**Spatio-temporal threshold selection for induced seismicity**

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**Abstract**

Earthquakes can be caused either by the motion of tectonic plates or by human activity. Both tectonic and anthropogenic earthquakes can be challenging to model and predict due to the complexity of the underlying processes and the difficulties in obtaining reliable measurements. Accurate inclusion of the uncertainties related to these processes is vital in mitigating future seismic hazards.

One of the main challenges that comes with earthquake modelling is variable data quality in the form of rounded and incompletely observed data. This is of particular concern with induced earthquakes which occur at shallow depths with low magnitudes in comparison to tectonic earthquakes. Investment into the development of sensor networks which measure these processes is only worthwhile if such improvements can be incorporated into modelling and inference. These developments can lead to the problem of missing observations from the periods where networks were too sparse to accurately detect these low-magnitude events.

Previous work has explored the selection of a time-varying modelling threshold above which earthquake catalogues may be considered complete. This allows smaller magnitude events, unused in other analyses, to contribute to the understanding of extreme events and incorporates changing data-quality into the subsequent extreme value analysis. The sensor network is not uniform across the spatial field and thus, the methodology needs to be developed to allow spatial variability in the parameters of the Generalised Pareto distribution to account for these changes in the measurement precision. We explore spatio-temporal properties of the underlying process and look at developing this automated threshold selection method to represent the spatial variability while still accounting for varying data-quality over time. We compare this method to existing extreme value threshold selection methods.