

General Comments: Major Revision

The manuscript describes thoroughly the framework of the Unified Forecast System Coastal Model (UFS-Coastal), including its model components (WW3 for ocean surface waves, CICE for ice modelling, and four hydrodynamic models, namely SCHISM, ADCIRC, FVCOM and ROMS), regression testing system for code development, and two strategies used for wave-current coupling, namely the radiation stress method and the vortex forces method. Through one case, Hurricane Sandy (2012), the good performance of the coupled WW3-SCHISM system is demonstrated.

It is a challenging work to develop a reliable, working coupling wave-ocean model. The efforts documented in this paper (development of the coupled WW3-SCHISM model) are very well welcome and will be highly useful for future cross-scale coastal simulations and predictions. I greatly appreciate the value of this work and therefore suggest to accept this work.

But I indeed have a few concerns about the writing, presentation and organization of the paper, as summarized below.

- 1) The title of this paper reads “The applications of UFS-Coastal v1.0.0b01: wave-current coupling of SCHISM and WAVEWATCH III”, from which I would expect more technical details about the SCHISM-WW3 coupling in the paper. Nonetheless, a large (perhaps disproportionately large, in my opinion) part of the manuscript is devoted to the description of the UFS-WM, UFS-Coastal framework (e.g., section 2.1.3, 2.2.1, 2.2.2 and 2.2.4 which provide the overview of CICE, ADCIRC, FVCOM and ROMS, respectively). Instead, the very important details of the two methods for wave-current interactions are given in the online supplement only. If the current title is left unchanged in the revision, I would suggest to move Section S1 and S2 to the main text (Table S1 and S2 can still be in supplement), and then shorten the descriptive part about UFS-WM and UFS-Coastal infrastructure significantly.
- 2) In Section 4, the authors mentioned that “the study has presented a comprehensive description, *systematic validation, and detailed evaluation* of the UFS-Coastal modeling framework”. However, I was a bit surprised to see that only one case study with three key figures (Figs. 4, 5, 6) were given in Section 3. Besides, “section 3.3 Results” is just ~1 page long.
- 3) For the single case presented, there are also some important details that need to be discussed more thoroughly.
 - a) Fig. 4: wave height and period are not well simulated at AWAC 6 m and 8 m stations, and mean wave direction is poorly simulated at ADOP 2m station. Discussion about the possible reasons for these mismatches should be provided.
 - b) Fig. 5: The standalone and coupled SCHISM simulations show very marginal differences. In this regard, the benefit of the coupling for the SCHISM simulations is not well demonstrated.
 - c) Fig 6: “Spatial distributions and vertical cross-sections of simulated current velocities provided *clear evidence of enhanced realism and accuracy* using the 3D vortex method compared to the depth-integrated approach”. Are there any observational data available to support this statement? Without doing so, it is difficult to judge which one (Run 4 or 5) is correct.
- 4) I am also curious about how the boundary conditions were specified for the wave and ocean

simulations. These details are not clearly mentioned. In the blue box of Fig. 1, the block “NUOPC Cap/ Data wave” is not included. I am wondering if any boundary conditions were used for the WW3 simulations.

To sum up, the work presented in this manuscript is very interesting and will be very useful for future coastal applications. However, in my opinion, the paper should undergo a **Major Revision** to improve the readability and to make the study more convincing.