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What are the mass movements triggering factors in deglaciated areas? Insights from field data and cosmonuclides datings in Upper Durance catchment (Southern French Alps).

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Glacial shrinking is recognized as a predisposing factor of slope instability; however the link between glacial debuttressing and mass movement triggering must be precised. Here the role of glacial debuttressing forces in mass movement occurrence is discussed: our aim is to know if debuttressing forces is a predisposing factor acting with other parameters (such as relief, lithologyĚ) or a triggering factor. Our method is to compare the evolution of deglaciated slopes in various physical settings, and to rely these evolutionary modele on absolute chronological data. A particular attempt is to compare the timing of mass movement triggering with the timing of glacial disappearance. So this study requires an absolute chronology technique (e.g. cosmogenic nuclides) and an area where a wide variety of geological, topographical, glaciological settings can be observed. We focused here on the Upper Durance catchment. Mass movement were mapped, classified (landslide, rock fall, rock avalanche) and computed in a GIS. Former extent of Durance glacier was precised, a computation based on paterson law was used to quantify debuttressing forces within a raster GIS. Geological and topographical data were also combined in the raster GIS. Then a statistical method (Landslide Susceptibility Score) was applied to classify mass movements settings. As a first insight a decompression of 80 kPa is required to trigger rock falls, while a decompression of 150 to 300 kPa was needed to trigger rock-avalanches. By describing mass movement deposits and instability zones the kinematics of materials setting are reconstructed. The role of development of new joints which orientation is directly related with the geometry of former glacier is underlined. Furthermore,

we shall try to explain the localization of main mass movements: we show that rock-avalanches had occurred where relief, slopes and debuttressing forces were high, while rock falls had occurred in a context of moderate relief and decohesion forces but in association with a weak bedrock (sansdstones). The last step is to compare the pattern of glacial shrinking with the pattern of mass movements triggering. Knowledge of glacier recession chronology in this area was hard hit for a long time by the lack of absolute dating, however cosmonuclides dating method offers now new insights in such a study. Most of mass movements had occurred during the deglaciation period: the role of debuttressing forces is underlined but combined with many other factors. To conclude the wide variety of deglaciated slopes responses is underlined, thus glacial debuttressing was an important instability factor but some other parameters had conditioned the nature of the response (e. g. the nature and the volume of the mass movement).