A first record of mass wasting events in peat records from the Romanian Carpathians throughout the late Holocene

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Mass wasting events, including landslides, avalanches and flooding related to heavy rains can have a major impact on the local environment. Due to their association to extreme precipitation and glacial retreat, their occurrence is likely to increase as the climate changes in the future. As such, understanding their causation, and predicting their future impact is of paramount importance. To make such predictions, understanding of the relationship between the climate and the mass-wasting event is key. For this to happen, we must use historical records of mass wasting and climate to tie the two together. As a result, a reliable, quick and easy method for determining these events in the sedimentological record must be developed.

Here we present the first Holocene record based on this proxy from a peat archive from a raised mountain bog in the Romanian Carpathians, nested at the foot of an avalanche-prone glacial cirque. Utilising a multi-proxy approach, including a novel geochemical proxy (Rb/Sr), Loss On Ignition (LOI), grain size measurements and the vegetation record as reconstructed via pollen assemblages, we have created a record of such mass wasting events for the last 3500 years.

Part of our work discusses the ratio of elements Rubidium against Strontium (Rb/Sr) that has been suggested as one indicator of mass wasting events, particularly based on lake sediment research in glaciated terrain. Our work was initially developed upon the behaviour of the two elements during weathering, considering that Rb commonly substitutes for K in mineral lattices and Sr commonly for Ca, due to similar ionic radii. Minerals containing K are much more resistant than Ca-bearing ones, and so there is enrichment in weathering products of Ca, and therefore Sr. As a result, Sr should be enriched in weathered material, resulting in a lowering of the Rb/Sr ratio. This assumption has been proven as reliable in similar research involving aeolian deposits and lake sediments.

Our geochemical assessments are based on complete digestion of samples, and analysis via ICP-OES, rather than based only on core scanning. Initial results look promising, with the peat core below the active layer (acrotelm) and above the minerogenically-influenced zone producing strong correlation to the estimates of the minerogenic input over the bog based on combustion techniques. Coupled to the more traditional LOI results, we have identified a number of periods of intensified local mass wasting, and we explore the potential for tying these periods of increased activity to changes in the local, or regional palaeoenviroment.