Vessel shelter conditions ascertained by NILAM-AIS at the time of Typhoon No. 18 of 2009

TAKEMURA Shinji, Researcher
Port Planning Division, Port and Harbor Department

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1. Outline

The "Technical Standards for Port and Harbor Facilities and their Interpretation" that were revised in 2007 make no quantitative statements regarding anchorage size during times of stormy weather. Although, in the past, the Standards/Interpretation did provide a quantitative formula for calculating anchorage size, this formula was removed at the time of the 1999 revision because the grounds for it were unclear. A real-world problem here is difficulty in ascertaining actual shelter conditions of vessels during stormy weather, and particularly the area of water needed for shelter, and as a result no calculation formula has been proposed.

In 2008, a regulation requiring both ocean-going and domestic vessels that meet or exceed a certain size to carry the Automatic Identification System (AIS) was implemented. Against this backdrop, the Port Planning Division is constructing an NILIM-AIS system by setting up AIS land stations in Japan's major sea areas. This system functions to observe ship movement in real time and conduct data analyses. The data analysis function was used to ascertain actual conditions surrounding vessel shelter, anchoring by large ships, and movement into/out of ports during the passage of Typhoon No. 18, which struck Japan in October 2009.

2. Actual conditions of vessel shelter

Figure 1 shows conditions immediately before the typhoon made landfall at the Chita Peninsula at 4:00 A.M on October 8. The wind speed at Central Japan International Airport (Centrair) was 22.1 meters/second. Each of the ships taking shelter is pointed into the wind direction that was observed in its vicinity.

The ship movement shown in the center of the figure pertains to an ordinary cargo ship of approximately 9,000 tons that was anchored in Mikawa Bay. Until the typhoon made landfall at around 5:00 A.M. on October 8, the ship is swinging around in a circle with little change in the central anchor point.

NILIM-AIS also ascertained the number of ships passing through the Irago Suido Traffic Route in two-hour units. The results are shown in Figure 2. From this figure, it is possible to confirm the following trends:

1) During the roughly 20-hour period centered on the time of maximum measured wind speed, no ships entered or exited the bay. Peaks are observed before and after this period.

2) The number of ships entering the bay peaked prior to the typhoon's approach, and the number exiting the bay peaked after the typhoon passed.

It should be noted that no measurements were made during the period between 4:00 A.M. and noon on October 8 due to a typhoon-caused power outage.

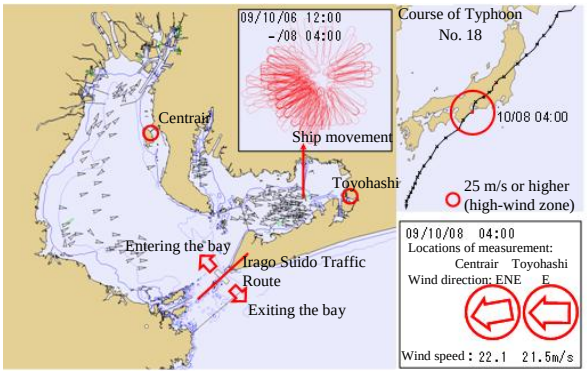

Figure 1: Shelter conditions

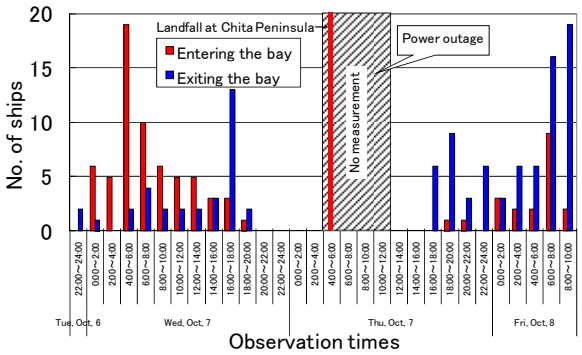

Figure 2: Time-series analysis of numbers of passing ships

The author intends to conduct a more detailed analysis of these results and to reconsider the formula for calculating anchorage size during stormy weather in the Technical Standards/Interpretation.

[References]

Technical Note of NILIM Nos. 431, 500, 529, 561