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CRE dating on the scarps of large landslides affecting the Belledonne massif (French Alps)

V. Lebrouc (1), L. Baillet (1), S. Schwartz (1), D. Jongmans (1), J. F. Gamond (1), D. Bourles (2), O. Le Roux (3), J. Carcaillet (1), and R. Braucher (2)

(1) Institut des sciences de la Terre (ISTerre) CNRS : UMR5275 – IFSTTAR – Université de Savoie – Université Joseph Fourier - Grenoble I – INSU – OSUG – IRD : UR219, (2) Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement (CNRS, UMR 6635), Université Aix-Marseille, BP 80, F-13545 Aix en Provence cedex 04, (3) Institut EGID-Bordeaux 3, Equipe d'accueil Géoressources et Environnement (EA 4134), Université Michel de Montaigne, 1 allée Daguin, F-33607 Pessac cedex, France

The southwestern edge of the Belledonne Massif (French Alps) consists of micaschists unconformably covered with Mesozoic sediments and Quaternary deposits. The morphology corresponds to a glacial plateau (Mont Sec plateau) bordered by steep slopes (around 40°), where moraines and peat bog subsist. The massif is incised by the East-West trending Romanche valley that was shaped by several cycles of quaternary glaciations and deglaciations. Slopes are affected by several active or past large scale rock mass instabilities. Cosmic Ray Exposure (CRE) dating was applied on the head scarps of three large landslides, one of which being the active Séchilienne landslide whose headscarp was already dated by Leroux et al. [2009]. Dating results suggest a concomitant initiation of these instabilities at about 7 $\pm$ 2 10Be ka, thousands years after the total downwastage of the valley. A different kinematic behaviour was however observed on two contiguous landslides for which continuous exposure profiles were obtained. On the Séchilienne landslide, 23 samples were collected from internal and lateral scarps, as well as on polished bedrock surfaces, with the aim of dating the internal kinematics of the landslide. Preliminary dating results obtained on polished surfaces and near the top of the scarps show unexpected low 10Be concentrations, suggesting the existence of thin moraine or peat bog deposits masking the bedrock, which have been subsequently eroded. The minimum thickness of these deposits was estimated assuming a constant denudation rate over time. Exposure date profiles show that the studied lateral and internal scarps were initiated at the same period as the Sechilienne headscarp. An increase in the exposure rate was also observed between 2 and 1 ka, in agreement with that evidenced along the headscarp. Forty other samples have been collected in the landslide to corroborate these results.

Reference

Le Roux, O., S. Schwartz , J.-F. Gamond, D. Jongmans, D. Bourles, R. Braucher, W. Mahaney, J. Carcaillet, and L. Leanni (2009). CRE dating on the head scarp of a major landslide (Séchilienne, French Alps), age constraints on Holocene kinematics. Earth and Planetary Science Letters, Vol. 280, 236-245.