



Sensitivity of the Mediterranean sea level to atmospheric pressure and free surface elevation numerical formulation in NEMO

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The sensitivity of the dynamics of the Mediterranean Sea to atmospheric pressure and free surface elevation formulation using NEMO (Nucleus for European Modelling of the Ocean) was evaluated. Four different experiments were carried out in the Mediterranean Sea using filtered or explicit free surface numerical schemes and accounting for the effect of atmospheric pressure in addition to wind and buoyancy fluxes. Model results were evaluated by coherency and power spectrum analysis with tide gauge data. We found that atmospheric pressure plays an important role for periods shorter than 100 days. The free surface formulation is important to obtain the correct ocean response for periods shorter than 30 days. At frequencies higher than 15 days^{-1} the Mediterranean basin's response to atmospheric pressure was not coherent and the performance of the model strongly depended on the specific area considered. A large-amplitude seasonal oscillation observed in the experiments using a filtered free surface was not evident in the corresponding explicit free surface formulation case, which was due to a phase shift between mass fluxes in the Gibraltar Strait and at the surface. The configuration with time splitting and atmospheric pressure always performed best; the differences were enhanced at very high frequencies.