



A regional reconstruction of debris-flow frequency in a dolomitic valley in the western Austrian Alps

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Dendrogeomorphic dating of historical debris-flow events is a highly valuable tool for improving historical records in the field of natural hazard management. Previous dendrogeomorphic investigations have generally focused on case studies of singular torrents; however, regional investigations may provide a more accurate reconstruction of regional patterns of activity and therefore may have an advantage over individual cases. Regional investigations exist for some European and North American sites, but do not exist for the Austrian Alps. Therefore, the aim of the study is to provide a regional reconstruction of debris-flow events in a dolomitic valley in the western Austrian Alps (Gamperdonatal, Vorarlberg) and to document spatial and temporal morphological changes in individual and neighboring torrents. Analysis of 442 trees (268 *Pinus uncinata*, 164 *Picea abies* and 10 *Abies alba*) allowed identification of 579 growth disturbances corresponding to 63 debris-flow events since AD 1839. The majority of growth disturbances were in the form of growth suppression or release (76 %) owing to the nature of both the deposited material and the process characteristics. Regional patterns of event frequency indicated a paucity of activity in the early to mid 20th century and increased activity since AD 1948, whereby large events were followed by subsequent years of continued activity of smaller magnitude. Patterns of frequency could be attributed primarily to spatio-temporal changes in channel morphology, but were also reflective of changes in transport conditions (e.g. precipitation events) within the valley. This investigation provides the first regional investigation in the Austrian Alps and contributes to the documentation of tree responses to geomorphic disturbances in dolomitic material.