

Tide and Tidal Current in the Bali Strait, Indonesia

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論 文 内 容 の 要 旨

The tide and tidal current, tide-induced residual current, and tidal front of the Bali Strait in Indonesia, are investigated, by using a 3-dimensional model called Coupled Hydrodynamical-Ecological for Regional and Shelf Seas (COHERENS). The elevation data at Pengambengan Station and the current velocity data at Bangsring Station, a narrow part in the Bali Strait provided by the Institute for Marine Research and Observation of Indonesia, are used to verify the model results. While the Bali Strait coastline and bottom depth data are obtained by smoothing a fine resolution bathymetry chart supplied by the Hydro-Oceanography Division of Indonesian Navy (DISHIDROS TNI-AL). Additionally, the image of sea surface temperature (SST) distribution from the satellite data, are employed to track the position of tidal front by comparing to the distribution of $\log(H/U^3)$ value (where H is the water depth in meters and U the tidal current amplitude in ms^{-1}).

We started our study by running the model which was forced directly along the open boundary by four major tidal constituents (M_2 , S_2 , K_1 , and O_1 tides) from the global tidal elevation of ORI.96 model, which was developed by the Ocean Research Institute - University of Tokyo. The capability of our 3-d model for tidal simulation are confirmed in a good agreement with the observation data. Furthermore we find that the tidal type at Pengambengan Station can be classified into mixed, mainly semidiurnal. While the type of tidal wave in the narrow part of the Bali Strait is the standing wave, where the current direction goes northeastward at ebb tide and southwestward at flood tide.

Moreover co-amplitude chart of the Bali Strait shows that the tidal amplitude decreases gradually from the south of the Bali Strait toward the middle area of the strait and becomes to minimum in the northern part of the strait. Whereas the co-phase chart shows that the progressive wave are mainly coming from the Java Sea and the Indian Ocean.

The computed tide-induced residual current during the spring tide on May 16, 2010 in the Bali Strait, shows a clockwise eddy in the shallow area at wide part of the strait and also a small clockwise eddy in the south of the narrow strait.

The observed SST distribution near the narrow strait with the lower SST of 27 degrees, corresponds with small value of $\log(H/U^3)$. And in the wide part of the strait, the $\log(H/U^3)$ is larger and corresponds to higher SST of 29 degrees. Thus, we propose that the tidal front in the Bali Strait, generated

between the stratification and vertical mixing area in the Bali Strait, is coincident along the line of $\log(H/U^3)$ of 6.5.