NUMERICAL INVESTIGATION OF DIFFERENT TYPES OF OPEN BOUNDARY CONDITIONS BY MODELLING OF THE INTERNAL-WAVE TRANSFORMATION AT THE EDGE OF THE SHELF BY M2 TIDAL FORCING

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To investigate the problem, (see the title) the 3-D rigid-lid model of marginal sea has been used. The model includes non-hydrostatic system of primitive equations of motion, equations of continuity, temperature, salinity, and constructed from them 3-D Poisson equation for pressure and is completed with the equation of state and k-ε closure of Kantha and Clayson (1994) type. Numerical approximation of the equations of the model is based on tetrahedron finite element and has the 2nd order of accuracy in time and space both. Near the shelf zone the nest grid was thickened up to 4 m in the horizontal and 1 m in the vertical direction. Angle of the shelf plateau declination is 80^{o}.

Flather (1976) and Orlanski (1976) radiation conditions for velocity vector (V), temperature (t) and salinity (s) at the outflow as well as periodical ones were tested. To avoid a loss of mass, radiation conditions are rather of modified Perkins et al. (1997) type.

All experiments were initialized from $V=0$ and designated vertical profile of s and t typical for northern shallow regions of the ocean all over the domain.

Here we present some results at z-x central cross-section of numerical solutions for experiments with radiation conditions for t and s and periodical (left column) and Flather radiation boundary conditions (right column) for V for the moments 8.25T and 8.5T (T - M2 period).

It is seen that the speed of propagation of the internal wave is greater and its front is much more expressed by the periodical boundary conditions for the both open sides of the domain, but propagation of the salinity through the left boundary is limited in contrary with the experiment with radiation boundary conditions at this boundary for the first half of the M2 period. (U-component is directed to the left). Flux of the salinity to the near shore region is too small and radiation boundary conditions seem more preferable.

The comparison of the Available Potential Energy (APE) and the Turbulent Kinetic Energy (TKE) illustrations with illustrations for salinity allows detection of the internal wave destruction zones. Regions where APE and TKE both have its maximum values coincide with zones of subcritical angles of isopycnes.

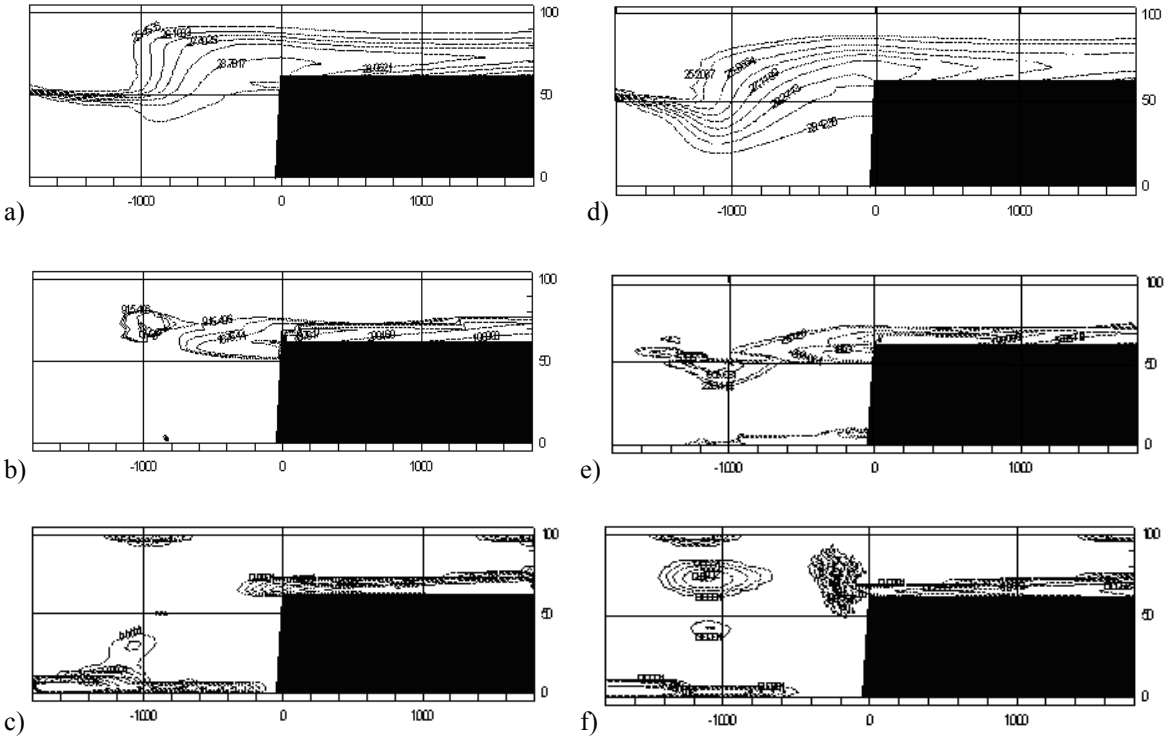

Figure 1. Central *z-x* cross-section of the salinity, APE and TKE fields at 8¼ T: (a), (b), (c) – periodical boundary conditions; (d), (e), (f) – Flather' boundary conditions. (*z, x* in meters).

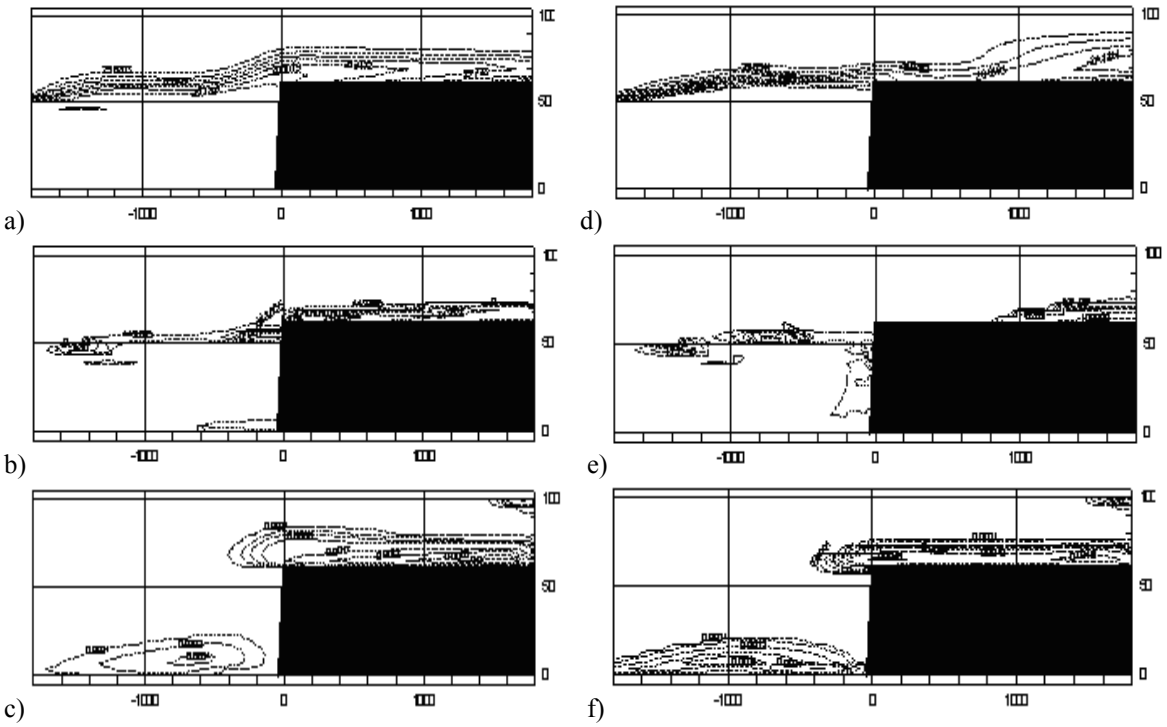

Figure 2. Central *z-x* cross-section of the salinity, APE and TKE fields at 8½ T: (a), (b), (c) – periodical boundary conditions; (d), (e), (f) – Flather' boundary conditions. (*z, x* in meters).