Seismic activity at the crustal block boundary

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Inland crust can be divided into some crustal blocks with various shapes and scales. As these blocks behave like rigid masses, crustal deformation and earthquakes are concentrated near around these block boundaries. Dividing the Kinki district into some blocks, Watanabe(2002) showed that most of historical large earthquakes occurred along these boundaries. He also discussed about the seismic correlation between some block boundaries. Adding the above districts, I'll discuss about the seismic activity along San'in coastal area and also refer to the characteristic mechanism at the block boundary.

The block structure of Kinki to East-Chugoku districts is shown in the figure. The San'in block is bound on the east by Northern-Tango Eq. zone and on the west by Western-Tottori Eq. zone. The Matsue block newly named is put between Western-Tottori Eq. zone and Mt. Sambe wide active zone.

A few days after the Western-Tottori Eq.(2000.Oct.6, M7.3), some small earthquakes occurred at northern Hyogo pref., where the Northern-Hyogo Eq.(2001.Jan.12, M5.3) occurred later. In Dec. 2000, an earthquake swarm occurred in the same area, and one month later, the Northern-Hyogo Eq. occurred there. Although both seismic activities, Western-Tottori Eq. and Northern-Hyogo Eq., apart 100km from each other, they seem to be correlated from their time sequences.

Watanabe(2002) showed the correlation between Tottori-Chubu Eq.(1983.Oct.31, M6.2) and Yamasaki fault Eq.(1984.May 30, M5.6) as a typical example of block boundary activity. One year preceding the Tottori-Chubu Eq., the seismic quiescence was recognized through the whole area of Tottori Eq. fault zone. Just after the Tottori-Chubu Eq., the quiescence along the Tottori Eq. fault zone was dissolved and the quiescence along the Yamasaki fault started to appear. After seven months' quiescence, the Yamasaki fault Eq. occurred and the quiescence was dissolved.

The mechanism of these seismic activities can be thought as follows; First, ordinary seismic activity is seen near around the fault zone. With accumulation of tectonic stress, the fracture strength along the fault increases and the seismic activity decreases. Then, the quiescence appears. Remarkable is that the quiescence was recognized through whole area of the fault. After a moderate earthquake occurred, some portion of accumulated stress near the hypocentral area might be released and the state of stress along the fault became inhomogeneous. But, the seismic activity along whole of the fault returned to the ordinary level.

There should be some kind of mechanism that smoothes the stress condition along the fault zone. If this mechanism acts really, it may transmit the stress from Western-Tottori Eq. zone to Northern-Hyogo Eq. area. A block boundary may involve this stress smoothing mechanism.

Kasahara(1967) presented the mechanical model with some springs and sliders to explain the occurrence of earthquakes. Watanabe(2004) added a dashpot onto Kasahara's model to explain the stress smoothing mechanism. This mechanical model is merely a thinking model and I don't know whether this dashpot corresponds to the flowage of the lower crust or not.

references:

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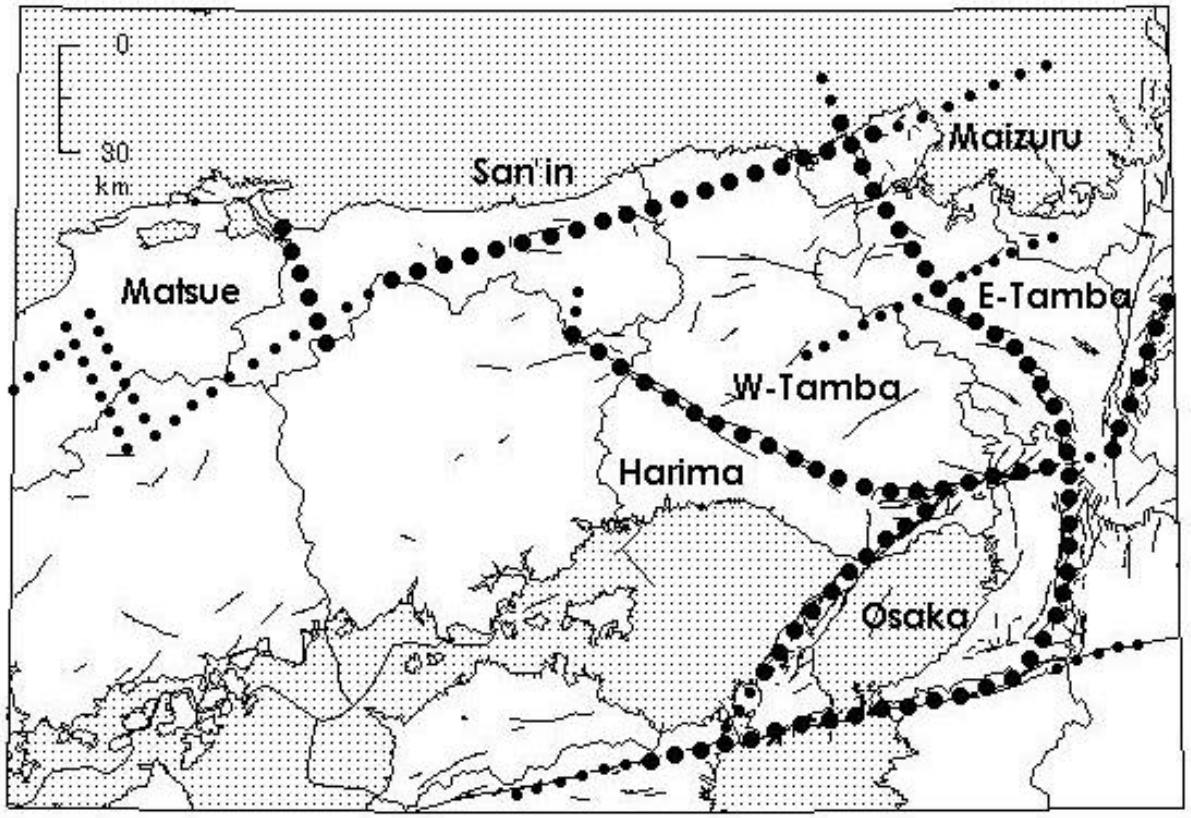
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