

# DISCRETE MATHEMATICAL ANALYSIS CLUSTERING OF EPICENTERS AND STRONG EARTHQUAKE-PRONE AREAS

*M. N. Dobrovolsky<sup>1</sup>, A. D. Gvishiani<sup>1</sup>, S. M. Agayan<sup>1</sup>, B. A. Dzeboev<sup>1,2</sup>*

<sup>1</sup> Geophysical Center of the Russian Academy of Sciences (GC RAS, Russia)

<sup>2</sup> Center of Geophysical Investigations of Vladikavkaz Scientific Center of the Russian Academy of Sciences and the Government of Republic of North Ossetia-Alania (CGI VSC RAS & RNO-A, Russia)

[m.dobrovolsky@gcras.ru](mailto:m.dobrovolsky@gcras.ru)

In the present work we perform clustering of earthquake epicenters with  $M \geq 3.0$  in California and in the Caucasus and obtain areas where the epicenters of earthquakes with  $M \geq 6.5$  (California) and  $M \geq 5.0$  (Caucasus) can occur. This was done using an FCAZ (Fuzzy clustering and zoning) algorithmic system developed at the Geophysical Center of the Russian Academy of Sciences. Recognized zones correspond well to the places where earthquake epicenters with  $M \geq 6.5$  (California) and  $M \geq 5.0$  (Caucasus) actually occurred.

The zones obtained in California were compared with zones recognized by I.M. Gelfand et al. in 1976 using the EPA (Earthquake-Prone Areas) method based on pattern recognition. The comparison showed that zones recognized by FCAZ system mostly located within or extend EPA zones in one or another direction. However, they occupy significantly smaller area, taking approximately 13% of the area of EPA zones.

In the Caucasus the recognized FCAZ-zones were compared with the EPA zones recognized by A.D. Gvishiani et al. in 1988. The comparison showed that zones recognized using FCAZ system mostly located within the EPA-zones and occupy smaller area. We also compared the FCAZ-zones with the zones obtained previously using gravimetric and geological data. A good correspondence between the results obtained by different methods is observed.