AOGS 2005

A New Method for Identifying a Short-Term Seismicity Gap before a Great Earthquake

JING Q.CAO

Seismological Bureau of Inner Mongolia in China

Based on the background of the medium-term seismic gap, and the creep rate slow down after accelerated strain release, by using a method of gradually reducing the step length and the window length of scanning, the characteristics and criteria of a short-term seismic gap have been studied from multi-dimension space research. A new method for identifying a short-term gap from 3-D axial stability collation has been advanced.

Through the study of 26 earthquake examples in north and south-west region of China, we found that a short-term seismicity gap appeared in 9 to 16 months before a strong earthquake, this type of gap is different from background gap and medium-term gap, and will lasted 4 to 7 months, end at the time of 3 to 8 months before the main-shock. The ending is marked by the appearance of a significant earthquake in or near the gap and of small earthquake in the gap.

Based on the research of 26 examples,

$$M = 0.0054L + 4.91 \pm 0.46 \qquad (1)$$

This is a statistical result, here L (km) is the length of the gap major axis, M is the magnitude of the main shock.

If the abnormal ratio of frequency outside to inside of the gap returns to normal, and time gap in R-T map end, then the future strong quake whose magnitude is given by Eq. (1), will occur in half a year. 18 of 26 examples passed the prediction.

The gap pattern before a strong earthquake will be undergoing the follow process, background gap to medium-term gap to short-term gap. These gaps have characteristics as follow: Gap major axis $L_b \geq L_m \geq L_s$; gap forming time $T_b \geq T_m \geq T_s$; gap low limit magnitude $M_b \geq M_m \geq M_s$. Here b for background, m for medium-term, s for short-term.

Form backgrounds to medium-term to short–term, the gaps are gradually shrinking toward the centre of the epicenter area.

Keywords: Short-term gap; 3-D axes; identification; stability collation; criterion.