Geophysical Research Abstracts,
Vol. 11, EGU2009-10413, 2009
EGU General Assembly 2009

Cosmic ray exposure dating of active faults and landslides in the SW Alps: Relationships between tectonics, slope instabilities and climate changes.

G. Sanchez (1), Y. Rolland (1), M. Corsini (1), R. Braucher (2), D. Bourlès (2), M. Arnold (3), and G. Aumaître (2)

(1) Geoscience Azur, Nice-Sophia Antipolis, France (guillaume.sanchez@unice.fr), (2) CEREGE, UMR CNRS 6635, Université Aix-Marseille, France, (3) CEA/DSM/LSCE, Gif sur Yvette, France

This study highlights the tectonic and gravitational response of a mountain range to abrupt climate changes by documenting temporal relationships between tectonic activity, landslide initiation and deglaciation during the Holocene. In the Argentera massif (Southern Alps), large active landslides develop along strike of an active corridor of dextral strike-slip faults currently revealed by shallow ongoing seismicity. Field analysis evidences faults cross-cutting polished glacial surfaces. Gravitational structures appear to be connected to these active faults. Dating using the in situ produced 10Be cosmogenic nuclide were performed on glacial, tectonic and gravity surfaces. The main deglaciation event is constrained by 10Be ages between 12 to 15 10Be ka obtained on polished glacial surfaces. The main tectonic activity closely post-dates the main deglaciation event and is constrained by 10Be ages of 11 and 7-8 10Be ka obtained on fault scarps. Finally, three successive periods of gravitational instabilities are recognized, at 11-12, 7-9 and 2.5-5.5 10Be ka. These Holocene ages obtained on right lateral strike slip faults indicate that recent Alpine tectonics are expressed by transcurrent movements. The discussed close age relationship between deglaciation and a tectonic pulse strongly suggests that climate changes do influence seismogenic tectonic activity, due to post-glacial rebound and enhanced groundwater circulation. Gravitational destabilizations at 11-12 and 7-9 10Be ka are coincidental with the main tectonic activity, and allow suggesting tectonics as a likely landslide trigger. The third gravitational destabilization at 2.5-5.5 10Be ka could be attributed either to climatic causes during the wetter optimum climatic period or to slope fragilization resulting from multiple low-magnitude earthquake events, as currently revealed by the residual seismic activity. These early and middle Holocene ages coincide with a phase of major landslide at the Alps scale which suggests that these large gravitational mass movements could be related to combined effects of intense tectonic activity and climate changes.