

Inversion analysis of the 1952 and 2003 Off-shore Tokachi Earthquakes using seismic intensity data

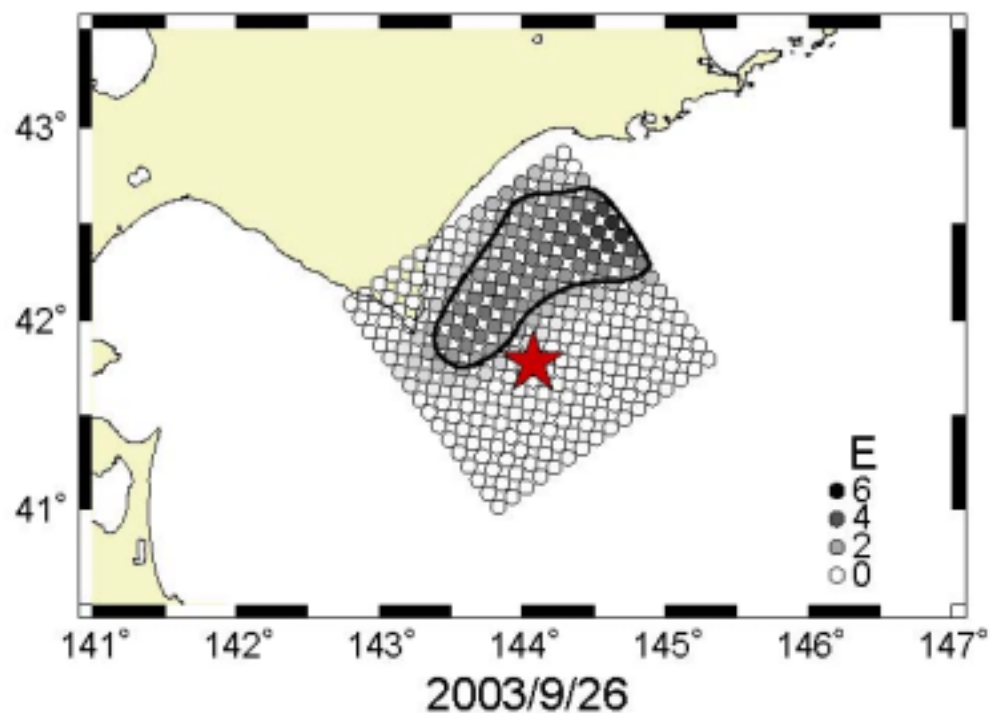
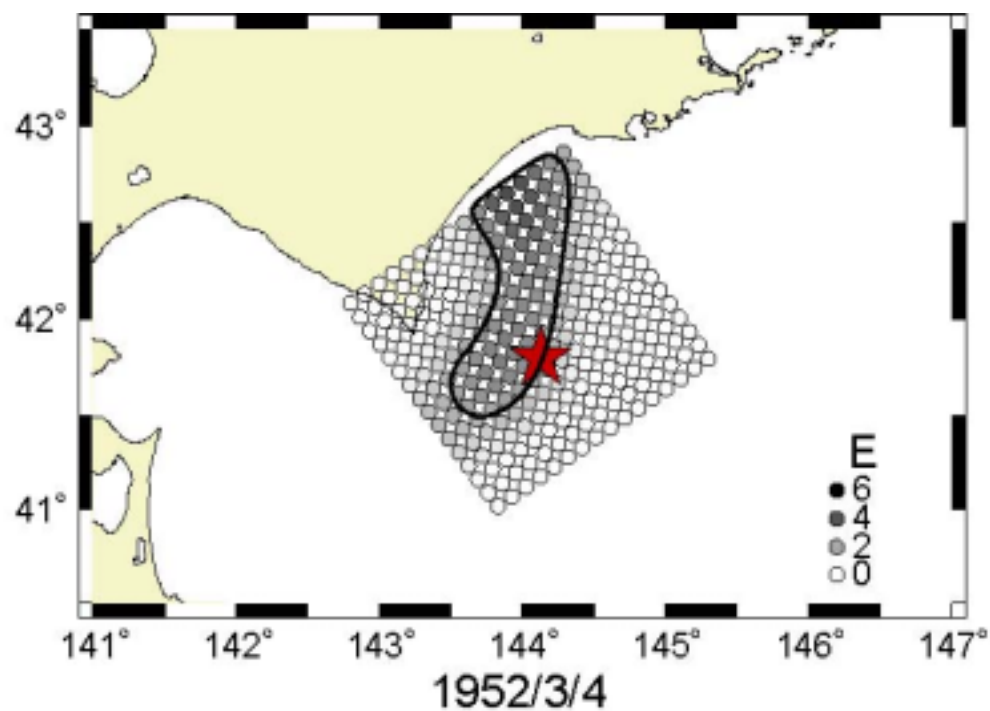
Katsuhisa Kanda[1]; Masayuki Takemura[1]

[1] Kobori Res. Comp., Kajima Corp.

We have developed the inversion method using seismic intensity data and have applied to subduction earthquakes such as Nankai Trough earthquakes and Off-shore Miyagi earthquake [Kanda et al.(2003)]. The Off-shore Tokachi earthquake is also one of major subduction earthquakes in Japan and just occurred on September 26, 2003. It is said that large slip zone of the 2003 Off-shore Tokachi earthquake is similar to that of the 1952 Off-shore Tokachi earthquake based on the waveform inversion analysis [Yamanaka and Kikuchi (2003)]. JMA reported some resemblances between these two earthquakes. For instance, a maximum aftershock occurred in the vicinity of a main shock, and aftershock activities moved from Off-shore Urakawa to Off-shore Kushiro. Therefore, They judged that the same type of earthquake occurred again. We have investigated whether or not short-period radiation zone on the fault plane of the 2003 Off-shore Tokachi earthquake resembled that of the 1952 Off-shore Tokachi earthquake using the inversion analysis of seismic intensity data.

Compared between the 1952 and 2003 Off-shore Tokachi earthquakes, isoseismal areas for seismic intensity 3 to 5 quite resembles each other. However, though the areas of seismic intensity 6 of the 1952 earthquake are limited in the Tokachi River basin, those of the 2003 earthquake are located not only in the Tokachi river basin but also in Hidaka and Kushiro regions. It may be due to the difference between measured intensity and bodily sensed intensity that includes uncertainty due to judgment of estimators. In order to improve the accuracy of seismic intensity distribution of the 1952 earthquake, we add seismic intensity data evaluated from the complete collapse rate of dwelling houses [Research committee of the 1952 Off-shore Tokachi earthquake(1954)]. Since the earthquake resistance performance of Japanese dwelling houses didn't improve until the 1952 Off-shore Tokachi earthquake [Moroi and Takemura(1999)], we estimate seismic intensity I from the collapse rate using the relationship for old dwelling houses [Takemura and Moroi(2001)] as follows: $I6.5=30\%$, $I6.0=10\%$, $I5.5=1\%$, and $I5.0=0.1\%$. In result, towns of intensity 6- also appear in Hidaka and Kushiro regions. It means that an isoseismal area for seismic intensity 6 of the 1952 earthquake become similar to that of the 2003 earthquake.

A seismic intensity attenuation formula and relative intensities related to the local site amplification are evaluated from seismic intensity data of six aftershocks (M greater than 6.0) of the 2003 earthquake for the inversion analysis. According to the seismic intensity inversion analysis, the most of short period radiation areas of the 1952 and 2003 earthquakes overlap each other. It may be inferred that similar earthquakes concerning short period earthquake motions occurred repeatedly. Furthermore, compared to large slip areas of the 2003 earthquake [Yamanaka and Kikuchi 2003), Koketsu(2003), and Honda et al.(2003)], it is noted that the most areas of short period radiation zones resemble them.



Short period radiation zones evaluated by the inversion analysis using seismic intensity data. Stars shows the epicenter. Curved black solid lines show fault zones radiating more than twice of average energy.