

RESEARCH ARTICLE

# Tides and Their Dynamics over the Sunda Shelf of the Southern South China Sea

Farshid Daryabor<sup>1,2\*</sup>, See Hai Ooi<sup>1</sup>, Azizan Abu Samah<sup>1,2</sup>, Abolghasem Akbari<sup>3</sup>

**1** National Antarctic Research Center, Institute of Postgraduate Studies, University of Malaya, 50603, Kuala Lumpur, Malaysia, **2** Institute of Ocean and Earth Sciences, Institute of Postgraduate Studies, University of Malaya, 50603 Kuala Lumpur, Malaysia, **3** Faculty of Civil Engineering and Earth Resources, University Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang, Kuantan, Pahang, Malaysia

\* [fdaryabor@um.edu.my](mailto:fdaryabor@um.edu.my); [farshiddaryabor@gmail.com](mailto:farshiddaryabor@gmail.com)



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## Abstract

A three-dimensional Regional Ocean Modelling System is used to study the tidal characteristics and their dynamics in the Sunda Shelf of the southern South China Sea. In this model, the outer domain is set with a 25 km resolution and the inner one, with a 9 km resolution. Calculations are performed on the inner domain. The model is forced at the sea surface by climatological monthly mean wind stress, freshwater (evaporation minus precipitation), and heat fluxes. Momentum and tracers (such as temperature and salinity) are prescribed in addition to the tidal heights and currents extracted from the Oregon State University TOPEX/Poseidon Global Inverse Solution (TPXO7.2) at the open boundaries. The results are validated against observed tidal amplitudes and phases at 19 locations. Results show that the mean average power energy spectrum (in unit  $m^2/s/cph$ ) for diurnal tides at the southern end of the East Coast of Peninsular Malaysia is approximately 43% greater than that in the East Malaysia region located in northern Borneo. In contrast, for the region of northern Borneo the semidiurnal power energy spectrum is approximately 25% greater than that in the East Coast of Peninsular Malaysia. This implies that diurnal tides are dominant along the East Coast of Peninsular Malaysia while both diurnal and semidiurnal tides dominate almost equally in coastal East Malaysia. Furthermore, the diurnal tidal energy flux is found to be 60% greater than that of the semidiurnal tides in the southern South China Sea. Based on these model analyses, the significant tidal mixing frontal areas are located primarily off Sarawak coast as indicated by high chlorophyll-a concentrations in the area.

## Introduction

The South China Sea (SCS) is a semi-enclosed tropical sea, located between several land-masses that include Peninsular Malaysia, Borneo, the Philippines and East Asia. The SCS has a complex bathymetry with a depth ranging from over 1000 m in the middle and northern parts to less than 100 m in the continental shelf (Fig 1). The southern South China Sea (SSCS) is bounded by Peninsular Malaysia's eastern continental shelf, the Gulf of Thailand and the sea off Borneo and the southern coast of Vietnam. It is connected to the Java Sea through the