

Q quality factor variations of fundamental modes consisting of spheroidal-toroidal mode coupling.

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The spectrum of Earth's seismic normal modes provides evidence for both its predominantly spherically symmetric internal structure and deviations from this idealized reference state. At low frequencies, fundamental spheroidal and toroidal modes are coupled strongly and are observed as hybrid multiplets which are shifted in both mean frequency and Q quality factor from the uncoupled values. The shifts can be predicted by considering the coupling effects of rotation, attenuation, and ellipticity of figure. Once we can successfully account for rotation and ellipticity of figure in the hybrid multiplets, the remaining features must be caused by aspherical structure including, perhaps anisotropy.

Using 100m laser strainmeter records and SG records of southern Sumatra event of September 2007 at Kamioka(Japan) station, we determined Q quality factors and eigenfrequencies of fundamental modes which consist of spheroidal-toroidal coupling between 2.0mHz and 3.0mHz and found that Q quality factors of fundamental spheroidal modes which consist of spheroidal-toroidal coupling are lower than those of toroidal modes. This magnitude correlation is opposite to PREM(Dziewonski and Anderson, 1981).

At frequencies below 3.0mHz, the shifts in the mean frequencies and Q quality factors of coupled modes can be dominantly predicted by considering the coupling effects of rotation. Masters et al.(1983) shows that coupling due to Coriolis force makes the hybrid Q quality factors attract and strong coupling would tend to homogenize singlet Q quality factors. However, the magnitude correlation reversal of Q quality factors can not be explained with Coriolis force effects. The coupling effects of ellipticity of figure are so smaller than those of rotation that we need to assume specific aspherical structure to explain these phenomena.

In this research, we determine Q quality factors and eigenfrequencies of fundamental modes which consist of spheroidal-toroidal coupling using GGP SG records of Sumatra-Andaman event of December 2004 to ascertain whether the magnitude correlation of Q quality factors between spheroidal modes and toroidal modes is opposite to that of PREM at other stations.