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Preliminary results from fault-slip analysis of the Pärvie neotectonic postglacial fault zone, northern Sweden

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Our study aims at constraining the paleostress field evolution of neotectonic postglacial faulting in northern Sweden. Postglacial faulting is a special type of intraplate faulting triggered by the retreat of continental glaciers and by the induced changes of the local stress field. We investigated the longest known post-glacial fault (PGF) in Scandinavia, the Pärvie PGF. It is 155 km long and consists of a series of 3-10 m high fault scarps developed in several rock types such as mafic and felsic meta-volcanic rocks, and in the north, Archean granites and gneisses. Most of the scarps trend north-northeast and dip steeply to the west. A smaller sibling fault to the east (the Lansjärv PGF) displaces postglacial sediments. It is interpreted as resulting from a great earthquake ($M \leq 8.2$) at the end or just after the last glaciation ($\sim$10 ky B.P.). Microseismic activity is still present along the Pärvie fault zone. Unfortunately, the stress history of the Pärvie PGF before the last glaciation is poorly known. To reconstruct its stress history, we have performed fault-slip analysis.

Fault slip data have been collected from two profiles across the Pärvie PGF in the Corruvagge valley and in Kamasjaure in the north, and Stora Sjöfallet in the southern part of the fault zone. Cross-cutting relationships, fracture mineralization and structural features of the brittle overprint of the rocks have been used to suggest a conceptual model of the brittle history of the fault.

Ca. 40 kinematically constrained fault planes were used in the inversion study in addition to ca. 1060 fractures. Preliminary results indicate that the oldest generation of fractures are coated by pink plagioclase and clinoamphibole. The key mineral epidote is prominent along cataclastic structures. Rarly multiple kinematic indicators are identified along the same fracture, indicating polyphase reactivation. Epidote coating is found along fractures from all the computed stress-fields, indicating that epidote coating is diagnostic of the early faulting phases as well as of the youngest.

Four distinct stress fields were identified, whereof the youngest is assigned to the Pärvie PG faulting event. This study confirms that postglacial faulting have reactivated an old fault system, which had accommodated at least three earlier episodes of brittle deformation.
Comparison with paleostress studies of regional significance elsewhere in Fennoscandia makes it possible to tentatively assign these older events to a deformation phase shortly after the Svecokarelian orogeny, around 1,7 Ga, and one stress-field that can be either the stress field during the Sveconorwegian or Caledonian orogeny. An extensional phase has also been identified but not further constrained, yet.