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Tide and tidal current observation in the Karimata Strait

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It is believed that the water exchanges between the South China Sea and the Indonesian Seas are significant, and play an important role in the water mass formation and air-sea interactions of both the South China Sea and Indonesian Seas. It has also been found that the current in Sunda Strait has been obvious seasonal variation, which indicates the water exchange between West Indonesian Seas and India Ocean. In order to make quantitative evaluation of the magnitudes of the exchange, the First Institute of Oceanography (FIO), China, the Agency for Marine and Fisheries Research, Indonesia, and the Lamont-Doheries Earth Observatory, USA established a collaborative program, "The South-China Sea-Indonesian Seas Transport/Exchange (SITE) and Impacts on Seasonal Fish Migration" in 2006. And, they extend and expand the cooperation to Sunda Strait in 2008, the title of the collaborative program was changed to "The South China Sea – Indonesian Seas Transport/Exchange (SITE) and Dynamics of Sunda and Lombok Straits, and Their Impacts on Seasonal Fish Migration".

Till now, 12 joint cruises have been conducted since December, 2007. Ten Trawl-Resistant Bottom Mounts (TRBM) have been deployed in the Karimata and Sunda Straits. The TRBMs are equipped with ADCPs and tide gauges for measuring current profiles and sea levels, respectively. The temperature-salinity profiles were measured with ship-board CTD during the cruises. Data obtained in Karimata Strait revealed that a significant water mass transport. This indicates that the Karimata Strait throughflow can greatly impacts the circulation of both the South China Sea and the Indonesian Seas.

The data obtained at the 5 stations alone the two sections in the Karimata Strait were used to study the tide and tidal currents in the Karimata Strait. 2 TRBMs were deployed at Section A, as well as 3 at Section B, which lies at the southeast of Section A. Station B1 is in the Gaspar Strait between Bangka Island and Belitung Island, Stations B2 and B3 are in the Karimata Strait between Belitung Island and Kalimantan. All stations have the sea level and current profile observation data longer than 1 month. Based on the observation, we analyzed the harmonic constants of the tide and tidal current, and calculated the tidal current ellipse and the horizontal tidal energy flux. The results show that, (1) The type of tide in Karimata Strait is regular diurnal. (2)The amplitude of K1 is bigger than 60 cm at all stations, and the phase lag is about 150°. For semi-diurnal tides, the amplitude is smaller than 5cm. (3) All stations show reciprocating tidal current. The major axis of tidal current ellipse is about 10 cm/s for diurnal tides, and smaller than 5cm/s for semi-diurnal tides. (4) The tidal energy propagates from the South China Sea to Indonesian Seas through the Karimata Strait. For Section A, K1 energy flux density is 2.85 KW/m at A1 and 6.97 KW/m at A2. The K1 energy propagation cross section A is about 1.8 GW. For section B, the K1 energy flux density is 11.55 KW/m at B1, 6.42 KW/m at B2, and 7.49 KW/m at B3.