Ocean Sci. Discuss., 12, C1473–C1475, 2016
www.ocean-sci-discuss.net/12/C1473/2016/

Ocean Science
Discussions

Interactive comment on "Modelling wave–current interactions off the east coast of Scotland" *by* A. D. Sabatino et al.

Anonymous Referee #1

Received and published: 18 January 2016

The authors have produced a paper on the challenging topic of wave-current interaction. Although the authors have used a commercial software package do the modelling, the interpretation is still difficult and interesting because wave-current effects are not always easily distinguishable from other effects. This is illustrated clearly in their Table 4 which gives some statistical parameters for the wave gauge validation. The values for the statistics are very similar and based on these numbers alone it is hard to convince someone that there is a real improvement in performance. Therefore the discussion should give a very careful interpretation of the result and search for other clues (e.g. in the 2D spectrum) that illustrate the wave-current interaction in both measurements and calculations. The authors could do a larger effort in this respect.

major-comments:

The coupling is one-way (transfer of depth average flow fields and of water depth from the hydrodynamic model to the wave model). Although this transfer of information is essential in wave-current interaction, it is not state of the art. The authors should at least give some arguments why more recent work on two way coupling (both in 2D and in 3D, e.g. the work of Bennis et al, 2011 and Michaud et al. 2012, is not or does not need to be considered for this study.

p. 3112: a maximum difference of +3 and -2m in Hs between are mentioned in line 3. These are very large differences for Hs and it would be very interesting to show that in more detail. The current contour plots in figs 6, 7, 11, 12, 14, 15 miss this detail. In fact, it is hardly possible at all to see anything on these figures I would suggest to also make time plots and to explain better why such large differences occur and report if this is realistic. The time plot of Hs in the bottom figure of Figure 9, shows only minor differences in wave height. The use of spectral plots, could help to explain the effects that are seen. In fact the use of 2D spectral plots would be very helpful in the discussion given for the different storms (in 2D spectral plots one can most often easily visualize different wave trains like wind sea and swell) If contour plots are used, I would recommend to use the same color scale for plots that can be intercompared (e.g. Fig 6 and 7. In some cases a more appropriate color scale can also help the reader (e.g in Figure 4 there is only the dark blue color)

Variables are not always well defined. For example: wind sea and swell are not defined. Possibly the MIKE SW model does this automatically but to understand the scientific discussion it is necessary to know how it is done.

The wave period is not used consistently. In the text the mean period Tm is used (of which I assume it is calculated using the first period of the spectrum). In the additional material the peak period is used for the satellite data (both for observations as for the modelled values). It is also not clear how this peak period has been obtained. The period is not measured directly by the altimeter instrument but estimated indirectly. Moreover the peak period is always difficult to determine accurately. See e.g.

Gommenginger, C. P., M. A. Srokosz, and P. G. Challenor (2003), Measuring ocean wave period with satellite altimeters: A simple empiricalmodel, Geophys. Res. Lett., 30(22), 2150,doi:10.1029/2003GL017743. The authors should check their manuscript carefully and make sure that variables are well explained and used consistenly.

Model settings can be better documented. The value of 0.6 of the gamma parameter in the Battjes-Janssen formulation caught my attention. The authors refer on p. 3107 to a calibration. The value they obtained is different from the default value 0.73 used in the SWAN model (the most frequently used spectral wave model). It would be interesting to know more about the calibration procedure (and have a reference to the calibration report)

In the conclusion new things are mentioned that were not discussed in the body of the text. E.g. on lines 7 and 8 on p.3116 it is stated that wave-wave interactions play an important role, but this has not been discussed before. Idem for the paragraph starting on line 18 and ending on line 25.

Captions of Table and Figures should contain sufficient information to be able to read them on their own. Two examples in Table 4 the period period used for the validation could easily be added and in Figure 9 adding that this refers to the Aberdeen wave gauge (water depth?) would be great. The authors should carefully check all captions and provide information useful for the reader.

minor comments: - manuscript contains several typo's - errors in angle are not expressed in % (e.g. for phase errors in harmonic components, see p3110 line 4) - what is S in the last line of p. 3114? Should it be Hs?

Interactive comment on Ocean Sci. Discuss., 12, 3099, 2015.