

Secular Changes of Elastic Constants Estimated using Tidal Strains Observed at Rokko-Futatabi and Rokko-Takao Stations

Atsushi Mukai[1]; Shigeaki Otsuka[2]

[1] Faculty of Informatics, Nara Sangyo Univ.; [2] Faculty of Humanities and Sciences, Kobe Gakuin Univ.

The amplitudes of the M2 tidal component observed at Rokko-Futatabi and Rokko-Takao stations, southern Hyogo Prefecture, showed secular decreases with the rate of 0.1-2.5%/yr since 2002. The tidal amplitude in the north-northwest direction, which is orthogonal to the Manpukuji fault nearby the stations, indicates the maximum decrease. It is considered that the healing of the fracture zone around the fault caused ascendance of the Young's modulus and reduced the tidal amplitudes. In this study, we calculated the elastic constants using the observed and predicted tidal strains. We investigated about the effect of the Manpukuji fault to the secular changes of the elastic constants.

Rokko-Futatabi and Rokko-Takao stations were established by Kyoto University. Both stations are located in the emergency evacuation roads for the Shin-Kobe tunnel. Rokko-Futatabi is about 0.6km distant from Rokko-Takao. In the Rokko-Futatabi station, an extensometer (EX0: N9W) with length of 20m was installed and the continuous observation of strain changes has been performed since 1980. In the Rokko-Takao station, four extensometers (EX1, EX2, EX3, EX4: N69E) and three strainmeters (ST1: N81W, ST2: N39E, ST3: N21W) were installed and observed continuously since 1989. The lengths of EX1, EX2, EX3 and EX4 are 15, 12, 30 and 30m, respectively.

We calculated the tidal constants every year by applying the tidal analysis program BAYTAP-G (Tamura et al., 1991) to the observational data of EX0, EX2, ST1, ST2 and ST3 from 2002 to 2007. The amplitude of the M2 tidal component showed secular decrease with the rate of 0.1-2.5%/yr. Particularly, the tidal strains in the north-northwest direction, EX0 and ST3, showed large secular decrease with the rate of 1.3-2.5%/yr. Elastic constants were estimated by using the observational data of strain and the tidal strain predicted by GOTIC2 (Matsumoto et al., 2001). We investigated the characteristics of the anisotropy and the secular changes of the elastic constants.

Tidal strains observed at the 800m-deep borehole, northwest Awaji Island, also showed the secular changes of the tidal amplitudes and the ascendance of the Young's modulus. It was considered that this ascendance of the Young's modulus was caused by the healing of the Nojima fault nearby the 800m-deep borehole after the 1995 Hyogo-ken Nanbu earthquake. Rokko-Futatabi and Rokko-Takao stations are located nearby the Rokko faults, on which slip occurred in the 1995 Hyogo-ken Nanbu earthquake. It is considered that the estimated secular decreases of tidal amplitudes in the north-northwest direction were caused by the healing of fracture zone nearby the Manpukuji fault.