

Rotations of the OT24 mode observed in Japan

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It has been known that the local structure can affect high-frequency surface waves. On the other hand, it is expected that the structure will not have a large effects on the lower frequency (less than 0.003Hz) waves, and large changes of the arrival direction will not be observed. If this is true, the direction of oscillations of the OT24 mode should always correspond to the transverse direction at the station.

In this study, We look for OT24 rotations by examining data sets aligned in various directions using a spectral analysis. 24 hours of data beginning at the time of large earthquakes are used. The rotation of the waveforms is done clockwise and in 10 degrees increments from 0 (N/S) to 170 degrees. The peaks of the OT24 mode are clearly identified in the spectrum of each direction, and the direction that has the maximum amplitude of the OT24 mode is determined. The direction of the OT24 oscillations is often shifted from the transverse as a result. This fact indicates that the long-period (about 300 sec) component of the seismic waves arrived at the station from a path off the great circle. The direction of the particle-motion for a single Love wave packet also shows the same rotation that is observed in the spectral analysis of 24 hours of data at the same station.

The pattern of the shifts of the OT24 directions across Japan is complicated, but there are clear regional trends. According to the results for several large events at three stable stations, FUJ, SGN, and TTO in the Tokai region, the shifts depend on the paths from the epicenters. For instance, when an epicenter is to the south (or the north) of these stations, the OT24 directions hardly show any shift, but there are large rotations for earthquakes arriving from the northeast. The large shifts in the OT24 polarization are likely due to the regional structure.