

NATIONAL REPORT
Submitted by Republic of Korea

BASIC INFORMATION

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4. Tsunami Standard Operating Procedures for a Local Tsunami (when a local tsunami hazard exists)

When an earthquake with a magnitude of 6.0 or higher occurs in the vicinity of the Korean Peninsula, Korea Meteorological Administration(KMA) calculates the magnitude and location of the earthquake and assesses the impact of tsunami using the Scenario database.

The scenario database is pre-calculated values of tsunami arrival time and height for the assumed earthquake sources in the surrounding seas of the Korean Peninsula (Figure 1). In Figure 1, the blue area and the red area have different settings.

[The blue area]

- Fault parameters at 5,901 locations were assumed.
- At each location, earthquakes were assumed to have magnitude 6.0~9.0 and focal depth of 10~600km for the tsunami simulation
- Estimated tsunami arrival time and maximum height at 3,450 sites along the coastal line including Japanese tidal stations were used to construct scenario database.

[The red area]

- Fault parameters were assumed at 939 locations along subduction zone.
- Earthquakes with magnitude 8.0~9.0 were assumed for the tsunami simulation and the results for arrival time and maximum height were used to construct scenario database.

Based on the results, a tsunami warning is issued if the expected tsunami wave height is more than 1.0m and a tsunami advisory is issued if it is between 0.5 and 1.0m. In areas where warnings are issued, a tsunami alert message is automatically sent via the Cell Broadcasting System (CBS). This information is disseminated to the public through KMA website, TV broadcasts, portals, YouTube and SNS. Also, national and local authorities receive them via SMS, MMS, fax, email, and computer messages.

When a warning is issued, additional information on predicted data and observed data is provided for forecast points within the warning area. If necessary, the numerical model is used to obtain more accurate tsunami prediction information using fault parameters determined by seismic waveform analysis.

The arrival time and maximum height of the tsunami is observed by applying tsunami detection system to observed sea level data in realtime (Figure 2), which consists of five algorithms (DART, TIDE, IS, CF, VAR). If the observed data is exceeded the thresholds of three or more algorithms, including the DART algorithm, tsunami is determined to be arrived and the arrival time is represented.

After the tsunami has arrived, the possibility of canceling the tsunami warning is considered if the tsunami height remains below 0.2 meters for more than two hours (Figure 3).

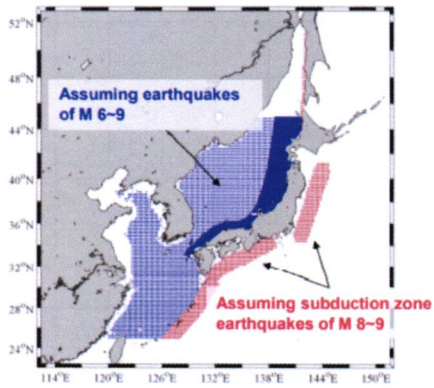


Figure 1. Scenario Database

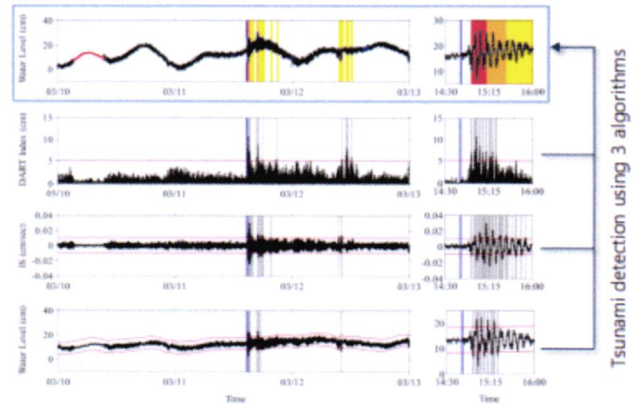


Figure 2. Detection Algorithm

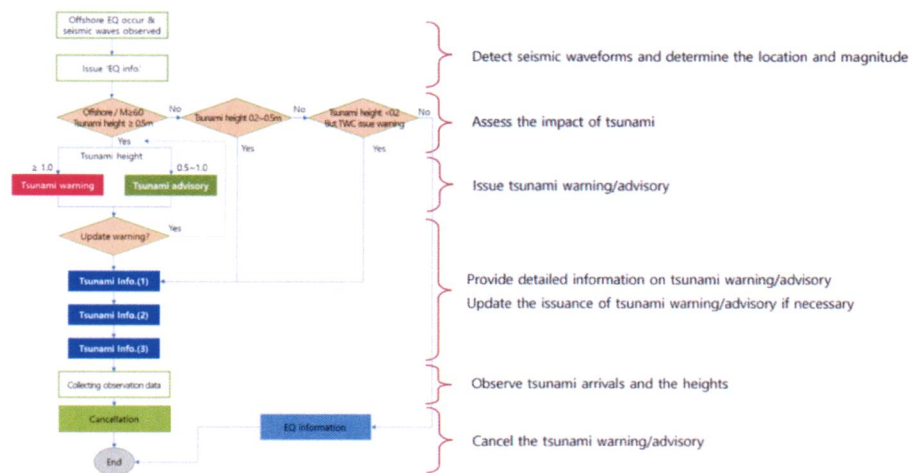


Figure 3. Workflow of tsunami

5. Tsunami Standard Operating Procedures for a Distant Tsunami (when a distant tsunami hazard exists)

Similar to local tsunami, KMA issues the tsunami warning and advisory based on the expected height of the tsunami, disseminate information and end the situation.

For the events that precalculated database is not available, tsunami prediction information is obtained based on numerical model.

And if international Tsunami Warning Center, such as NWPTAC, PTWC, JMA, predicts the impact to the Korean peninsula, KMA can issue tsunami information. There are a total of eight forecast points that NWPTAC provides tsunami information for the Korean peninsula: Ulleungdo, Sokcho, Busan, Tongyeong, Nohwado, Heuksando, Jeju, and Seogwipo.

6. National Sea Level Network

KMA collects sea-level data from various organizations. KMA measures sea-level at 26 points and collects sea-level data from 55 tidal stations observed by Korea Hydrographic and Oceanographic Agency (KHOA) every one minute (Figure 4).

Among them, 3 wave gauge and 72 tidal station data are applying to the tsunami detection system in realtime.

In addition, sea-level data from 22 tidal stations of Japan Meteorological Agency (JMA) are collected in real time and used for monitoring tsunamis (Figure 5).

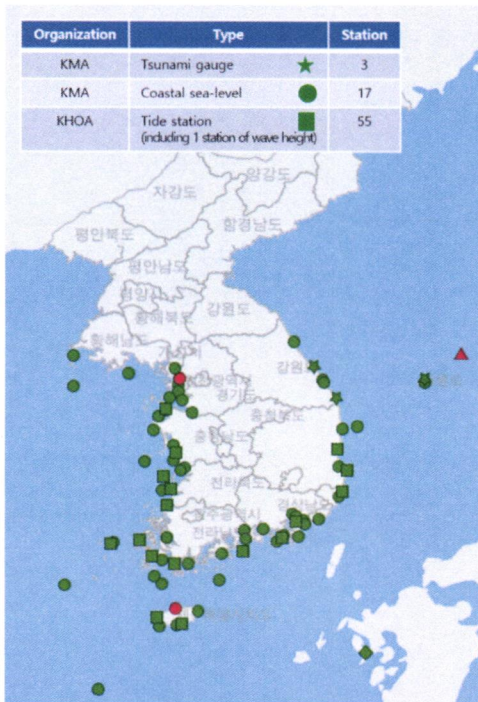


Figure 4. Sea-level station of Korea

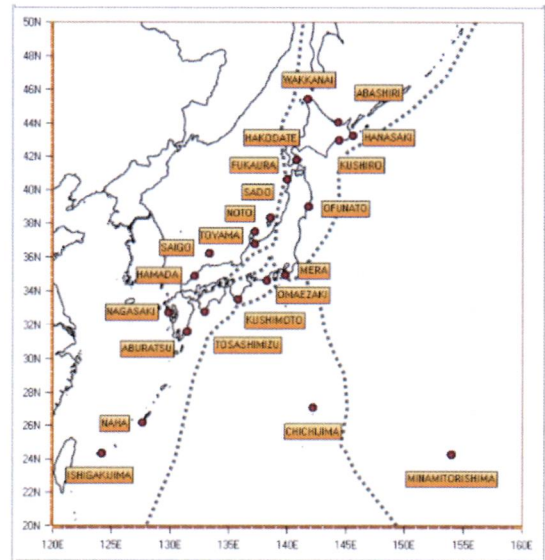


Figure 5. Sea-level station of JMA

7. Information on Tsunami occurrences

No tsunami waves have recorded in the last two years.

* When Hunga Tonga - Hunga Ha'apai volcano erupted in January 15th 2022, Sea-level fluctuations of 10-15cm were observed in Seogwipo and Moseulpo stations about 13 hours later. However, fluctuations within 20cm can be typically caused by meteorological conditions, so tsunami information was not issued.

8. Web sites (URLs) of national tsunami-related web sites

KMA is responsible for issuing and disseminating an earthquake and tsunami warning and information. All the related information is reported in its web site (https://www.kma.go.kr/eng/weather/current_state/current_introduction.jsp).

9. Summary plans of future tsunami warning and mitigation system improvements.

KMA is preparing the following plans to strengthen tsunami monitoring and improve prediction technology.

(1) Expansion of tsunami observation network

- KMA is planning to develop tsunami observation technology using RTK(Real Time Kinematic)-GPS method and establish offshore observation network.
- An automatic tsunami observation technology using CCTV based on Artificial intelligence technique is under research.
- Tsunami detection algorithm will be improved.

(2) Improvement of tsunami impact analysis and prediction information production

- Tsunami warning system for non-typical source will be developed.
- Tsunami numerical model considering fine-grid coastal topography data will be developed.

NATIONAL PROGRAMMES AND ACTIVITIES INFORMATION

10. EXECUTIVE SUMMARY

KMA is conducting various technological development and research to enhance the tsunami prediction capabilities. Recently, the prediction area of the tsunami has been expanded to the global, enabling the calculation of prediction information for the Pacific tsunami. In addition, real-time preprocessing algorithm and new detection algorithm have been added to the detection system to improve its accuracy.

To strengthen observation capability of the tsunami, KMA plans to apply the RTK-GPS method and use artificial intelligence technique for CCTV. Also we develop a high-resolution tsunami numerical model considering fine-grid coastal topography data.

KMA has been operated 24/7 Earthquake Early Warning System (EEWS) to issue earthquake warning when an earthquake with magnitude of 5.0 or higher occurred and tsunami warning system to issue tsunami alert when the expected tsunami height is over 0.5m.

KMA disseminates official earthquake or tsunami alerts using Cell Broadcasting System(CBS). In 2022, we reduced the dissemination time to 5-10 seconds of earthquake rapid information for earthquakes with magnitude 4.0 or higher.

In addition, KMA conducts the tsunami training to improve its ability to respond to the tsunami and conducts joint training in cooperation with disaster management agencies and local governments. And the tsunami explanatory booklet was distributed to disaster management agencies.

To enhance understanding of earthquake and tsunami, we conduct education programs on earthquake, tsunami, and volcano every year. These programs include educational courses for students and safety training courses for institution. Additionally, KMA establishes clubs for middle and high school students to provide education and experiential learning on earthquake and tsunami.

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