Towards a new seismotectonic characterization of Switzerland (SeismoTeCH)

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In the year 1997, the Swiss Geophysical Commission (SGPK) launched the project Seismotectonic Atlas of Switzerland with the goal of a first nationwide inventory of seismotectonic relevant data. In the course of the project, the contribution of the Swiss Seismological Service (SED) focused on the calculation of earthquake focal mechanisms, the identification of stress regimes from stress inversions and possible ways to present the information on digital maps. Another goal of the project was the compilation of a map of active faults within the Swiss Alps from geological field data. The latter task, however, turned out to be challenging due to a lack of field-based evidence for recent fault activity and therefore only a handful of clearly active (i.e. neotectonic) faults could be mapped. Hence, large uncertainties regarding the seismotectonic interpretation remained.

With the advances in earthquake monitoring and processing (e.g. improved data quality, significant densification of the seismic network, improved seismic velocity models, and relative relocation techniques), accuracy and precision of hypocenters improved significantly, so that today, location uncertainties can be narrowed down to the subkilometer scale (e.g. Diehl et al. 2017). In addition, recent re-processed and re-interpreted 2D and new high-resolution 2D and 3D reflection seismic data as well as geological 3D models provide new insights into the subsurface structural setting of the Swiss Molasse Basin (Heuberger et al. 2016; e.g. Landesgeologie 2017; Sommaruga et al. 2012). Furthermore, with swisstopo's harmonization of geological vector data (GeoCover) a more complete structural dataset becomes available. Insofar, the interplay between seismicity and faults can now be investigated in much more detail. Finally, the Global Navigation Satellite System (GNSS) in Switzerland provides increasing data volumes, leading to steady improvements of surface deformation estimates in the Alps and its foreland.

In the light of these new developments, the SGPK has launched a follow-up project called 'SeismoTeCH' (Seismotectonic Characterization of Switzerland). In the corresponding pilot study presented here, we try to highlight different aspects and possibilities of seismotectonic interpretation, but also the pitfalls associated with it. Furthermore, we try to establish a strategic roadmap for the development of a future seismotectonic model of Switzerland.

References:

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