SHOWA SANRIKU EARTHQUAKE TSUNAMI (March 1933 / Japan)

1. The Tsunami and Resulting Damage

At 02:31 on 3 March (Japan Standard Time), an earthquake with a magnitude of 8.1 occurred off the Sanriku Coast (latitude 39°14'N, longitude 144°11'E), northeast Honshu, Japan. From about one month before the main shock, the level of the sea bottom had dropped. Two days before the earthquake, the sea level had lowered. Although intensity grade 5 on the JMA scale was measured along the Sanriku Coast, at the time of the main shock, only stone walls were slightly damaged. About 30 to 60 minutes later, a huge tsunami hit the Sanriku coastal region as well as the southern part of Hokkaido. The height of the tsunami was 10.1m in Taro Town, 16.5m in Akedo in Tanno village, and 23.0m in Ryori in Sanriku Town. The death toll in Taro was 763, which was 42 per cent of the total population in Yosihama, near Ryori, 982 persons were killed. In the whole country, including Ryukyu, 3,606 persons were killed. 1,692 persons were injured, 4,034 houses were swept away, 1,817 houses were entirely destroyed, and 4,018 houses were inundated. Moreover, in Kamaishi City, a fire broke out and burnt 216 houses. The tsunami also hit Hawaii Island. In Kona, the water level rose to 3m above sea level, but the damage was rather small.

Sanriku Coast had been hit by Mei回头 Sanriku Tsunami on 15 June 1896. The height of the 1896 tsunami somewhat exceeded that of the 1933 tsunami. The number of the victims of the 1896 Tsunami was 22,066 persons. The number of the victims was less in the 1933 tsunami because many people in several villages remembered the 1896 tsunami and quickly took the initiative to evacuate.

2. Measures taken after the Tsunami

After the 1933 Showa Sanriku Tsunami, a breakwater and embankments were constructed or raised in many places. In many towns and villages, plans to separate residential areas from fishery facilities and to remove the whole residential area to higher places were implemented. In recent years, massive breakwaters were constructed at the mouth of the harbours at Kamaishi, Ofunato and Onagawa, taking into account the height of the 1933 tsunami. In Ryon Village, which suffered the heaviest damage from the 1933 tsunami, a lock gate system, which can be closed within a few minutes of a tsunami warning, was constructed.

Epicentre and Wave-spread of the Showa Sanriku Tsunami (Watanabe, "The Full List of Tsunami Damaged in Japan")

A Devastated Port of Ryori in Sanriku Town (Fumio Yamasita "Modern Records of Tsunami in Japan" Seiji-sya. 1984, pp 238)
1. 津波と被害概要

チリ地震津波（1960年5月22日、チリ）

1960年5月22日、チリ南部ウエルディピア地方（緯度41.0°、経度73.5°）の沿岸、マグニチュード8.5の地震が発生した。この地震はエネルギー量に基づくモーメントマグニチュードMw 9.5で、1989年以降の時点で史上最も強力なものであった。この地震に伴い、大津波が発生し、チリ沿岸の沿岸部ならびに、ハワイ及び太平洋に至るまで沿岸部に被害をもたらした。チリのモチアン島では20〜25mと最も高い津波が記録され、メイディでは8.5〜15m、コラルでは8〜10m、タルクアノでは3mであった。チリ沿岸の被害は、死者607名、負傷者2,822名、被災者537,937名に達した。さらに、地震発生後3時間後、津波は日本列島の三陸沿岸に達し、24時間後には紀伊半島から九州の沿岸に達した。これらの沿岸部では3〜5mの津波が記録された。沖縄を含む日本全本土の被害は、死者122名、負傷者873名、被災者1,590,258名であった。このほか、北千島のパラセールス島で7mの津波が記録された。また、この津波によりフィリピンでは、死者19名、負傷者13名が発生した。日本列島では津波の進展は、ハワイ及び日本列島に集中している。

これにより、津波のエネルギーが一気に海面に垂直方向に多く放出されるという法則があり、ハワイと日本列島はチリの海岸線の重力の延長線上に位置していることになる。

2. 災害後の対策

この津波を教訓として、ハワイのヒルでは将来の津波に備えるため、低地を緑地帯として居住地は建てさせない。海岸部に沿って樹木を密に植える等の都市計画が実施された。日本では遠距離津波の警報体制が整備され、ハワイ、ソ連のハバロフスクとはの間での情報交換が行われることとなった。

Wretched sight of Ofunato, Iwate Pref. (“Report on the Chilean Tsunami of May 24, 1960, as observed along the coast of Japan”. Committee for Field Investigation of the Chilean Tsunami of 1960-1961, pp 397)

The remains of the Hilo Boys Club, left, with the Hilo Theatre in the background (“The Big Wave”, The Hilo Tribune-Herald Ltd., 1960)
MINDANAO EARTHQUAKE AND TSUNAMI (17 August 1976/Philippines)

1. The Tsunami and Resulting Damage

A big earthquake with a magnitude of 7.8 occurred in the southeast part of Moro Gulf (latitude 6.3°N, longitude 124.0°E) in Cotabato city, on the eastern shore of the Moro Gulf, the road was fissured for 30km. Two bridges on the Rio Grande river collapsed, and the highways to Davao and General Santos were intercepted. Four-story buildings of Harbordian University, and seven buildings including the Sultan Hotel, the Grand Hotel, and the Francon Theatre were destroyed in an instant. Most of the houses in the shopping area were partially damaged.

However, it was not the earthquake but the tsunami which caused the severest damage. The seawater rose to 7m above sea level in Cotabato. The height of tsunami was 4.3m in Pagadian as well as in Latayan on Bongo Island. Along the coast of Moro Gulf, the height of the tsunami was reported to have been over 10m in some places. The death toll, therefore, was heavy. 180 in Pagadian and 130 in Zamboanga. The death toll in the whole country ranged from 5,000 to 8,000. The number of people who lost their homes was 28,700. This was the severest natural disaster ever recorded in the history of the Philippines.

At 12:19, on the 17th, about 12 hours after the main shock, a strong aftershock with a magnitude of 7.1 occurred (latitude 7.2°N, longitude 122.9°E) and caused additional damage.

2. Recovery

Just after the main shock, the President declared a state of emergency in the disaster-hit areas of Mindanao, Sulu, Tawi-Tawi, and Basilan Island. Transport of food and medicines was immediately organized to the affected area. Moreover, the Chief Commander of the Mindanao Island sent troops to carry out relief and reconstruction activities.