

## An investigation of sea level fluctuation around the Tosashimizu Port by observed data

TANOBE, Atsushi<sup>1\*</sup> ; IMAI, Kentaro<sup>2</sup> ; HAYASHI, Yutaka<sup>3</sup> ; ABE, Kuniaki<sup>4</sup> ; IMAMURA, Fumihiko<sup>2</sup>

<sup>1</sup>Graduate School of Engineering, Tohoku University, <sup>2</sup>IRIDeS, Tohoku University, <sup>3</sup>Meteorological Research Institute, <sup>4</sup>None

### 1. introduction

When a long wave such as tsunamis invades the harbor and port, secondary undulation may occur depending on the topography condition and the period of the tsunami. Such a secondary undulation is observed in past tsunami events.

The study for a water level change caused by natural period is accomplished a lot with observation data and numerical computation.

Those studies were achieved dominant period of the natural period from the fluctuations of sea level of the harbor and the topography condition and discussion about amplification factor.

In this study target at Tosashimizu port, Kochi and observed sea level at inside and outside the port. This study research for secondary undulation at Tosashimizu port.

### 2. observation data

In this study, install 7 pressure gauge in the Tosashimizu Port and, during periods from September 10, 2014 to December 9, 2014, observed a sea level by 15 seconds sampling interval. We used High-frequency filter to remove sea level variations associated with synoptic atmospheric activity. We divided that data into 2 types : period containing weather disturbance and the other.

We performed spectrum analysis for the these data and considered the characteristic of the secondary undulation in the Tosashimizu Port

### 3. conclusion

In this study, We analyzed sea level data from September 10, 2014 to December 9, 2014 and examine characteristic of the secondary undulation in the Tosashimizu Port and got the following results.

3.1. From a result of the spectrum analysis of the not containing weather disturbance, the Tosashimizu port has strong peak around 20 minutes which are a natural period in the port. A peak begins to appear in around 40 minutes as approach the mouth of a port. On the other hand, out of the port has peaks seen around 40, 60 and 85 minutes.

3.2. From a result of the spectrum analysis of the containing weather disturbance, in the port, has strong peaks around 20 and 40 minutes. Out of the port has peaks around 30 and 75 minutes, on the other hand, not seen 40 minutes peak.

From the above results,

The period that spectrum peaks appears is different in inside and outside the port. In the Tosashimizu Port a state with different secondary undulation properties was confirmed in the inside and outside. In the containing weather disturbance period, the peak appear around 40 minutes is different from natural period and need to examination this peak generation factor.

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