Ocean Sci. Discuss., 12, 275–313, 2015
www.ocean-sci-discuss.net/12/275/2015/
doi:10.5194/osd-12-275-2015
© Author(s) 2015. CC Attribution 3.0 License.

Ocean Science
Discussions
Open Access

This discussion paper is/has been under review for the journal Ocean Science (OS).
Please refer to the corresponding final paper in OS if available.

An estimate of the Sunda Shelf and the Strait of Malacca transports: a numerical study

F. Daryabor[1,2], A. A. Samah[1,2], S. H. Ooi[1], and S. N. Chenoli[1]

[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

Received: 18 December 2014 – Accepted: 3 February 2015 – Published: 17 February 2015

Correspondence to: F. Daryabor (fdaryabor@um.edu.my, farshiddaryabor@gmail.com)

Published by Copernicus Publications on behalf of the European Geosciences Union.

Abstract

Using the Regional Ocean Modeling System (ROMS), this study aims to provide an estimate of the volume, freshwater, heat, and salt transports through the Sunda Shelf and the Strait of Malacca in the southern region of the South China Sea (SSCS). The modeling system is configured with two one-way nested domains representing parent and child with resolutions of 1/2 and 1/12°, respectively. The simulated currents, sea surface salinity, temperature and various transports (e.g., volume, heat, etc) agree well with the observed values as well as those estimated from the Simple Ocean Data Assimilation (SODA) re-analysis product. The ROMS estimated seasonal and mean annual transports are in accord with those calculated from SODA and those of limited observations. The ROMS estimates of mean annual volume, freshwater, heat and salt transports through the Sunda Shelf into the Java Sea are 0.32 Sv ($1\,\mathrm{Sv} = 10^6\,\mathrm{m^3\,s^{-1}}$), 0.023 Sv, 0.032 PW ($1\,\mathrm{PW} = 10^{15}\,\mathrm{j\,s^{-1}}$), and $0.010 \times 10^9\,\mathrm{kg\,s^{-1}}$ respectively. The corresponding ROMS estimates for mean annual transports through the Strait of Malacca into Andaman Sea are 0.14, 0.009 Sv, 0.014 PW, and $0.0043 \times 10^9\,\mathrm{kg\,s^{-1}}$ respectively. The relative percentages of mean annual transports computed individually from those of volume, heat, salinity, and freshwater between the Strait of Malacca and the Sunda Shelf range from 39 to 43.8 %. This reflects that the Strait of Malacca plays an equally significant role in the annual transports from the SSCS into the Andaman Sea.

1 Introduction

The southern region of the South China Sea (SSCS) has complex bathymetry and water circulation near the equator in which the monsoon plays a dominant role (Daryabor et al., 2010, 2014, 2015). The SSCS connects to the Java Sea, which is a source of low-salinity water mass (Wyrtki, 1961) through the Sunda Shelf and Karimata Strait, as well as the Andaman Sea through the Strait of Malacca (Fig. 1). Therefore, the SSCS is important for water exchange through these Straits.