Geophysical Research Abstracts, Vol. 8, 01581, 2006
SRef-ID: 1607-7962/gra/EGU06-A-01581

Where and when will the next $M7$ Vrancea (Romania) intermediate-depth earthquake occur?

N. Hurukawa (1), M. Popa (2), M. Radulian (2)

(1) International Institute of Seismology and Earthquake Engineering (IISEE), Building Research Institute, Tsukuba, Japan, (2) National Institute for Earth Physics (NIEP), Romania (hurukawa@kenken.go.jp / Fax: 81-29-864-6777)

A long-term earthquake prediction, based on the regularity of earthquake occurrences and a seismic gap theory, is presented. Especially in subduction zones, clear geophysical background (plate tectonics) and short recurrence time allow us to make practical use of the prediction. An $M7$ intermediate-depth earthquake occurs in the Vrancea region of Romania on average every 20 to 30 years. The last major earthquake occurred in 1986 ($M7.2$). According to the average rate frequency, we expect a next large earthquake will occur soon. Although a long-term prediction based on regularity of earthquake occurrences has already been carried out by Purcaru (1974) and Enescu *et al.* (1974), and the predicted $M7$ earthquake actually occurred in 1977, this prediction was not based on the seismic gap theory and the hypocenter could not have been precisely predicted. Here we show (i) that we can relocate earthquakes since 1934 quite accurately by using the modified joint hypocenter determination method developed by Hurukawa & Imoto (1992), and (ii) that past $M7$ class earthquakes had occurred at a depth range of 60-140 km with no overlapping of the aftershock areas, and the area at 140-160 km depth remains unbroken.

Considering three seismic active time bands in each century characterized by "quasi-cycles" of about 100 year identified by Purcaru (1979), and the relocation results, we propose a hypothetical scheme for the occurrence of the $M7$ Vrancea earthquakes, as follows: a first $M7$ earthquake occurs in the deeper segment (140-160 km in depth) at the beginning of each century (years 0-10), then a second $M7$ earthquake occurs in the midst segment (110-140 km in depth) at the midst of each century (years 30-40), and finally a third $M7$ earthquake occurs in the shallower segment (80-110 km in depth) at the end of each century (years 70-90). Certainly, the focal depth of old

earthquakes is not accurate, since it is estimated from seismic intensity distribution. However, historical $M7$ earthquakes show a clear dependence of focal depth on the particular active time interval in each century.

Purcaru (1974, 1979), Enescu *et al.* (1974) and Enescu & Enescu (1996, 1999) predicted from the regularity of earthquake occurrence that the next major Vrancea earthquake will occur in this decade. Considering the result of this study and the periodicity of the seismic activity over the past 1000 years, we believe that the possibility of the next $M7$ earthquake occurring at a depth of 140-160 km by 2010 is very high.