



## **A high resolution, long term debris flow chronology derived from lake sediments – possibilities and limitations**

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Due to climate change, the frequency of fast mass movements as debris flows interests more and more scientists, insurance companies and hazard managers. Ordinary methods for reconstruction of debris flow chronologies as dendrogeomorphology, the study of historical archives or lichenometry achieve a high temporal resolution but cover only a few centuries. Other dating methods as  $^{14}\text{C}$ -dating, palynology as well as lichenometry can cover a long period but achieve only a very low temporal resolution. A study at lake Lago di Braies in NE Italy has shown, that lake sediments are a convenient geoarchive to reconstruct long term debris flow calendars with a comparable high temporal resolution. Thereby the approach is as follows: after a debris flow event the coarse grained material accumulates at the debris flow cone, whereas the fine grained material is washed into the lake, which is close to several debris flow cones. This fine grained material builds characteristic layers in the lake sediments, that can be dated via the “normal” annual laminated sedimentation. The comparison of the varve based chronology with other independent dating methods has shown some problems concerning assessment of distinct debris flow layers and temporal resolution. For last few centuries a good agreement exists between varve counting and other dating methods as for example  $^{137}\text{Cs}$ - and  $^{14}\text{C}$ -age. Further back dated events have a gap between varve counting and  $^{14}\text{C}$ -Age. Possible reasons therefore are erosion and bioturbation in the lake sediments or rearrangement of the  $^{14}\text{C}$ -sample. Another challenge is the completeness of the debris flow calendar. So it is uncertain, if we can differentiate small debris flow events from flood events. Additionally, due to not assessable erosive processes, it is impossible to exclude a rearrangement of debris flow sediments. These problems will be discussed critically and solutions will be offered.