



Moderate, strong and strongest earthquake-prone areas in the Caucasus, California and the Andes

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We present this study on recognition of areas of possible occurrence of strong earthquakes. The study deals with the earthquake-prone areas in three regions with different geological and tectonic structures located in different parts of the world.

The authors created a new method (FCAZ—Fuzzy Clustering and Zoning) for recognition of highly seismic areas, where epicenters of earthquakes with magnitude $M \geq M_0$ can occur. The magnitude threshold M_0 depends on the seismic activity of the region. The objects of clustering are earthquake epicenters. The new method allows us to implement uniformly necessary clustering of the recognition objects respectively for moderate, strong and strongest events. Suggested approach consists of two steps: clustering of known earthquake epicenters by the original DPS (Discrete Perfect Sets) algorithm and delineating highly seismic zones around the recognized clusters by another original E2XT algorithm.

By means of this method we detected the areas of possible occurrence of the epicenters of strong earthquakes in the Caucasus ($M \geq 5$), in California ($M \geq 6.5$) and in the mountain belt of the Andes ($M \geq 7.75$). The latter case relates to the possible areas of natural disaster occurrence.

Reliability of the results is confirmed by numerous control experiments, including individual and complete seismic history.

Two strongest recent Chilean earthquakes occurred in 2014 and 2015 after the moment the results were published. Their epicenters belong to the zone recognized as high seismically hazardous. It is a strong independent argument which confirms the reliability of the results.

The presented results integrate most recent outcomes of more than 40 years of research in pattern recognition and systems analysis for seismic zoning implemented in Russian Academy of Science.

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