

## **A numerical experiment to investigate the residence time of water mass in the Gulf of Thailand**

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The residence time of water mass provides opportunities for water column to interact with the surrounding environment and modifies some environmental phenomena including primary productivity by phytoplankton, eutrophication and hypoxia in a coastal sea. Based on the finding of Buranapratheprat et al., (2016), the residence time may be related to salinity variation and hypoxia development in near-bottom water in the Gulf of Thailand (GoT). Our study aims to investigate the controlling mechanism and the temporal variation of the residence time of the water mass in GoT based on a numerical experiment. The Princeton Ocean Model (POM) coupled with a passive tracer sub-model in three-dimensional mode was used to calculate the distribution of a conservative dissolved material. The temporal change of this substance was used to calculate the residence time of the water mass with the Remnant function (Takeoka, 1984). Major forcing for POM is climatological monthly wind, discharge, temperature and salinity profiles. Tidal elevation from the harmonic analysis was also assigned at the open boundary. The results show that the averaged residence time of the water mass in GoT has been changed over time, ranges from about 200 to 500 days, with low values during the southwest monsoon season and high values during the northeast monsoon season. Relatively short residence time during the southwest monsoon was caused by Ekman transport, which enhanced the density-driven current in the direction that the surface current flowed out of the bay. This phenomenon led to the enhancement of sub-surface water intrusion from the South China Sea (SCS) to GoT, which resulted in a shortened residence time. In contrast, long residence time during the northeast monsoon was organized by Ekman Transport that directed from the gulf mouth to the inner gulf. The influence of SCS had no significant impact on the residence time of the water mass in GoT during this season.

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