

Timing of paleoseismicity in western Finnish Lapland

R. SUTINEN^{1*}, I. ARO¹, T. RUSKEENIEMI² AND M. MIDDLETON¹

(*correspondence: raimo.sutinen@gtk.fi)

¹Geological Survey of Finland, P.O. Box 77, 96101, Rovaniemi, FINLAND

²Geological Survey of Finland, P.O. Box 96, 02151, Espoo, FINLAND

High-resolution LiDAR-based digital elevation models provide an efficient tool to detect postglacial fault (PGF) scarps and paleolandslides beneath forest canopies (Sutinen et al., 2014; Palmu et al., 2015). The spatial distribution of these features tend to be coincidental hence suggesting that dating of landslide-buried organic materials will provide evidence on the frequency of the past earthquakes.

We percussion drilled through the paleolandslide accumulations to find buried organic materials in 2012 and 2014, and were able to reveal several samples for the C¹⁴ datings. In Kittilä, the Taalovuoma buried organic sediments yielded 5050 yrs calBP. In Kolari, Lehtolaki site provided data on three different paleoslide events with following ages: 1275, 1585, 5860, 10185 yrs calBP. In addition, three basal peat samples yielded 9220, 9480 and 9510 yrs calBP from peat bogs developed on the foot wall of the Ruokojärvi postglacial fault, just next to the fault scarp in Kolari.

Our previous finding of landslide-buried woody remnants of birch yielded 9730 yrs calBP in Kittilä (Sutinen 2005). We therefore propose that earthquakes around 9500-10200 yrs calBP, 5000-5900 and 1200-1600 yrs calBP occurred in western Finnish Lapland. Historical earthquakes (M<4) are spatially coincidental with PGFs, yet our results suggest that the frequency of major earthquakes (M~7) may be of the order of 4000 years within the Fennoscandian plate.

References:

Palmu, J.-P. Ojala, A.E.K., Ruskeeniemi, T., Sutinen, R., and Mattila, J., 2015. LiDAR DEM detection and classification of postglacial faults and seismically-induced landforms in Finland: a paleoseismic database. GFF, DOI: 10.1080/11035897.2015.1068370

Sutinen, R., 2005. Timing of early Holocene landslides in Kittilä, Finnish Lapland. Geological Survey of Finland, Special Paper 40, 53-58.

Sutinen, R., Hyvönen, E. and Kukkonen, I., 2014. LiDAR detection of paleolandslides in the vicinity of the Suasselkä postglacial fault, Finnish Lapland. International Journal of Applied Earth Observation and Geoinformation 27, 91-99.