

Remarkable recurrence pattern of large intermediate-depth earthquakes beneath the Hindu Kush

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Remarkable activity of intermediate-depth earthquakes exists beneath the Hindu Kush, the western vicinity of the Himalayas where the Indian plate is colliding against the Eurasian plate. Utsu (1994) pointed out that beneath the Hindu Kush (around 36.4N, 70.8E, h 220 km) M 7-class large earthquakes had recurred five times every nine years or so. They were; April 6, 1956 event (h 224 km, mb 6.5), March 14, 1965 event (h 219 km, mb 7.5), July 30, 1974 event (h 211 km, mb 7.1), December 30, 1983 event (h 215 km, Mw 7.4), and August 9, 1993 event (h 230 km, Mw 7.0). The successive time intervals are 8.9, 9.4, 9.4, and 9.6 years. Moreover, on March 3, 2002, 8.6 years after the last event, a Mw 7.3 earthquake took place in the same place at a depth of 220 km.

In order to examine whether these earthquakes are characteristic earthquakes or not and to discuss the mechanism of their occurrence, we relocated all earthquakes beneath the Hindu Kush during the period from 1964 through 2003, including the 1965, 1974, 1983, 1993, and 2002 large events, using ISC data and Hurokawa's (1995) Modified Joint Hypocenter Determination (MJHD) method.

The results are: (1) The 1965, 1974, and 1983 earthquakes occurred at almost the same location at a depth of 208 to 209 km. (2) The 1993 event took place about 15 km east to the formers at a depth of 207 km. (3) The 2002 earthquake took place about 18 km west-northwest to the earlier three events at a depth of 220 km. (4) These five hypocenters are within about 35 km alignment striking in the ESE-WNW direction. (5) Focal mechanisms of all five large earthquakes are very similar, showing ESE-WNW running high-angle reverse faulting with a down-dip tension.

Thus, these five large earthquakes seem to be repeating ruptures of an identical fault plane. We also report our preliminary result of our study on their rupture process.

We used the MJHD program written by N. Hurokawa and the teleseismic body-wave inversion program written by M. Kikuchi and H. Kanamori (<http://www.eri.u-tokyo.ac.jp/ETAL/KIKUCHI/>), and we had kind help of S. Yoshida and O. Murakami. We thank all these people.