

# Generation mechanism of the velocity fluctuations off Busan in the Tsushima Strait

Kioshi Mishiro<sup>1</sup> Tetsuo Yanagi<sup>2</sup> Jong Hwan Yoon<sup>2</sup>

<sup>1</sup>Department of Earth System Science and Technology

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University

<sup>2</sup>Research Institute for Applied Mechanics, Kyushu University

## 1 Introduction

The structure of the Tsushima Warm Current (TWC) across the Tsushima Straits has been studied using the result of long term Acoustic Doppler Current Profiler (ADCP) observation by a ferryboat between Hakata and Busan, which has been conducted from Feb. 1997 to Dec. 2009. ADCP observation shows the large velocity fluctuations along the southern coast of Korea within 10 km from Busan every summer, which are appeared with the geostrophic balance and accompanied by the strong oscillation and southwestward current with the periods from about 10 to 50 days and mean velocity fluctuations are in the range from 20 cm/s to 50 cm/s.

## 2 Data and Analysis

### 2.1 Velocity and Sea level height at Busan

The data used in this study were obtained from Feb. 1997 to Dec. 2009 by the multilevel ADCP (VMBBADC, 300 kHz, RD Instruments) mounted on the ferryboat "New Camellia". The ferryboat makes a round trip between Hakata, Japan and Busan, Korea and observed the TWC 1 time per day from Feb. 1997 to Feb. 2004 and 2 times per day from Jul. 2004. The data sampling intervals are about 24 s and 8 m in depth from 18 m depth below the sea surface to the bottom. The ADCP data is processed by time interpolation in 24 hr interval with respect to 00:00 (JST) from Feb. 1997 to Feb. 2004 and in 12 hr interval with respect to 00:00 and 12:00 (JST), respectively. The velocity fluctuations near Busan are always appeared with geostrophic balance, which indicates that these fluctuations show the strong correlation just in summer from Aug. to Oct. 1998.

### 2.2 Sea level difference between the east and south coasts of Korea

The sea level difference between Pohang and Wando, and the sea level height at Busan show the correlation, and the sea level difference and the sea level pressure difference between Pohang and Wando also show the correlation, respectively, which indicate that the sea level pressure contributes to the velocity fluctuation near Busan and the sea level height at Busan.

### 2.3 Wind effect along the Korean coast

It is considered that the southwestward current along the southern coast of Korea becomes strong due to the alongshore wind after the low pressure passes through the Tsushima Straits except the effect of the sea level difference between the east and south coasts of Korea. The NNE wind and the sea level height at Busan show the correlation, which is suggested that the anticlockwise wind of the low pressure intensifies the alongshore wind component along the Korean coast, that is, the wind blows toward the East China Sea from the Japan Sea along the Korean coast when the low pressure is passed through the Tsushima Strait.

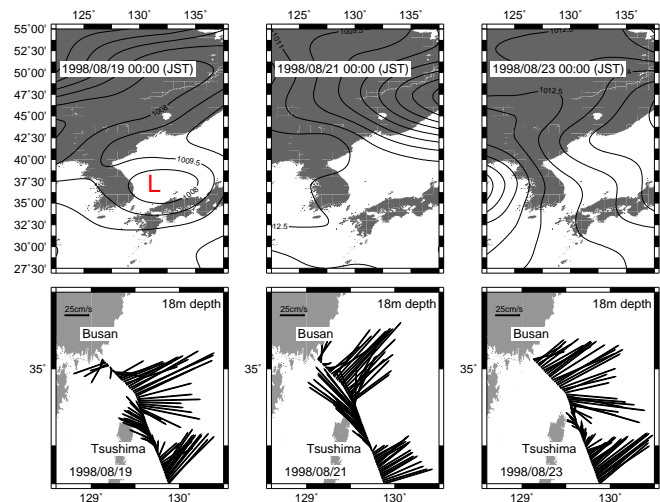


Fig 1: Meteorological charts of the sea level pressure in East Asia (upper) and observed current vector at 18m depth in the western channel of the Tsushima Strait (lower).

## 3 Conclusion

In summer, it is known that the low pressure frequently passes over the Korean peninsula from the East China Sea to the Japan/East Sea. It is concluded that the velocity fluctuation near Busan is caused by the sea level difference between the east and south coasts of Korea, and the alongshore wind which are caused by the low pressure, and these contribution ratios to the sea level height at Busan are 1.2 to 1.0, respectively, according to the multiple regression analysis results.