Geophysical Research Abstracts
Vol. 20, EGU2018-3757-1, 2018
EGU General Assembly 2018

Evolution of long internal waves across the Iberian shelf for different weather conditions

Ira Didenkulova (1,2), Oxana Kurkina (1), Wenyan Zhang (3), and Till Hanebuth (4)

(1) Nizhny Novgorod State Technical University n.a. R.E. Alekseev, Nizhny Novgorod, Russian Federation (oksana.kurkina@mail.ru), (2) Department of Marine Systems, Tallinn University of Technology,Tallinn, Estonia (didenkulova@mail.ru), (3) Institute of Coastal Research, Helmholtz-Zentrum Geesthacht, Geesthacht, Germany (wenyan.zhang@hzg.de), (4) School of Coastal and Marine Systems Science, Coastal Carolina University, Conway, U.S.A. (thanebuth@coastal.edu)

Propagation, transformation and shoaling of long internal waves across the Iberian Shelf is studied numerically. The hydrologic conditions are reconstructed from the in situ measurements of the GALIMOS 2014 cruise which successfully monitored the impact of a storm on shelf currents and sediment transport. In addition, a 3-Dimensional hydrostatic coastal ocean model was applied to reconstruct the entire hydrodynamic regime including temperature and salinity fields. The derived temperature and salinity fields for different weather conditions (pre-storm, during storm and after storm conditions) are then used to set up the background conditions for a weakly nonlinear model based on the variable-coefficient Gardner equation to simulate internal waves. Observed amplitudes and periods of long internal waves at the shelf edge are used to provide boundary conditions for the simulations. The evolution of a long initial isopycnal displacement of negative polarity propagating onshore is studied in detail. Short-scale internal solitary waves of negative polarity are found to be generated from the long initial disturbance. They become asymmetric and change their polarity while shoaling. For specific hydrologic conditions large-amplitude solibores may form and run-up the slope. The simulated density variations are very similar to those observed during GALIMOS 2014 experiment, thus validate our model. Results also indicate that mode-1 internal waves were intensified during and after the storm, along with an offshore shift of their breaking depth toward the seaward edge of mud deposits located in mid-shelf. This provides a powerful mechanism for winnowing sediment and constraining the seaward extension of mud deposits on the NW Iberian shelf.

We thank Captain Rainer Hammann and his team of RV METEOR for their intense support during the M110 cruise. I. Didenkulova is supported by the grant PUT1378. O.Kurkina is supported by the State Task Programme in the sphere of scientific activity of the Ministry of Education and Science of the Russian Federation (project No. 5.1246.2017/4.6). W. Zhang is supported by the research programme "Marine, Coastal and Polar Systems" (PACES II) of the Hermann von Helmholtz-Gemeinschaft Deutscher Forschungszentren e.V. The cruise was supported by the DFG Research Center/Excellence Cluster The Ocean in the Earth System (EXC309) at the University of Bremen. All data derived from the cruise (M110) are summarized in the public accessible cruise report through https://www.tib.eu/suchen/id/awi:-doi:10.2312%252Fcr_m110/. Field and model data used in this study are available on request from authors. The internal wave model is available from http://lmnad.nntu.ru/en/projects/igwresearch/.