

## Tsunami Warning/Advisory categories and action to be taken

|                       | Estimated maximum tsunami height |                      | Action to be taken  | Expected damage  |
|-----------------------|----------------------------------|----------------------|---|--|
|                       | Quantitative expression          | For huge earthquakes |   |  |
| Major Tsunami Warning | over 10 m<br>(10m < height)      | Huge                 | <p>Evacuate from coastal or river areas immediately to safer places such as high ground or a tsunami evacuation building.</p> <p>Tsunami waves are expected to hit repeatedly. Do not leave the evacuation location until Tsunami Warnings are cleared.</p> <p>Keep evacuating to higher and higher ground wherever possible!</p>  <p>Educational video "Escape the Tsunami" (JMA)</p> | <p>Wooden structures are expected to be completely destroyed and/or washed away; anybody exposed will be caught in tsunami currents.</p>  <p>(Most wooden structures washed away due to the tsunami in 2011)</p> |
|                       | 10m<br>(5m < height ≤ 10m)       |                      |   |  |
|                       | 5m<br>(3m < height ≤ 5m)         |                      |   |  |
| Tsunami Warning       | 3m<br>(1m < height ≤ 3m)         | High                 | <p>Tsunami waves will hit, causing damage to low-lying areas. Buildings will be flooded and anybody exposed will be caught in tsunami currents.</p>  <p>Toyokorocho (2003)</p>   |  |
| Tsunami Advisory      | 1m<br>(20cm ≤ height ≤ 1m)       | (N/A)                | <p>Get out of the water and leave coastal areas immediately. Do not engage in fishing or swimming activities until Advisories are cleared.</p>   | <p>Anybody exposed will be caught in a strong tsunami currents in the sea. Fish farming facilities will be washed away and small vessels may capsize.</p>   |

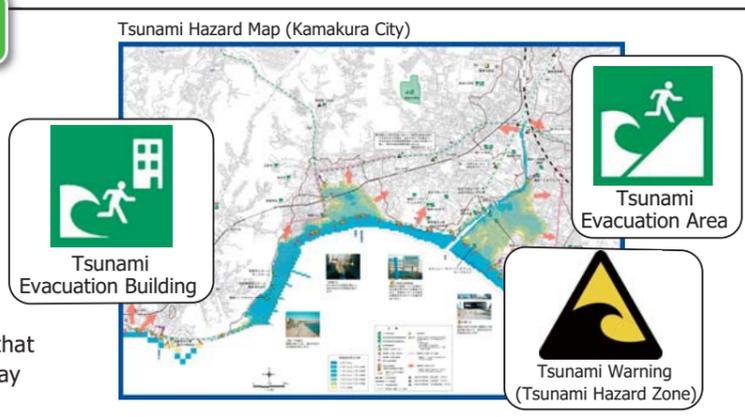
- Tsunamis may hit before warnings are issued if the source region is near the coast. Be sure to evacuate when shaking occurs.
- Tsunami heights may exceed estimations due to coastal topography and other factors in some regions. Evacuate to higher ground.
- Tsunami Forecasts (Slight Sea Level Change) are issued if the estimated tsunami height is less than 20 cm and no damage is expected, or if slight sea level changes are expected after Tsunami Advisories are cleared.

## Tsunami Hazard Maps and Signs

Tsunami hazard maps and signs show estimated tsunami inundation zones and/or evacuation areas. Residents should regularly consider various scenarios and check evacuation routes/areas.

### Note

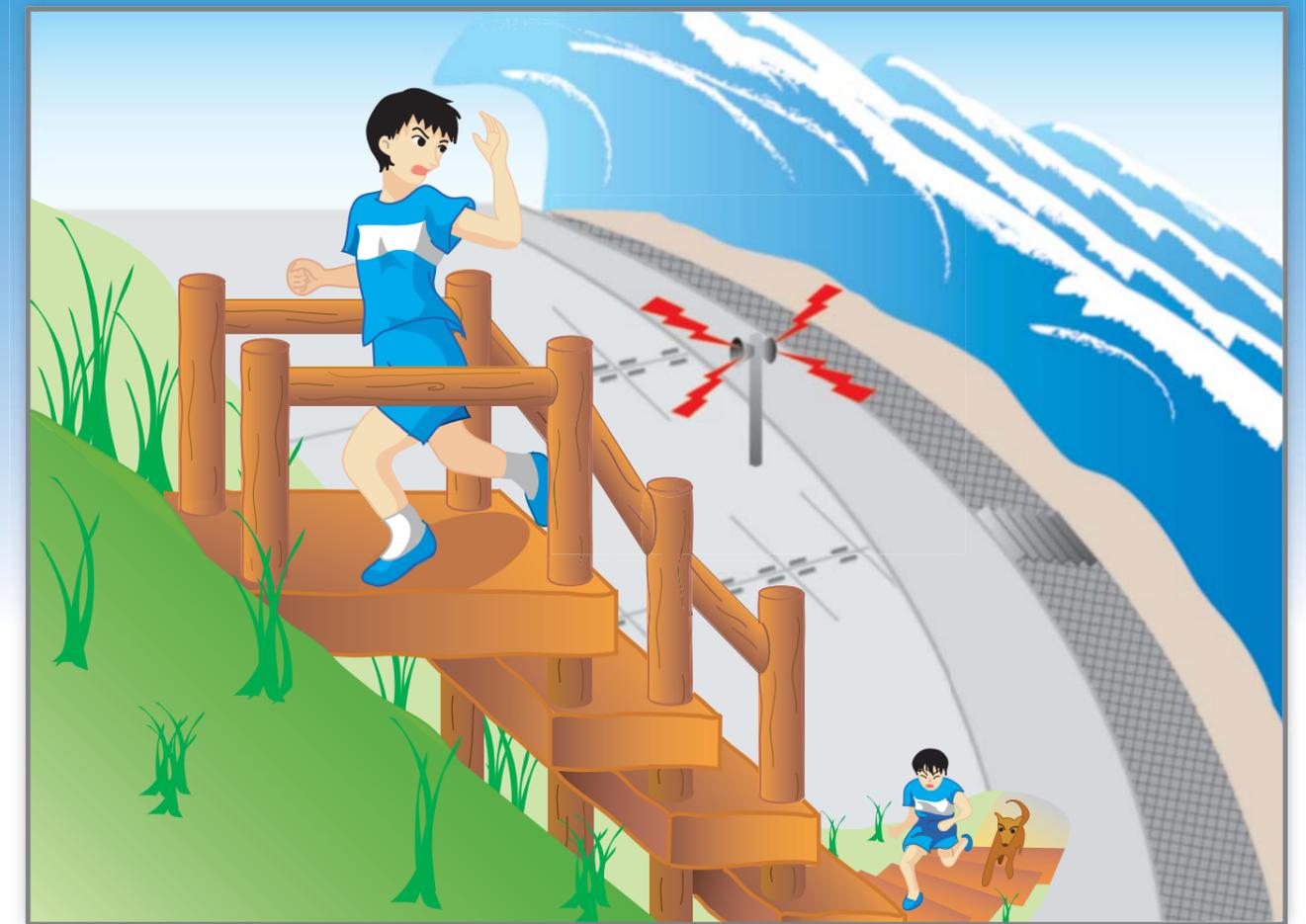
As the scale of tsunamis varies, be aware that areas outside expected inundation zones may also be flooded.



7 March 2013

# Start of New Tsunami Warning System Operation

Tsunami Warnings provide important information on expected tsunami disasters.



**For protection from tsunamis:**

- if strong shaking or weak ground motion for an extended period occurs
- if a tsunami warning is issued

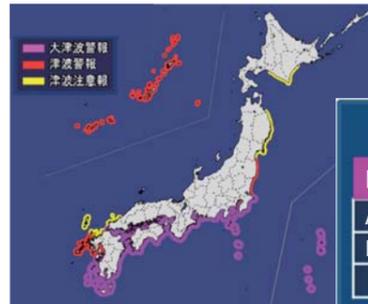
**▶▶▶▶▶ Evacuate immediately !**

# Tsunami Warnings/Advisories

If a tsunami strike is expected, JMA issues Major Tsunami Warnings, Tsunami Warnings and/or Tsunami Advisories around three minutes after an earthquake occurs. Tsunami Information bulletins on matters such as estimated tsunami heights and arrival times are subsequently issued.



For earthquakes with a magnitude of 8 or more:  
The scale of the emergency is emphasized in a Major Tsunami Warning with the term "HUGE"



Major Tsunami Warning  
Tsunami Warning  
Tsunami Advisory

| Estimated tsunami heights and arrival times |                              |      |
|---|------------------------------|------|
| <b>Major Tsunami Warning</b> (height)       |                              |      |
| AAA PREF.                                   | Arrival of tsunami inferred. | HUGE |
| BBB PREF.                                   | 10:30 JST                    | HUGE |
| :   | :                            | :    |
| <b>Tsunami Warning</b>                      |                              |      |
| CCC PREF.                                   | 11:00 JST                    | HIGH |
| DDD PREF.                                   | 12:00 JST                    | HIGH |

Issuance of Tsunami Warning  
(for earthquakes with a magnitude of 8 or more)

- When a large earthquake with a magnitude of 8 or more occurs, it takes time to determine its exact scale. For this reason, JMA issues an initial warning based on the assumed maximum magnitude to avoid underestimation.
- When the predefined maximum magnitude is used, estimated maximum tsunami heights will be expressed in qualitative terms such as "HUGE" and "HIGH" in initial warnings to alert people to the state of emergency.



If a Major Tsunami Warning with the term "HUGE" is issued, evacuate immediately to higher ground considering tsunamis as large as those seen after the Great East Japan Earthquake of 2011 may hit!

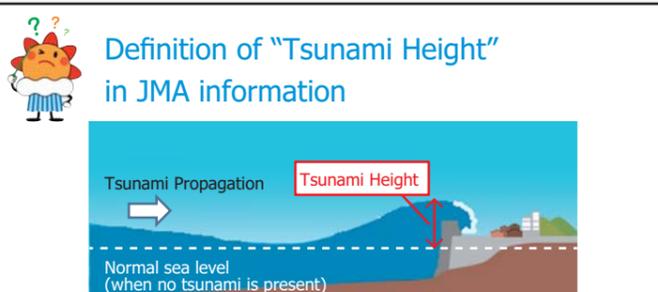


Once the exact magnitude has been determined:  
Estimated tsunami heights are classified as over 10 m, 10 m, 5 m, 3 m or 1 m

- JMA issues Tsunami Warnings/Advisories in five classes (reduced from the previous eight) in relation to damage based on the fact that the margin of error increases for larger estimated heights.
- Warnings/Advisories are based on the upper limits of each class for estimated tsunami heights.

|                       | Estimated maximum tsunami height |                 |
|-----------------------|----------------------------------|-----------------|
|                       | Height classification            | Height to issue |
| Major Tsunami Warning | 10 m -                           | over 10 m       |
|                       | 5 - 10 m                         | 10 m            |
|                       | 3 - 5 m                          | 5 m             |
| Tsunami Warning       | 1 - 3 m                          | 3 m             |
| Tsunami Advisory      | 20cm - 1 m                       | 1 m             |

e.g. When the estimated height range is 3 - 5 m, "5m" is issued.



The tsunami height is the height of the wave's crest above normal sea level (i.e., the assumed sea level when no tsunami is present).

# Tsunami Observations

After issuing Tsunami Warnings, JMA issues Tsunami Information indicating the arrival times and heights of tsunamis observed offshore and along coastlines.



"Currently Observing" announcements while observed tsunamis remain small

- When a Major Tsunami Warning and/or a Tsunami Warning is in effect and observed tsunamis appear much smaller than estimated, JMA uses the phrase "Currently Observing" rather than actual values to keep people aware that higher waves may still approach.

Tsunami waves are expected to hit repeatedly. Waves arriving later may be higher!

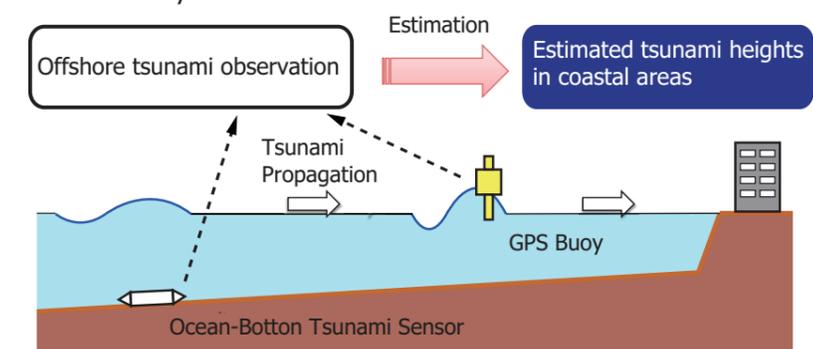


Criteria for issuance of "Currently Observing" announcements rather than max height information  
For coasts where Major Tsunami Warnings are in effect:  
Observed tsunami height  $\leq 1$  m  
For coasts where Tsunami Warnings are in effect:  
Observed tsunami height  $< 20$  cm  
\*JMA sets criteria for offshore tsunami observation in the same way and issues "Currently Observing" announcements.



Prompt issuance of information on offshore tsunami observations

- JMA monitors tsunamis at offshore gauges and issues information based on their measurements along with estimated heights in coastal areas before tsunamis hit the coast.
- Warnings are updated promptly if tsunamis are expected to be higher than initially estimated.



Tsunamis become higher as they approach coastal areas.