Geophysical Research Abstracts
Vol. 15, EGU2013-2122, 2013
EGU General Assembly 2013

The sedimentary response of mountain environments to large earthquakes: an example from south Westland, New Zealand

Sean Fitzsimons (1), Jamie Howarth (1), Gealdine Jacobsen (2), and Richard Norris (3)

(1) Department of Geography, University of Otago, Dunedin New Zealand (sjf@geography.otago.ac.nz), (2) Institute for Environmental Research, Australian Nuclear Science and Technology Organisation, Lucas Heights, Australiagej@ansto.gov.au, (3) Department of Geology, University of Otago, New Zealand (richard.norris@otago.ac.nz)

In tectonically active mountain belts large earthquakes trigger pervasive landsliding, which drives landscape evolution and is a source of considerable hazard to infrastructure and society. Despite this, the magnitude and duration of postseismic landscape response remains poorly understood. We use lake sediments to constrain the magnitude and duration of postseismic landscape responses in small range front catchments and large trunk valleys of the Southern Alps to sequential great (Mw8) earthquakes on the Alpine Fault. The lake sediments contain a detailed record of co-seismic, post-seismic and aseismic deposits that are correlated to the Alpine Fault seismic cycle using high precision chronologies derived from Bayesian modeling of AMS radiocarbon dates. The landscape response to the last three earthquakes (1717 A.D., ∼1570 A.D. and ∼1400 A.D.) persisted for several decades after each event in both range front and trunk valley catchments. During this time increased rates of landsliding on catchment hillslopes caused a threefold increase in sediment flux from the mountain belt. Increased postseismic sediment flux suggests that Alpine Fault earthquakes are important drivers of millennial scale denudation rates in the Southern Alps. The greatest impact of these events occurs in small range-front catchments that are situated adjacent to the fault, while larger catchments experience a more subdued sedimentary response that occurs over a longer duration. These data demonstrate that the landscape response to co- and postseismic landsliding in mountains can be protracted and a source of seismic hazard that persists long after the initial earthquake.