

## Comparison of source processes of 'characteristic' earthquakes off Kamaishi, Iwate Prefecture, NE Japan

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### 1. Introduction

Many large earthquakes have occurred along the plate boundary east off northeastern (NE) Japan, but no large earthquakes occurred in the area of N39-40, E142-143. One interpretation for this is that the area is a creep segment on the plate boundary. In this area, M4.8 ± 0.1 earthquakes have occurred regularly since 1957 with a recurrence interval of 5.35 ± 0.53 yrs at the same location off Kamaishi, Iwate Prefecture (Igarashi et al., 1999). We interpreted that these characteristic earthquakes are caused by repeating ruptures of an asperity with a dimension of ~1km. The last event occurred on 11/13/2001 16:44 (JST) M4.7 (we call as the 2001 event) and the previous one was 3/11/1995 10:30 (JST) M4.8 (we call as the 1995 event). Waveforms of these events are similar to each other. In this study, we compare slip distributions of the 1995 and 2001 events by waveform inversions.

### 2. Hypocenter relocation

First, we relocated hypocenters of the 1995 and 2001 events by the homogeneous station method. We compared P- and S-wave arrivals of the 2001 event with that of the 1995 event and tried to pick the same phase of the two event.

Hypocenter of the 2001 event is determined about 200m to the west of the 1995 event.

### 3. Moment tensors

We determined moment tensors of the 1995 and 2001 events. Details of the inversion method is discussed in Okada et al. (2001a). Waveform data were from Tohoku university's broad-band seismic network.

Moment tensors of the two events are almost the same. They are thrust-type solutions with low-angle westward dipping planes, which are consistent with the geometry of the plate boundary between subducting Pacific plate and the overlying plate. Scalar moments of the 1995 and 2001 events are almost the same. They are  $1.1 \times 10^{23}$  dyne.cm.

### 4. Source processes

We determined spatio-temporal moment release distributions of the two events by waveform inversions (Okada et al., 2001b). Their fault planes were assumed as a low-angle westward dipping plane of the moment tensor solutions. We used a grid net with 81 points spaced 300m on a plane of 3km x 3km. We selected as the empirical Green's function an event (8/17/2001 12:14 M3.1) located near the 1995 and 2001 events. Waveform data were from Tohoku University's microearthquake observation network. Seismographs of the network are short-period seismographs or broad-band seismographs. For the 2000 event, we also used waveform from JOF station of JMA and OB3, which is one of cabled ocean bottom accelerometers off Kamaishi. These waveforms were low-pass filtered with a cut off frequency of 5Hz in the analysis.

For the 2000 event, Spatial extent of rupture area is about  $1.5 \times 1.5$  km<sup>2</sup>. Moment release distribution is homogeneous. Peak of moment release is located near the hypocenter. For the 1995 event, spatial extent of rupture area is about  $1.5 \times 1.5$  km<sup>2</sup>, which is the same as that of the 2001 event. Moment release distribution is not so inhomogeneous. Peak of moment release is located about 300m to the west from the hypocenter.

Comparison of the rupture area of the 2001 event with that of the 1995 event (Fig.1) shows that they are almost overlapped with each other, although their hypocenters are different from each other. The present observations clearly show that the 1995 and 2001 events are caused by the repeating ruptures of the same asperity patch, and that the asperities are persistent features.

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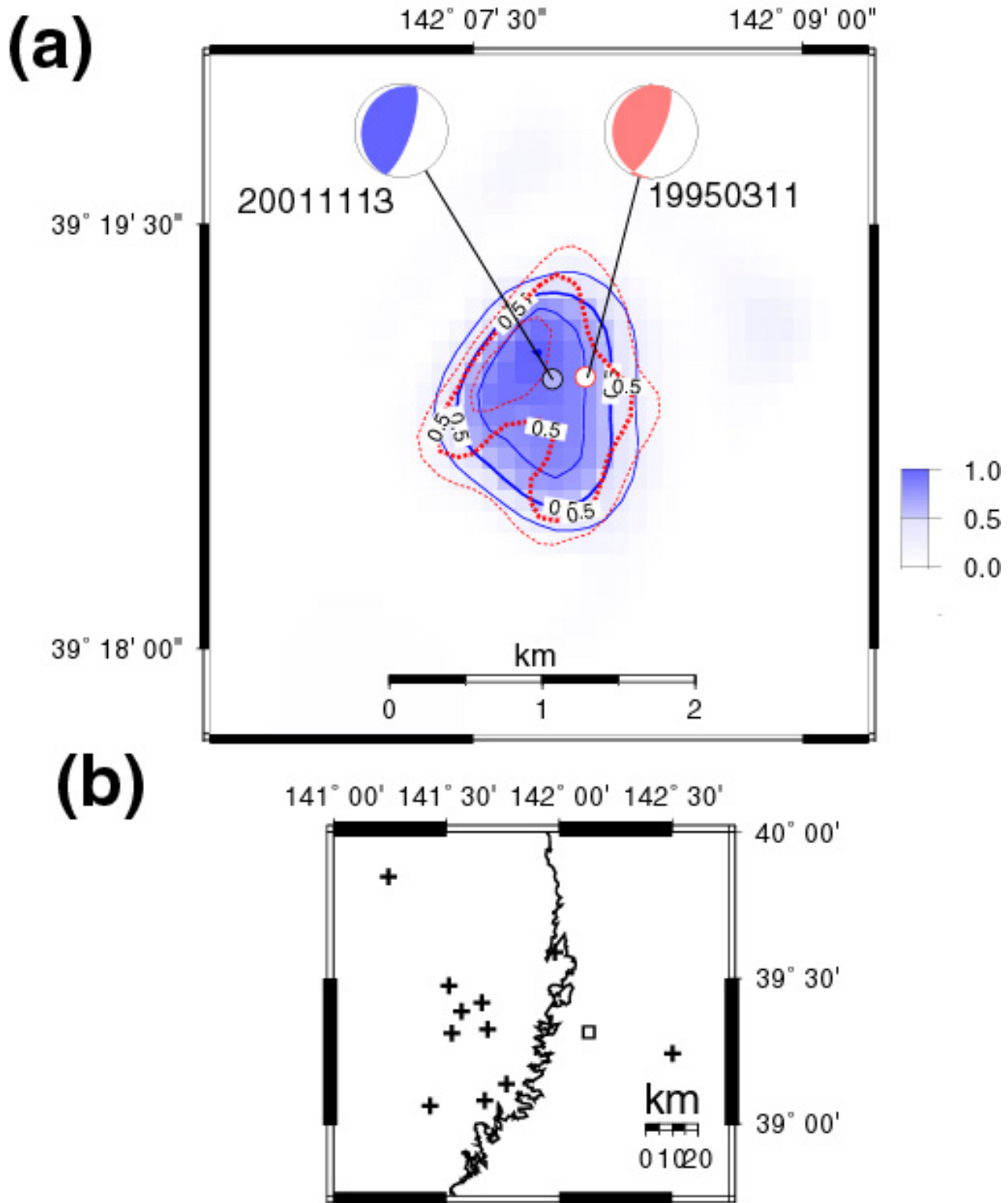


Fig 1. (a) Moment release distributions of the 1995 and 2001 events. Amount of moment release density normalized by the peak value is shown. Blue solid contour line and red broken contour line denote distributions for the 2001 and 1995 event, respectively. Moment tensors of the 1995 and 2001 events are also shown. (b) Observation stations used in the inversion for the 2001 event. Square denotes the area shown in (a).