Author Response to Reviewer RC1

The UKC3 regional coupled environmental prediction system

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1 Response to general comments

We would like to thank the reviewer for their thorough and complementary review. The list of specific comments provided is appreciated and these have been addressed in the revised manuscript, thereby improving the paper. We provide specific responses to these below.

2 Response to specific comments

a) *p 13, line 13: could you elaborate a bit more why the NEMO turbulent kinetic energy budget due to wave processes are not included in UKC3?*

Further clarification of this choice is now provided in the revised manuscript from p13, line 13. We focussed the initial implementation on improving the description of the momentum budget across atmosphere, ocean and wave components. Some tests were conducted using an implementation of wave effect in modifying the TKE budget (through the phioc parameter), but it is likely that other aspects of NEMO (e.g. mixing scheme) would require retuning in order to correct for compensating errors. This is therefore an aspect of ongoing work, with support from collaborations such as the NEMO Wave Working group.

b) *p 15, line 14: Are tau_wav and tau_wave:ocn computed from the wave model respective source term and if so, what was done for the contribution for frequencies above the last discretised frequency? The approach in Breivik et al. 2015 is to assume a balance between input and dissipation in the high frequency range. This is an assumption and truly speaking, it is not really correct as the nonlinear source term also contributes to flux of wave momentum and energy. Accounting for the nonlinear source term contribution and possible alternative methods to evaluate the momentum and energy fluxes are currently being investigated (Bidlot personal communication).*

In the version of WAVEWATCH III used in this work, the surface stress terms are only calculated in the model's numerical grid frequency range. No values are appended for the high frequency tail. As such, we interpret this to by similar to the approach in Breivik et al. 2015. A brief comment has been added to the revised manuscript to explicitly note this.

c) *p 15, line 29: the Stokes drift at other water depths than the surface could easily be computed. It has been deemed too expensive, hence the use of parameterisations to recover the Stokes drift profile. So I would change "known" to "usually available"*

We agree and have updated the manuscript in line with this suggestion.

d) *Figure 5: Mean wave period reported by buoys tends to be based on the T02 (i.e. the second moment).According to the CEFAS WaveNet web page, they report "Average (zero crossing) wave period", which is T02. They also provide frequency spectra, so it is well possible to re-compute using any method. But then, one should make sure to use the same frequency range. Please clarify.*

The reviewer is correct that we should have provided comparisons of the observed mean wave period with T02 rather than T01 diagnostics from the wave model. As T02 was not readily available from all archived model simulations, the revised manuscript text and Figures 5 and 8 have been updated to discuss the wave peak period results, enabling comparison with more observation sites than the mean period (Fig. 1). The change of observed variable here does not impact our conclusions at all.

3 Response to technical corrections identified

p16, lines 6 and 7: Phillips 2015 -> Breivik 2016

This has been updated in the revised manuscript.

Appendix A: last entry: omega_p : units 1/s , name wave peak angular frequency

Thank you for spotting this error – it has been corrected in the revised manuscript.

p31, line 4: absorbed by the waves -> absorbed and/or released by the waves

This has been corrected in the revised manuscript.

Table 9: wave-wave nteraction -> wave-wave interaction

This has been corrected in the revised manuscript.

Figure 1: maximum wave period : do you mean Tp, the peak wave period ?

Yes, we mean the peak wave period. This has been corrected in the figure caption.

Figures 2, 3, 9, 11, 13: (a,d,j) -> (a,d,g,j)

This has been corrected in the revised manuscript where relevant for Figure captions 3, 9, 11, 13.