



TECHNICAL COMMUNICATION

Tsunami Disaster Caused by 1993 Earthquake in Northern Part of Japan Sea

Yoshitaka Hayashi

Geological Survey Department
Kokusaikogyo Company, Ltd.
3-6-1, Asahigaoka
Hino-shi, 191 Japan

OUTLINE OF DISASTER

At 10:17 p.m. on the 12th of July 1993, a large earthquake (magnitude 7.8) occurred in the southwest of Hokkaido, Japan (Figure 1). Only 5 minutes after the earthquake occurred, a warning for a tsunami was issued by the Japan Meteorological Agency. The tsunami hit the coast of the Okushiri Island, situated 50 km from the mainland. Damage was mainly caused by the tsunami and liquefaction. Official reports stated that 239 people were killed or missing and 558 houses were completely destroyed. Okushiri Island sustained the most damage.

This paper reports damage caused by the Tsunami as observed from air-photograph interpretation and field observation. The air-photographs were taken on the morning of July 13th.

DISASTER CAUSED BY THE TSUNAMI

Figure 2 shows "run up height" of tsunami waves estimated by air-photo interpretation and field observation. The figure indicates Okushiri Island was the most damaged area.

Figure 3 shows the affected area by the tsunami in Okushiri Island. Most inundated areas were Monai (south-western coast), Inaho (northern coast) and Aonae (southern coast). These coasts have a wide and shallow shoreface. The islands have a bay-shaped coastline which is mirrored by bottom topography of the shallow sea (50 m deep). These topographical features possibly accelerate tsunamis which strike the coast.

Aonae Area (Southern Coast, Photo 1)

The Aonae area was seriously damaged by the tsunami and a fire caused by the earthquake. The damaged area was divided into 4 units according to state of damage, as listed below.

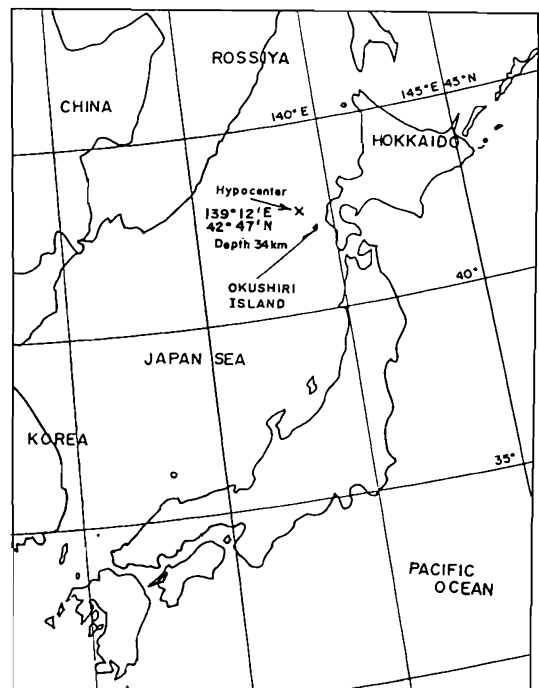


Figure 1. Location map.

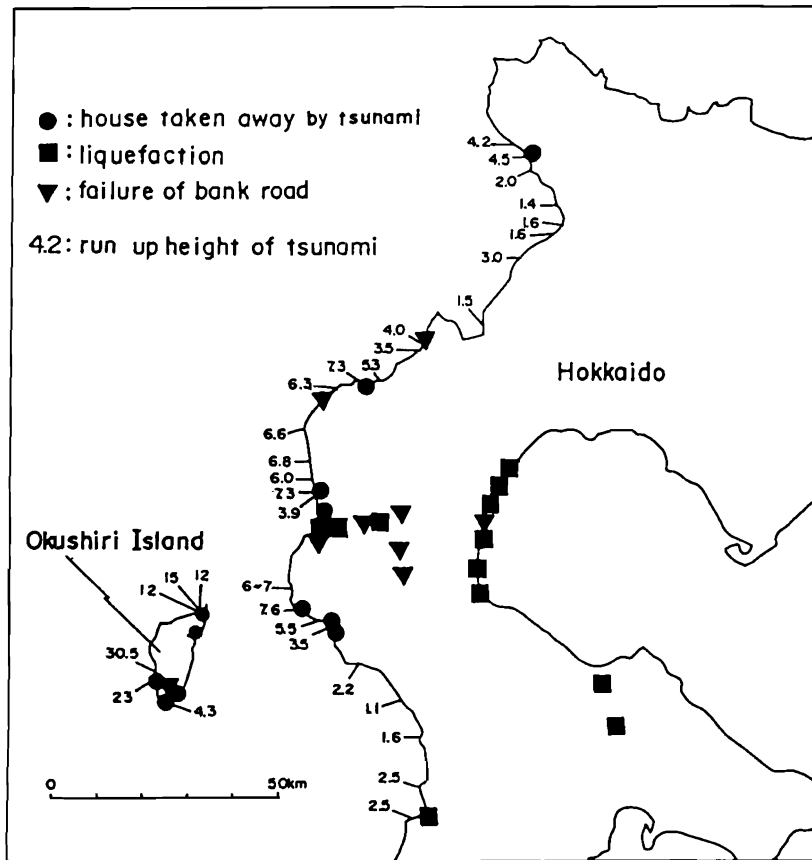


Figure 2. Disaster map caused by the earthquake.

(1) Around Cape Aonae (Unit Completely Destroyed by the Tsunami)

Houses were completely destroyed and washed away by the tsunami (they were almost all mortared frame houses). Only basements made with concrete were left intact (Photo 2).

(2) The Area Around Aonae Harbor (Toe of the Tsunami Inundation)

Houses were not destroyed completely, but first floors were damaged. The tsunami washed everything away and moved debris onto this unit (*i.e.*, toe of inundation, Photo 3).

(3) Small and Low Terrace (4 m) Between the Higher Terrace (40 m) and the Harbor

This unit was damaged slightly by the tsunami.

Almost all the houses were burnt in a fire after the tsunami. Inundation was estimated as relatively calm and very low, judging from shrubs which were burnt but still standing.

(4) Northern Aonae Village (Destroyed by the Tsunami)

This unit was hard hit as was unit "1". It was estimated that the tsunami came from the east, a different direction from that of unit "1".

Monai Area (Southwestern Coast)

The Monai coast faces the Japan Sea, where the tsunami was produced. The tsunami ran up to 10 to 30 m above sea level. Electric-light poles were broken down, and a boat was carried inland

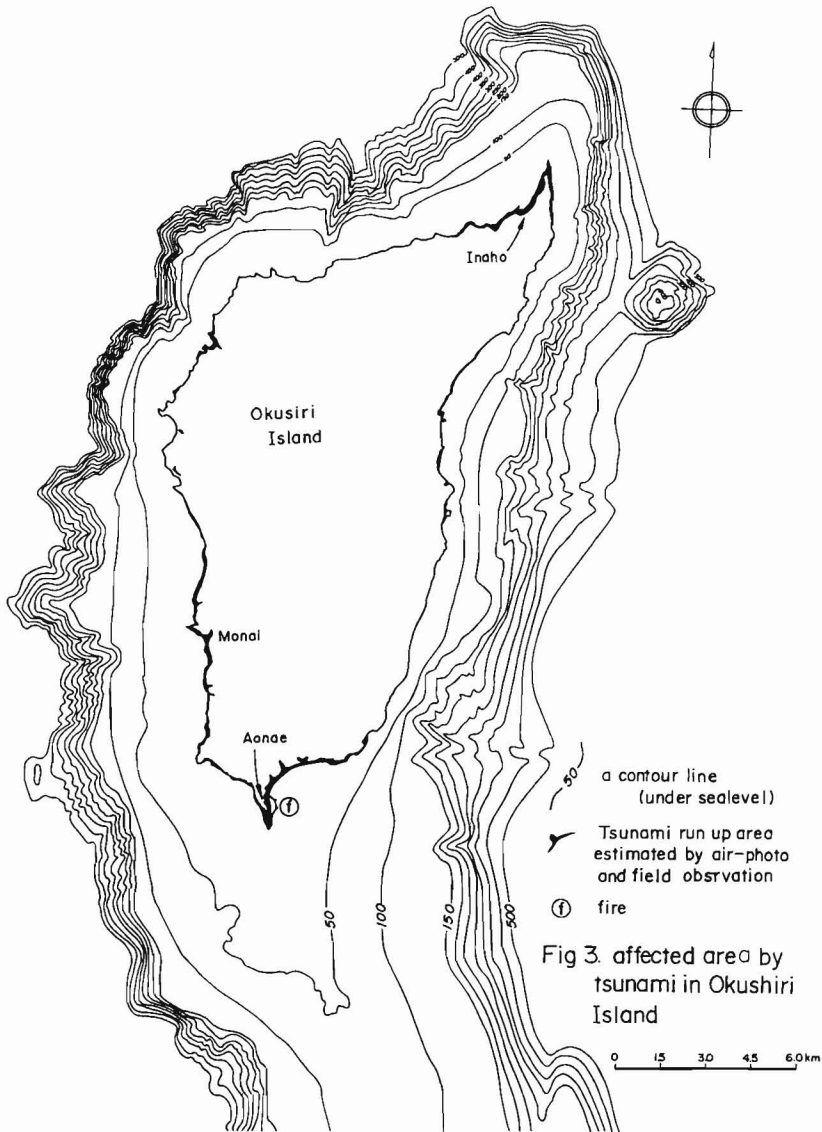


Figure 3. Affected area by tsunami in Okushiri Island.

by the tsunami (Photo 4). The tsunami also flooded a small valley which faces the coast. Here the maximum "run up height" (30 m) was measured by investigators from Tokyo University (Photo 5).

Inaho Area (Northern Coast)

The Inaho coast also faces the sea. The tsunami ran up Inaho village to 15 m above sea level, and destroyed it completely (Photo 6).



Photo 1. Aonae area.



Photo 2. Around cape Aonae. (Unit completely destroyed by the tsunami.)



Photo 3. Around Aonae harbor. (Toe of the tsunami inundation.)



Photo 4. Monai area. A boat was carried beyond a road by the tsunami.



Photo 5. Monai area. A small valley where the maximum run up height was measured.



Photo 6. Inaho area. This village was also destroyed completely. At a foot of a mountain, traces of the tsunami can be seen clearly.