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Preliminary results for Space-Time Clustering of Seismicity and its Connection to Stimulation Processes, in North-Western Geysers Geothermal Field

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The Geysers geothermal field located in California, USA, is the largest geothermal site in the world, operating since the 1960's. Although maximum production took place in the mid 1980's the field is still operating nowadays and a dense local seismic network deployed in 2003 provides a high quality seismicity data. We here utilize the data associated with 2 injection wells (prati-9 and prati-29) which covers a time period of approximately 7 years (from November 2007 to August 2014). Our analysis comprises two different methods. In the first one, multi-dimensional clustering is attempted after transforming selected catalog parameters (e.g. hypocentral coordinates, distance of events from the injection point) into equivalent dimensions, by applying the methodology proposed by Lasocki (2014). Then, we identify clusters as hierarchically closed neighbors in multi-dimensional space. In addition, correlation between spatio-temporal seismicity evolution and variation of the injection/ production data will be performed and quantified by elaboration of time-series through specified statistical tools (cross correlation, binomial test to investigate significant rate changes, b-value variation). Preliminary results are expected to facilitate the proper parameterization of the methods applied in order to reveal the role of the physical processes that control seismogenesis in geothermal sites.

References

Lasocki, S. (2014), Transformation to equivalent dimensions – a new methodology to study earthquake clustering, Geophys. J. Int., 197, 1224-1235.

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