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Latitude and longitude dependencies of the eigen frequency in core moeds of the earth's free oscillation

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Seismological studies revealed that the inner core had axisymmetric anisotropy(Morelli et al., 1986; Woodhouse et al., 1986).Kawasaki (2009) pointed that the eigen frequency of the core modes changed with the latitude for the axisymmetric anisotropy. In this study, we use waveform data of the 2004 Sumatra-Andaman earthquakes recorded by superconducting gravimeters and STS-1 seismometers. We calculate the power spectrum of the waveform data using discrete Fourier transformation to identify excited core modes and to discuss the latitude and longitude dependencies of the eigen frequency. In addition, we apply Sompi method to excited core modes. Sompi method estimates the eigen frequency and the quality factor of the free oscillation simultaneously.

We identify $_0S_0$, $_1S_0$ and $_3S_2$ as the excited core modes from the power spectrum. We can find the latitude and longitude dependencies in $_1S_0$ and $_3S_2$, but we can find no dependencies in $_0S_0$. From the comparison of the results of Sompi method with those of Fourier transformation, we suggest that the attenuation of the free oscillation affect little the estimation of the eigen frequency.

Because $_3S_2$ is sensitive mainly to the boundary between the inner core and the outer core, we suggest that observed dependencies in $_3S_2$ are caused in this region. $_1S_0$ is sensitive mainly to the outer core.It is unlikely assumed that there is anisotropy in the outer core, because it is difficult to expect lateral variations in density larger than one part in 10^5 in the fluid outer core (Stevenson, 1987). Therefore, the very small dependencies in $_1S_0$ may be caused in other sensitive regions that are the core mantle boundary and the inner core. No dependencies in $_0S_0$ may result from little sensitivity to the anisotropy of the core and mantle.

Keywords: the earth's free oscillation, spectral analysis, the inner core, anisotropy