The tsunami source areas of the 2003 and 1952 Tokachi-oki earthquakes

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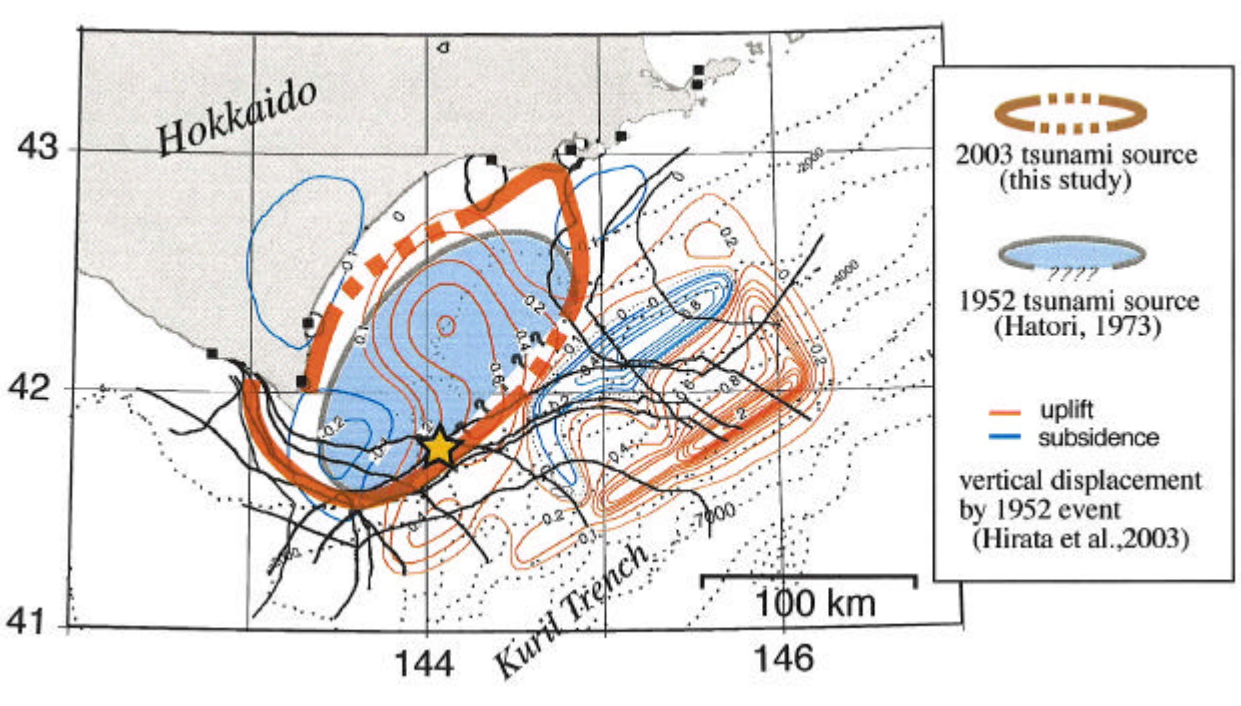
We estimate the tsunami source area of the 2003 Tokachi-oki earthquake (Mw 8.0) from observed tsunami travel times at 17 Japanese tide gauge stations. The estimated tsunami source area (~1.4 x 10^4 km^2) coincides with the western-half of the ocean-bottom deformation area (~2.5 x 10^4 km^2; Hirata et al., 2003, JGR) of the 1952 Tokachi-oki earthquake (Mw 8.1), previously inferred from tsunami waveform inversion(Fig.1). This suggests that the 2003 event ruptured only the western-half of the 1952 rupture extent. Geographical distribution of the maximum tsunami heights in 2003 differs significantly from that of the 1952 tsunami(Tanioka et al.,2003,submitted to EPS), supporting this hypothesis. Analysis of first-peak tsunami travel times indicates that a major uplift of the ocean-bottom occurred approximately 30 km to the NNW of the mainshock epicenter, just above a major asperity inferred from seismic waveform inversion(Yamanaka & Kikuchi,2003,submitted to EPS).

Fig.1 The tsunami source area of the 2003 Tokachi-oki earthquqake (thick red curve) and ocean-bottom deformation area (thin red (uplift) and blue (subsidence) contours). The 1952 tsunami source area (shaded blue ellipsoid) was determined by Hatori(1973,Zisin).


Hokkaido
43
42
41
144
146
Kuril Trench
100 km
2003 tsunami source
(this study)
1952 tsunami source
(Hatori, 1973)
uplift
subsidence
vertical displacement
by 1952 event
(Hirata et al.,2003)