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Assessment of large rock-fall events at the lower margin of discontinuous permafrost using airborne LiDAR and photogrammetry in Central Austria

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Mass movements, especially occurring on slopes and faces at high mountain areas underlain and stabilized by permafrost, are getting more frequent in recent years. In 2007 several large rock falls occurred on the southern flank of the mountain Mittlerer Burgstall (2923 m a.s.l.), a former nunatak within the Pasterze glacier in the vicinity of the Großglockner, Hohe Tauern Range Austria (N 47°46´, E 12°42´). These events took place at the lower margin of discontinuous permafrost and are therefore a very interesting phenomenon considering the ongoing global warming. In September 2008 an airborne LiDAR (Light detection and ranging) campaign was carried out in the entire Pasterze area within the project ALPCHANGE (www.alpchange.at) to obtain a very high resolution digital terrain model (DTM, geometric resolution 1m). Together with data from very high resolution aerial photographs acquired in the extremely warm summer of 2003 (geometric resolution 1m), these DTMs form the basis for volumetric as well structural comparisons. First analyses show that the entire mass movement covers some 85,000 m^2 including areas of transportation and deposition. The volume of the released bedrock was calculated with about 35,000 m^3. Reason for that events appear to be a combination of unfavourable geological conditions, massive glacier retreat in the last decades, permafrost warming and degradation as well as the impact of the warm winter of 2006/07.

Further investigations to answer particular geomorphodynamical questions will be carried out with a comprehensive monitoring system including geomorphological mapping, permafrost distribution modelling and ground temperature data from a shallow borehole on the summit plateau.