Two-way coupling of ROMS and WWM models

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Circulation models like the Regional Ocean Modeling System (ROMS) are widely used in environmental, engineering and oceanographic studies. In order to properly evaluate waves and their impact on currents, turbulence or sediments it is desirable to couple the circulation models with separate spectral wave models. Here we propose coupling the finite difference ROMS model with the unstructured-grid 3rd generation Wind Wave Model (WWM), in order to account for the wave-current interactions in three dimensions. To that end we first introduce a systematic approach for generating an unstructured mesh from a finite difference mesh while preserving the structure of the flow near straits and coasts. The grid thus generated is used to quantify the differences when using a fully unstructured mesh with much less nodes for the same domain in order to improve the computational efficiency of the fully coupled model. This coupled model was applied to analytical test cases and the Northern Adriatic usingthe wind forcing validated against scatterometer data. The coupled model shows good agreement with the data paired with clearly improved flexibility in handling different wave model grids.