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Kinematics and geophysical investigation on destabilized rock glaciers in the Swiss Alps

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Eleven so-called destabilized rock glaciers have been so far identified in the Swiss Alps. Most of them have been recognised for the first time by the systematic analysis of InSAR (Synthetic Aperture Radar Interferometry) scenes of the ERS-1/2 satellites tandem dating back to 1991-1999. Kinematics and geophysical investigation is being carried out on several features in order to better understand the ongoing dynamical processes. The surface motion of eight among the destabilized rock glaciers has been surveyed by means of in situ GPS measurements, for the longest series since 2005. Most rock glaciers display exceptionally high annual displacement velocities ranging between 5 and 10 m/year, pointing out the occurrence of tertiary creep or a sliding phase. The rate of interannual changes looks similar to those of "usual" active rock glaciers and mostly responds to changes in mean annual ground surface temperature with a delay of a few months. This suggests that the dynamics of a destabilized rock glacier is at least still partly controlled by its thermal state. A systematic geophysical investigation (electrical resistivity, refraction seismics, ground-penetrating radar) has been initiated so far on four rock glaciers. The preliminary results show that transversal rupture or cracks can penetrate deep through the rock glaciers. In two cases at least, the rock glacier terminus has split off in two distinct parts that are no more connected. Finally, in one case the rock glacier kinematics has developed dramatically reaching in 2009 a velocity of more than 100 m/year without any collapse of the landform.