

Quality factor of toroidal modes consisting of spheroidal-toroidal mode coupling

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Up to now, various earth models such as PREM(Dziewonski and Anderson,1981) have been made by using the eigenfrequencies and the quality factors of the earth's free oscillation excited due to the large earthquake. However, the observed eigenfrequencies and the quality factors of modes are still different from theoretical values of the earth model such as PREM due to earth's rotation, ellipticity, and aspherical structure. Therefore it is important to compare observed values with theoretical values and estimate these effects.

In the 112th meeting of the geodetic society of Japan, using strainmeters and superconducting gravimeter data in Matsushiro, Japan, we determined the eigenfrequencies and the quality factors of normal modes consisting of Spheroidal-Toroidal coupling excited by the Sumatra event in December, 2004 with sompi method(Kumazawa et al., 1990). The eigenfrequencies and the quality factors of ${}_0S_{11}$ and ${}_0T_{12}$ that couple strongly are similar to theoretical values by Masters et al. (1983). However, the quality factor of ${}_0T_{12}$ excited to vertical component is similar to that of PREM, while the quality factors excited to horizontal components is different from PREM.

In spherically symmetric, non-rotating, perfect elastic and isotropic earth model such as PREM, toroidal modes are not excited to vertical components, and toroidal modes are excited to vertical components due to coupling with other modes(Zurn, 2003). Spheroidal-Toroidal couplings between normal modes are mainly due to earth's rotation and reflect the mantle structure. Therefore, the quality factors of toroidal modes excited to vertical component can be keys to earth's rotation or mantle structure.

However, we determined quality factors of toroidal modes using only one station data. So it is necessary to check quality factors using many other station data. In this research, we determine quality factors of toroidal modes using superconducting gravimeter data of GGP and STS-1 seismometer data of IRIS to ascertain whether quality factors of toroidal modes excited to vertical components are different from those excited to horizontal components.