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Numerical simulations of the Turkish Straits System for the 2008-2013 period

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Two six-year simulations of the Turkish Straits System (TSS) using a high-resolution three dimensional unstructured mesh ocean circulation model with realistic atmospheric forcing are performed. The difference between the two simulations is the surface salinity boundary condition in a closed domain. The results suggest a sensitivity of the system to the surface salinity boundary conditions. The depth of the interface between the upper and lower layers remains stationary after six years of integration showing that even with the limitations of the closed domain numerical solutions can be kept realistic for several years. The water mass structure in the Marmara Sea is compared with the observations and results show a qualitative agreement between model and observations with relatively good skill scores. The experiment with boundary condition considering also the water fluxes compares the data better. The net volume flux through the Bosphorus and Dardanelles compares well with the observations except for the northern Dardanelles section. The upper and lower layer volume fluxes are always less than the observed estimations. The wind work in the Marmara Sea is shown to be higher compared to the some other marginal seas. The kinetic energy in the Marmara Sea strongly responds to the short-term atmospheric cyclone passages. The mean kinetic energy in the northern Marmara Sea can be as high as the mean kinetic energy of the Bosphorus inflow in some years. Two circulation patterns are identified in the annual averages. When the wind stress maxima is located in the central basin, the Bosphorus jet flows to the south and turns west after reaching the Bozburun peninsula. On the other hand, when the wind stress maxima increases and expands in the north-south direction, the jet deviates to the west after exiting the strait and forms a cyclonic gyre in the central basin.