Emergency Ship Evacuation for Risk Reduction on Chemical Accidents Triggered by TSUNAMI at Sea Port from the Aspects of Maritime Sciences

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Background

The Japan Institute of Navigation (JIN) has organized the 3 times symposium focused on the countermeasures for emergency ship evacuation triggered by TSUNAMI.

- The 1st symposium → 16th, May, 2011
  just after 2 months since the Great East Japan Earthquake.
- The 2nd → 23rd, May 2012
- The 3rd → 20th , Nov. 2013

By through these 3 times symposium, several kinds of specific recommendations on emergency ship evacuation were obtained.

Objectives

The primary purpose

⇨ to clarify the specific recommendations and proposals for the safe ship operation of dangerous cargo ships

LNG (Liquefied Natural Gas) carrier
LPG (Liquefied Petroleum Gas) carrier

⇩

Petrochemical Complexes

Risk of explosion

METHODS

- The source of analysis is presentation references of these symposium.
- There are some limitations of estimation on the ship motion, so it might be valuable to use simulation method.
- But in these symposium more valuable reports on the actual situation and more effective comments are eventually introduced and considered.

METHODS (Continue)

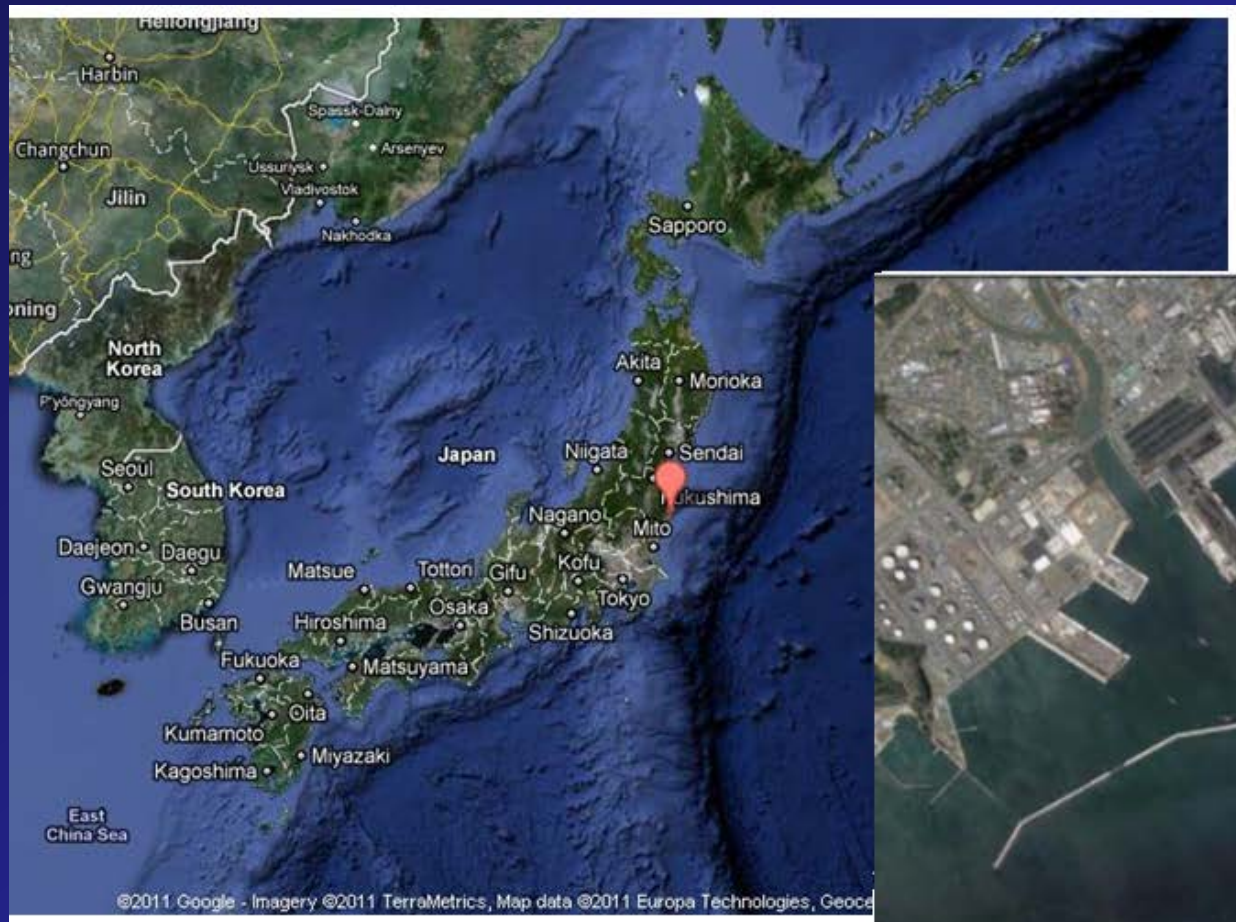
- Especially the comments and opinions by ships' masters are fully supported to understand the suitable and timely recommendations for emergency procedure of the ship evacuation.

Example of the Actual SHIP EVAQUATION

Loa: 225 m, Breadth:32 m, Gross Tonnage: 39,659 t

Dead Weight Tonnage 75,395 t

- ***Two or three tugboats are normally required*** for departing or entering port.
- 15:36 ***started emergency evacuating independently left her berth in about*** 7min. Her speed at the Line X was ***16.5 knots***.

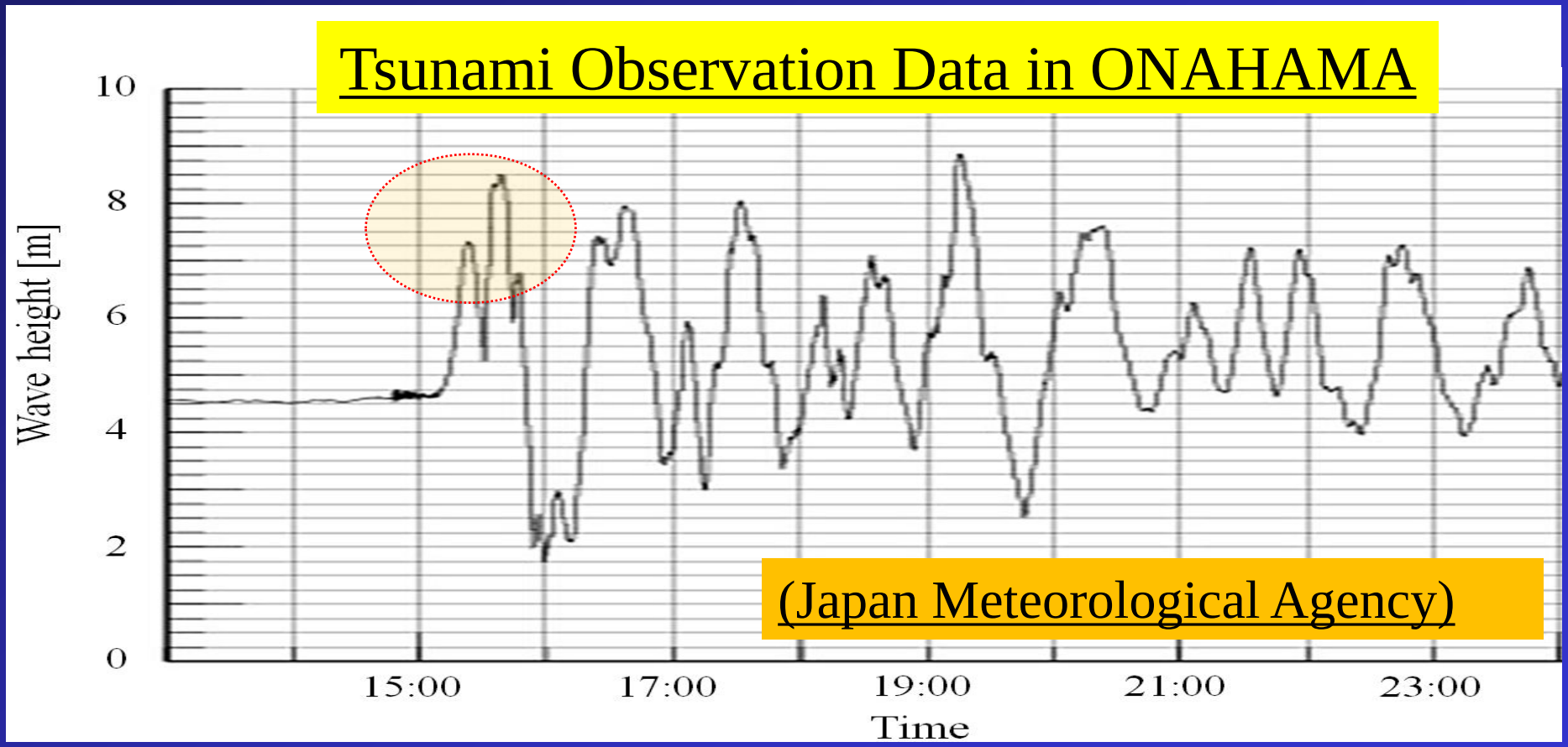


ONAHAMA PORT

- Distance from the epicenter is about *250km*.
- The major Tsunami warning was issued *3min* after the earthquake.

Observed Tsunami in ONAHAMA

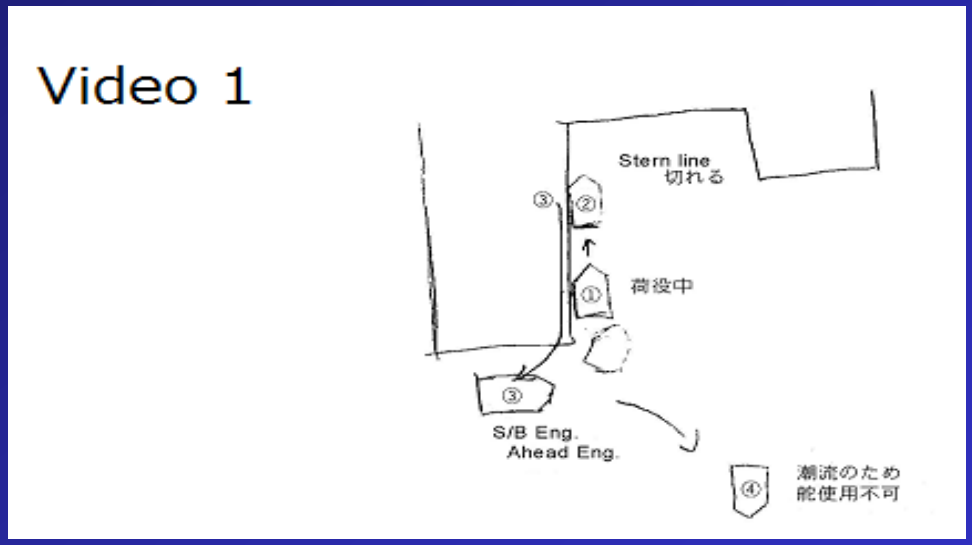
- ***14:46 Earthquake occurred***
- ***14:52 The 1st tsunami*** reached offshore
- ***15:39 The largest tsunami*** with height ***3.3m***

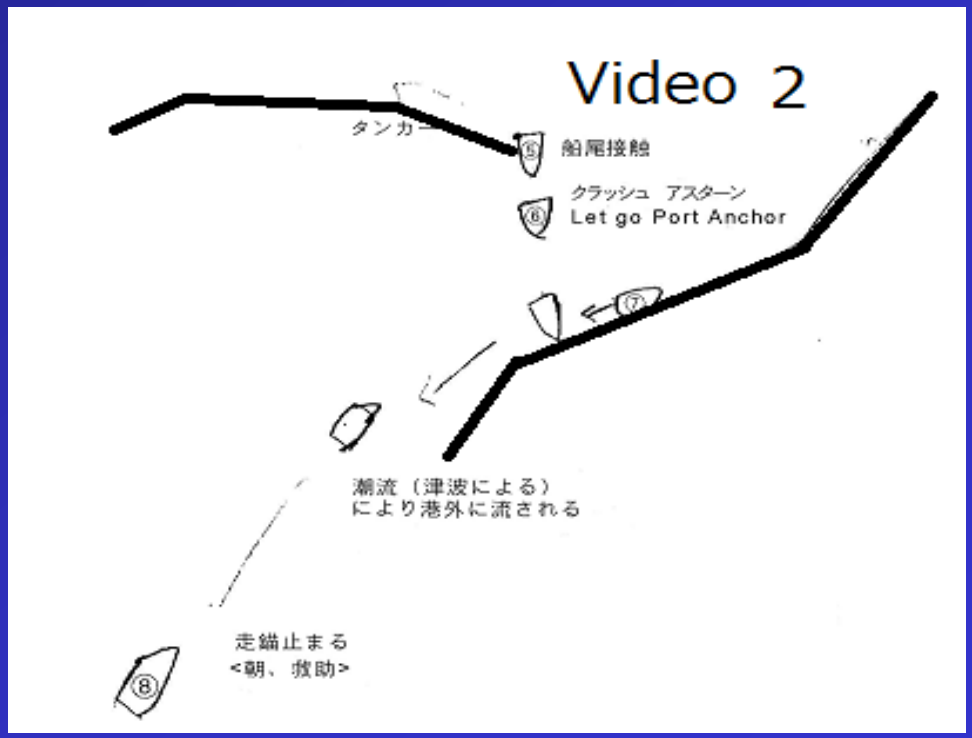


COAL Ship Evacuation at ONAHAMA Port

Video 1
From Berth to BW
(Line X)

Video 2
After passing BW
(Line X)





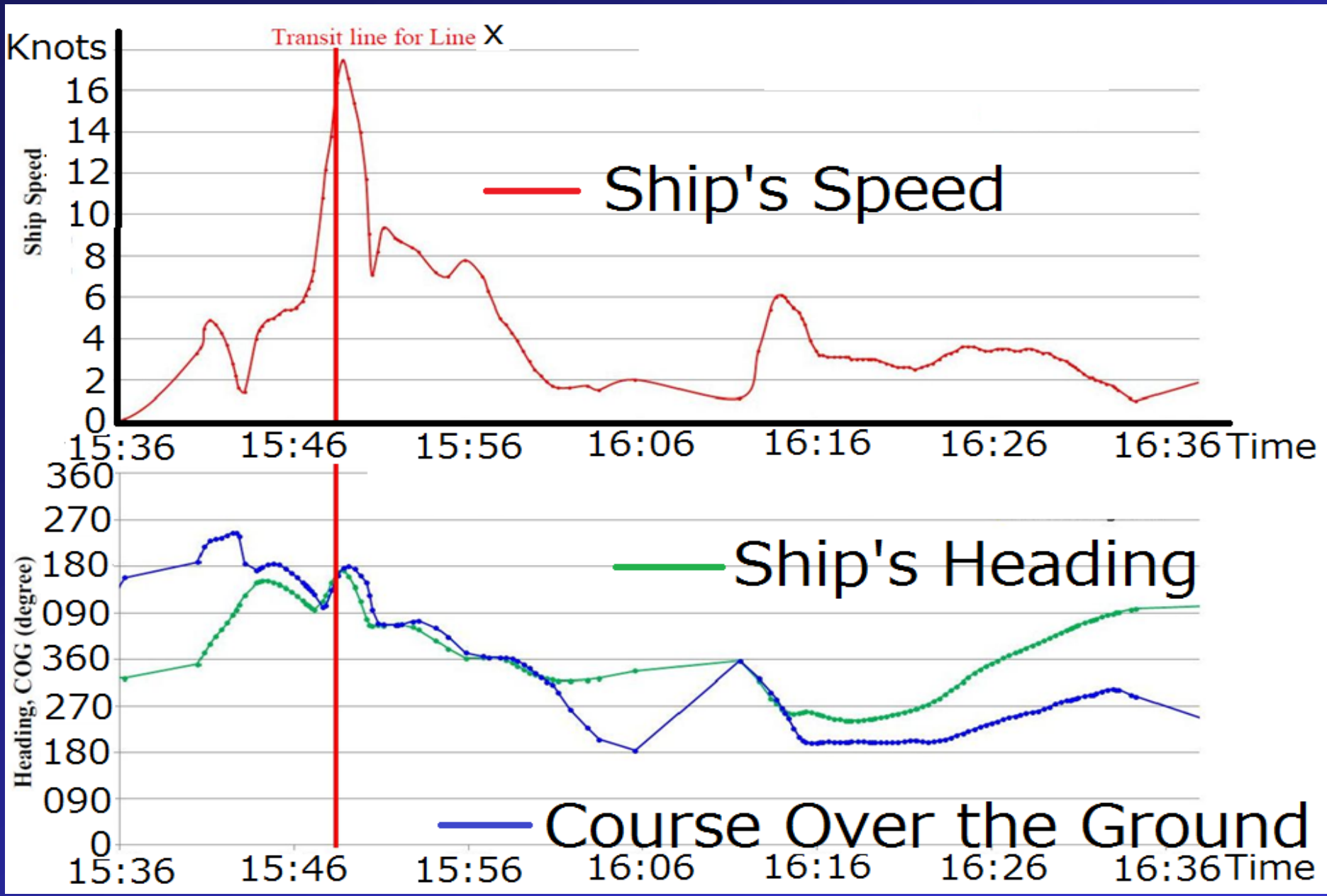


Fig: Ship's Speed, Ship's Heading, COG

RESULTs

There are 2 ways how to manage the dangerous cargo ships in case of TSUNAMI attack.

- One way is still remain in the sea port, and another way should be evacuated outside the port.
- The decision making by the master of the ship should be well considered by comparing with both the time allowance till the TSUNAMI coming and the time required for emergency ship evacuation outside the port.

Specific Proposal
by the JIN (Japan Institution of Navigation)

1. LNG or LPG carrier should always make emergency evacuation from the shore even if there will be no supported by pilot and/or tug boat assistance.
2. It is recommended that a fireboat or a patrol boat which has a towing function, should be stand by in a port with preparing for emergency evacuation of LNG or LPG carrier without pilot or tug boat assistance.

Specific Proposal (Continue)

3. In case of an emergency evacuation of LNG/ LPG carrier, the bow thruster will be more effective.
4. In case of an emergency evacuation of LNG/LPG carrier, 2 propellers' propulsion control system has a flexible maneuverability as like as thruster function.
5. One escort boat which has more than 3500 HP equipped with both functions of towing and of enough powered, will be able to make safety and emergency evacuation in case of 8 m/sec of the shore wind velocity.

Specific Proposal (Continue)

6. Implementation of the station drills / exercises such as an emergency evacuation, the releasing shore lines, will be recommended to prepare for tsunami warning.
7. In case of 2～3 meters of Tsunami height and about 3 knots of the tsunami flow velocity, the safety possibility of the shore alongside will be high.
8. In case of ship shore alongside, the tension of the hawser rope of the ship should be taken in slack preventing for her movement.

Specific Proposal (Continue)

9. Considering points in case of an emergency evacuation from the shore, are proposed as shown under;

   1) How to keep contact with terminal staff members, agent persons and JCG officers such as VTS officers

   2) How to communicate with foreign ship masters and captain of a tug boat

   3) How to prevent her sloshing of the LNG tank

   4) How to release her shore lines without assistance by line handlers

   5) How about the responsibility of the facility damage

CONCLUSION

The main procedure of the emergency ship evacuation for risk reduction on chemical accidents triggered by TSUNAMI at sea port from the aspects of maritime sciences can be proposed and recommended as follows;

1. The LNG and LPG carrier should be considered the emergency shift from at the port to outside the port.
2. The escort boat with equipped firefighting apparatus and with thruster function should always be stand-by for preparing emergency ship evacuation outside the port.

CONCLUSION(Continue)

3. Under the following condition, for example, the height of TSUNAMI is within 3 meters, the velocity of TSUNAMI is approximately 3 knots, the possibility of safe alongside in port is high.

4. The alert notice of TSUNAMI coming is the most important information, so this alert should be immediately shared as soon as possible.

5. The emergency evacuation methods should be demonstrated not only by ship handling simulator but also by paper planning on the desk.

Thank you for kind attention!