mid-mountain areas in the forest zone. The aims of this study are (1) to identify debris flows on the basis of geomorphic forms and (2) to date the erosional events along the debris flow track by means of dendrochronological evidence. The study area is situated in the upper part of the Cerny Potok catchment in the Eastern Sudetes Mountains (north eastern Czech Republic). The analysed debris flow is located in the eastern slopes of the Cervena Hora massif (1337 m a.s.l.). Originally, the massif was covered by beech and mixed forest, gradually giving way to spruce forests at higher elevations. This vegetation has been replaced by spruce monocultures. The extension of the youngest debris flow track analysed reaches about 750 m. In its longitudinal section three distinct parts can be observed: debris flow niche, gully and tongue. The dendrochronological study shows that trees started growing at the margin of the debris flow between 1908 and 1963. On the adjacent slope, trees are about 150 years old. Hence, the studied slope was transformed by debris flows at the turn of the 19th to the 20th century. All trees collected from the tongue of the debris flow started growing between 1935 and 1964. However, the debris flows took place several years before; probably during an extraordinary rainfall event in June 1921. During this event numerous debris flow were recorded on the Cervona Hora slopes. The slope was

gradually reforested after the event. Most of the growth reductions observed in trees at the margin of the debris flow occurred in the years 1967/1968, 1971 to 1973, 1975 to 78, 1991. 1994 and 1997 meaning that the slope was intensively transformed during these periods. Additionally, reforestation was stopped following important debris flow events after 1965 . These debris flows occurred in the existing gully, and were probably induced by snow melt.