NUMERICAL INVESTIGATIONS OF LATERAL TIDAL STRAINING IN REGIONS OF FRESHWATER INFLUENCE IN THE GERMAN BIGHT WITH THE ONE - DIMENSIONAL GOTM MODEL

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This master thesis deals with numerical investigations of lateral tidal straining in regions of freshwater influence (ROFI) in the German Bight, based on the ADCP data observations completed by the research center “Marum”. For this study, plots of the ADCP data were performed through MATLAB software. Simulation results of velocity magnitude, velocity direction, salinity and absolute shear were obtained by using the General Ocean Turbulence Model (GOTM) and interpreted through the programming language “Python”. Moreover, the sensitivity analysis of the density salinity gradient direction, its strength and tidal current velocity magnitude was achieved based on these GOTM simulation results. This analysis was completed to find a setup of the GOTM model that can or cannot reproduce the ADCP observations, obtaining that the best match coincides with a density salinity gradient of -1.6×10^{-4} psu m^{-1} directed from the south ($\alpha = 270°$) and a tidal current velocity of 0.5 m s^{-1}. In addition, this research determined the drivers and their dimensions, which influence on lateral tidal straining phenomenon. Obtained results of this Master thesis contribute to further investigation of lateral tidal straining in the regions of freshwater influence as well as understanding the parameters that influence on the dynamic regime of the water column in coastal waters. According to the GOTM simulations these regimes can be: permanent stratification, strain-induced periodic stratification (SIPS) and well mixed. All of them have a crucial role in controlling sediment transport and the vertical fluxes of water properties such as heat, salt and nutrient elements.