Abstract

The distribution and variability of the termohaline properties and the three-dimensional circulation of the Curimataú river estuary had been studied with the application of the numerical model of simulations Delft3D-Flow, validated with experimental data measured during two consecutive cycles of neap and spring tide. Two numerical grids were applied with the intention of observing the differences between the barotropic and baroclinic simulations. The initial conditions such as: salinity, velocity, density and the horizontal and vertical kinematic coefficients of viscosity and difusivity had been undertaken through the results under homogeneous initial conditions. After that, the numerical model had been used in more realistic conditions which were compared with the experimental data.

The simulations of the structure of salinity, in the barotropic model during the spring tide, showed better results when compared with the experimental data, validated by the *Skill* equal to 0.96; in the baroclinic model the simulations also had presented a good quality and the Skill was very close to those one (0.94). The theoretical simulations of the field of velocity were also of a good quality, comparatively the experimental to the experimental data; the mean Skill had been very close the barotropic and baroclinic models (0.80 e 0.79). Those values of the Skill confirm that the dynamic and the mixing process of advective and diffusive nature had been well presented mathematically. During the neap tide the theoretical results of the barotropic and baroclinic models had not been of a good quality (Skill 0.60), due to the difficulties of imposition of suitable boundary conditions to the high river discharge during the experiments.

Besides the simulations with time intervals of 25 h, which were used to the validation with the experimental data, also had been realized hourly simulations of the termohaline features, of the circulation and the advective salt transport into temporal series of 16 and 90 days in the barotropic and baroclinic models respectively.

To the simulated results of the salinity and velocity structures, in the baroclinic model and under spring conditions, had been applied the aim methodology used in process and analyzes of experimental data, with the finality of interpretation of the dynamic behavior and the mixing process and the transport.

In the barolinic model, during both tides, neap and spring, in the lower reaches of the estuary was classified as partially mixed (tipe 2a), with low values to the stratification parameters $O(10^{-2})<pe<O(10^{-3})$ and with the circulation parameter varying considerably between high values ($pc \approx 50$) and low values ($pc \approx 2$). The analyses of the variability of the Kinematic and diffusivity coefficients in the Curimataú river channel indicated that those coefficients had been in the interval of: 10^{-3} $m^2.s^{-1}$ a $1.2x10^{-2}$ $m^2.s^{-1}$. The kinetic turbulent energy and the rate of energy dissipation had indicated that in the vicinity mediations of the estuary mouth are concentrated the highest values: $6,5x10^{-3}$ $m^2 s^{-2}$ and 2,4 $m^2 s^{-3}$, respectively.

Key word: Numerical model, three-dimensional circulation, termohaline properties and flushing time.