Geophysical Research Abstracts, Vol. 9, 00529, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-00529

Barotropic and baroclinic tidal energy budget in The Strait of Sicily

J. Abdennadher, M. Boukthir
UR1304, Institut Préparatoire aux Etudes d'Ingénieur de Tunis, Tunisia.

The tidal response of Tunisian and Sicilian coastal waters is studied through three-dimensional simulations using the Regional Ocean Modelling System (ROMS). The model was initialized with realistic vertical stratification. Tidal forcing was implemented by setting the elevations of the major constituents in the region (M_2, S_2, N_2, K_1 and O_1) along the four open boundaries, with the coefficients taken from a two-dimensional gravity-wave model MOG2D. The numerical results compare favourably with tide-gauge data, satellite data, and currentmeter measurements.

The barotropic tidal energy budget reveals that most of the dissipation (~ 61 %) occurs in the Gulf of Gabes which covers only 13.6 % of the total domain. The Strait of Sicily and the Strait of Messina are also areas of strong dissipation. Moreover, the energy lost in the entire domain is primarily due to the bottom stress dissipation since it accounts for nearly 79 %.

The conversion rate of energy from surface tide to internal tide indicates potential area for possible generation of M_2 and K_1 internal tides.The M_2 internal energy flux reveals the complicate pattern of the M_2 internal tide propagation.

The Adventure Bank is identified as the main area of generation of K_1 internal tide. Nevertheless, the cross and along shelf of the internal flux energy show that this energy is topographically trapped, which is coherent with the fact that the diurnal frequency is subinertial at the latitude of the Sicily Strait.

Our results suggest that the internal waves in the Adventure Bank are essentially diurnal, which is in accordance with the observations of Artale et al. (1989). In contrast, the semidiurnal internal signal dominates in the Messina Strait.

The wavelet analysis of the vertical velocity field reveals that M_4 is comparable to M_2 at the sharp western edge of the Adventure Bank's Shelf denoting the importance of the non-linear response in this region.