HIST-ETAS models - revisited with emphasis on background seismicity

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It has been passed about 15 years since the hierarchical space-time ETAS (HIST-ETAS) models have been proposed; and the short- and intermediate-term earthquake forecasts in and around Japan using the HIST-ETAS model is under examining for 8 years by the Testing Center of the Collaborative Study of Earthquake Predictability (CSEP).

Some parameters of the HIST-ETAS model are characterized by a two dimensional piecewise linear function whose value at any location is linearly interpolated by the values at the nearest three earthquake locations that consists a Delaunay triangle. The solutions of the parameter functions are obtained through the inversion of the log-likelihood function of the space-time earthquake data, with certain smoothness constraints. This is suited not only for high resolution inversion in the region of clustering of earthquakes but also accurate space-time forecast in the active stage of seismicity.

Among the parameters of the HIST-ETAS models, we are primary interested in that of the background seismicity. This values can regionally vary in the range of several orders is in a seismogenic zone, but the solutions are confirmed to be independent of observed periods. Hence this is quite useful for the secular prediction of large earthquake locations, in conjunction with Gutenberg-Richter distribution where the b-value is also location dependent.

In this talk, I will show examples of such forecast in Japan inland and vicinity, California, and the global seismicity. The relevant software codes and manual can be obtained by the request mail to ogata@ism.ac.jp.

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