Detection of seismic zones that form earthquakes with magnitude greater than five in a fault interface

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New method of seismic catalogs analysis is proposed that is aimed to reveal potentially seismic zones with earthquake magnitude greater than five.

The overall method consists of two parts. At first the declastering procedure of a seismic catalog is executed. This means that all dependent earthquakes are removed. We detect these dependent events based on analysis of nearest-neighbors in a multidimensional domain that includes the location, time, and size of earthquakes. The result of this step is a cleared catalog that consists of independent events.

Secondly, the algorithm of topological filtering is executed that is aimed to get dense sets of events. Fuzzy comparison is used to determine "dense level" that is the geometric mean of a sample to lie in a localization radius.

Two assumptions was made to automatically detect these seismic patches with big events: 1) if seismic patches form in an interface characterized by dense clusters of seismic sources, the specific distance between clusters should correspond to the specific distance between all the sources that are localized in the fault segment under consideration; 2) the seismic patch configuration which best represents the current state of knowledge about the heterogeneity of fault interface is the one with the largest number of seismic patches.

After that localization zones of these dense sets of events were approximated by minimal square ellipses. We believe that in the neighborhood of these ellipses earthquake sources are formed.