

The southern and eastern limits of glacially induced faulting in Europe determined from models of glacial isostatic adjustment

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Glacially induced faulting describes fault movement caused by a combination of tectonic and glacially induced isostatic stresses. It is associated with intraplate regions but also discussed for some plate boundary areas. Ice sheet load induced stresses are generally released during or after ice melting with the potential to reactivate pre-existing faults.

Research focus was for a very long time set to the Nordic countries in Europe. This is owed to the facts that the most impressive fault-scars, which witness glacially induced fault activity are found there, that the infrastructure eases geoscientific investigations, and that the search for nuclear waste repositories in Sweden and Finland deserved answers on the (re-)activation potential of these faults. More than a dozen of kilometre-long fault-scars were identified in northern Fennoscandia in the last decades. It was mainly assumed that these features are unique although similar fault structures, but by far not of such dimensions, were also described from the United Kingdom and from eastern Canada. In other formally glaciated areas in Europe such glacially induced faults were rarely observed and discussed in the literature but the number of studies with reliable field evidence (e.g. in Denmark, northern Germany, Poland, Baltic countries) has considerably increased in the last years. The estimated fault movements are of minor magnitude though as compared with those in northern Fennoscandia. Finally, a few studies in Germany even point to glacially induced faulting outside the former glaciated area.

With numerical modelling we will explore in which areas of Europe glacially induced faulting can be expected. We use the latest generation of three-dimensional high-resolution models of glacial isostatic adjustment that incorporate the most recent ice sheet history models of northern Europe. We will highlight the geographical limits of glacially induced faulting in Europe and discuss the likelihood of this type of faulting in the Netherlands, Germany, Poland, the Baltic countries, Belarus and Russia.