

Holocene paleo-seismicity of the Bollnäs fault derived from multi-proxy surficial geologic records

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In order to characterize the low-occurrence probabilities of high-magnitude seismicity, it is necessary to understand both the timing and magnitude of paleo-seismic events. In Fennoscandia, this means understanding the paleo-seismicity associated with the rupture of pre-existing bedrock faults that were reactivated by a combination of tectonic and isostatic stresses following deglaciation. Recent mapping, using high-resolution digital elevation data, has revealed linear escarpments that cross cut glacial sediments in central Sweden, some 400 km south of the well-known Lapland Fault Province. One such feature, near the town of Bollnäs, has undergone extensive field investigation to verify its post-glacial fault origin and determine when it ruptured and with what magnitude of associated seismicity.

Trenches excavated across the scarp show both faulted glacial sediments and landslides down the scarp. Water-escape structures in fine-grained sediments, interpreted to be seismically induced, suggest a minimum magnitude of 5.5, and the dimensions of the surface rupture suggest a magnitude of about 6.2. Finally, landslides in till on low-angle slopes have been dated to 10,200 calendar years before the present, which was shortly after local deglaciation. These results are consistent with modeling results of fault instability following deglaciation.