Fault area radiating short-period seismic waves during Great Earthquakes at the Nankai Trough seismogenic zone

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Three great earthquakes have occurred since 300 years ago in the both of the Tokai and Nankai areas along the Nankai trough in southwestern Japan, where the Philippine Sea plate is subducting beneath the Eurasian plate. The inversion analysis has been developed to evaluate the distribution of seismic energy radiated from an earthquake fault plane using seismic intensity data and applied to the great interplate earthquakes. The obtained energy distribution shows short-period wave radiation zone on the fault plane for each earthquake, since the seismic intensity is closely related to 0.5 - 1.0 seconds period contents of seismic waves. The attached figure shows short-period wave areas plotted on a topography map. The seismic profile of each short-period radiation zone is discussed as follows:

No.1 zone is located beneath the interior of Suruga Bay in case of the Hoei and Ansei-Tokai earthquakes, and is consistent with the collision point between the Suruga trough and Izu peninsula. It is suggested that the fault rapture might be rapidly stopped at the zone and strongly radiate short-period seismic waves.

No.2 zone is located off the Enshu Sea where the Paleo-Zenisu Ridge has been subducted. The short-period radiation zone appeared during every earthquake. Baba(2002) suggested, however, that this zone was not raptured during the Showa-Tonankai earthquake, and that the Paleo-Zenisu Ridge inhibited rapturing. Short-period seismic waves might radiate where the Paleo-Zenisu Ridge acted as a barrier inhibiting the rapture.

No.3 zone is located beneath the Kumano Sea, where the asperity estimated from the tsunami and strong motion waveform inversions adjoins for the Showa-Tonankai earthquake. This short-period radiation zone appeared during every earthquake.

No.4 zone is located off Cape Shiono. It appeared during the Showa and Ansei earthquakes, when the area became an edge of fault segment. There is no short-period radiation zone at this area during the Hoei earthquake, when the both segments of Tokai and Nankai zone were raptured successively.

No.5 zone is located at the entrance of the Kii Channel. It appeared during every earthquake. Cummins et al.(2002) suggested a possible tear in the slab beneath the western edge of the Kii peninsula. It seems that the tear was a boundary between Tonankai and Nakai fault rapture plane. It is remarkable that this short-period radiation zone is located so as to avoid the epicenters of deep low-frequency seismic tremors [Obara(2002)]. A short-period radiation zone of the Hoei earthquake exists in the west of a subducted seamount. The fault rapture of the Hoei earthquake seemed to extend throughout the subducted seamount, though it might act a barrier to inhibit the propagation of an interplate rapture during the Showa and Ansei earthquake. The rapture of a subducted seamount induced a large stress drop, increased slip speed, generated short-period seismic waves, and propagated to the deep landward edge. The structural role of the subducted seamount may explain that seismic intensities along the Pacific coast and in Osaka plain are quite larger than those of the Showa and Ansei earthquake.

No.6 is located around the west coast of Kochi and corresponds to the north-west end of the asperity from tsunami waveform inversion at the Showa-Nankai earthquake. Though the short period radiation zone of the Ansei Nankai earthquake extended near the trench, the solution is unstable due to the configuration problem of observation site. Furthermore, Park et al.(2002) suggested that the deep strong reflector existed near the trench and acted as a possible releaser of the shear stress energy at the plate boundary and generated a steady state slip during the interseismic period. The short-period radiation zone near the trench may have low reliability.

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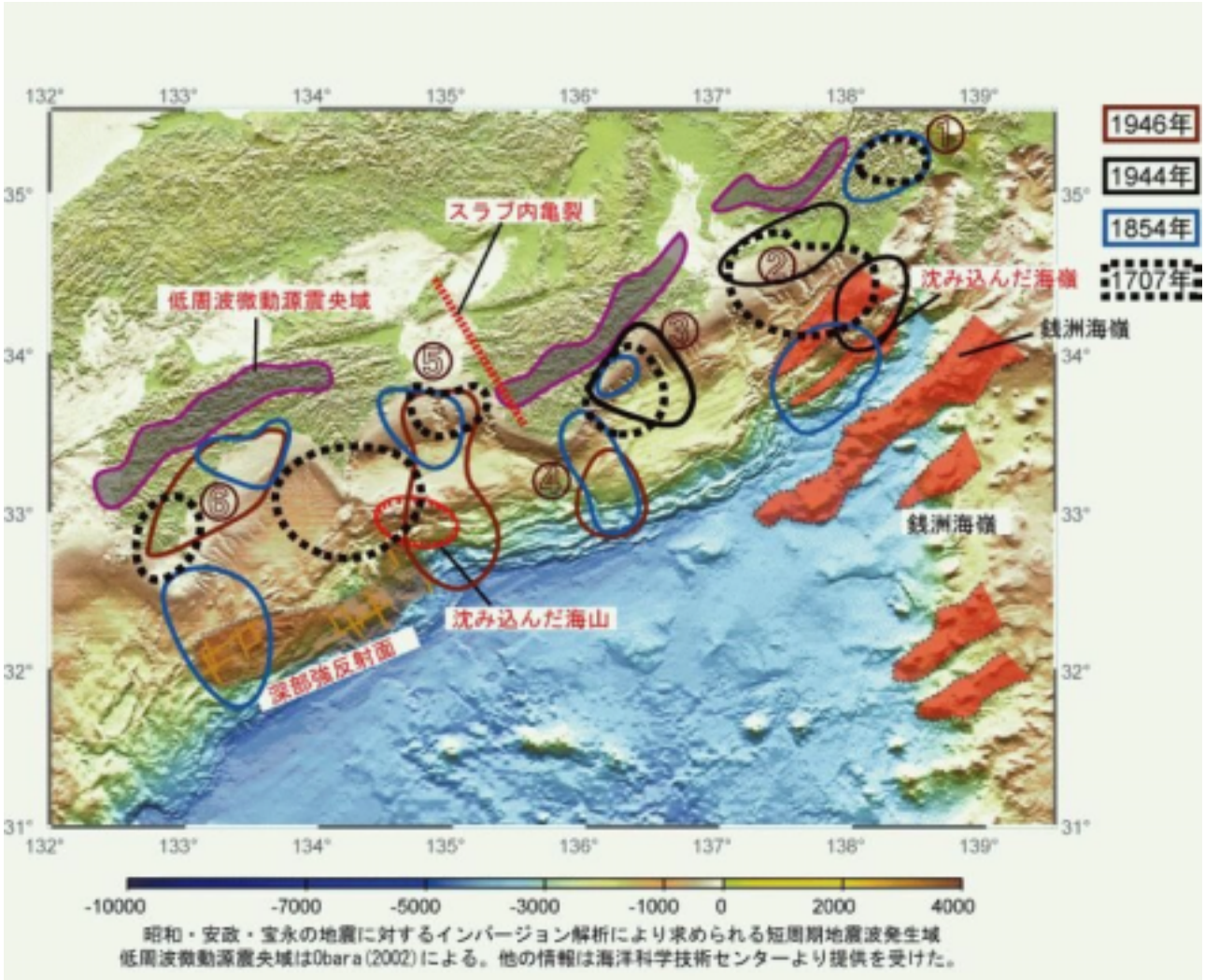

昭和・安政・宝永の地震に対するインバージョン解析により求められる短周期地震波発生域
低周波微動源震央域はObara (2002) による。他の情報は海洋科学技術センターより提供を受けた。