

Historic mass movements recorded in the sediments of Hallstätter See (Upper Austria) – natural hazards at a UNESCO World Cultural Heritage Site

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Human activity associated with salt mining in Hallstatt (Upper Austria) can be traced back to the Neolithic and underground salt mining in the area is documented since the Middle Bronze Age. The cultural importance of this salt mining and the wealth of archaeological artefacts – particularly from the epoch of the Early Iron Age, for which Hallstatt became the eponym – has been recognized already 20 years ago by assigning the status of a UNESCO World Cultural Heritage Site to the Hallstatt area. Mining activity is well documented for prehistoric times and known to have been repeatedly affected by large mass movements, destroying mining facilities, for example, at the end of the Bronze Age and during the Late Iron Age. In contrast, evidence of mining activity in the Common Era until the late 13th century AD is scarce, which could be related to socio-economic changes as well as mass movement activity, possibly biasing the archaeological record. Within a project aiming at reconstructing past flood activity of the Traun River, a major tributary of the Danube, a ca. 16-m-long sediment core has been recovered from Hallstätter See. The sediments are continuously cm- to sub-mm-scale laminated, reflecting seasonally variable detrital input by the Traun River and the smaller tributaries. However, an outstanding feature of the sediment record are two meter-scale event layers. The upper one is characterized by a basal mass-transport deposit of ~2.50 m thickness, containing folded laminated sediments, homogeneous sediments with liquefaction structures and large stones of up to 4 cm in diameter, which is overlain by a co-genetic turbidite of ~1.50 m thickness. From the lower event layer only the topmost part of the turbiditic sequence was recovered, revealing a (minimum) thickness of ~1.50 m. Based on their sedimentological characteristics, both event layers are interpreted as the subaqueous continuation of large-scale mass movements, which occurred during the last 2000 years and likely originated from the Plassen Massif where the Hallstatt salt mining area is located. This indicates that past mass movement activity not only threatened prehistoric salt mining, but repeatedly occurred during the Common Era, which could possibly explain the lack of archaeological evidence for mining activity between the Late Iron Age and the late 13th century AD.