Review of « Measurements of Nearshore waves through Coherent Arrays of Free-Drifting Wave Buoys » Rainville et al., ESSD, 2023

General Comments

This article reports on the development of the microSWIFT, a small wave buoys equipped with a GPS module and an IMU, building on the SWIFT buoys (Thomson, 2012), with the objective of providing measurements to investigate nearshore wave dynamics through the deployment of coherent arrays of microSWIFTs. As a proof of concept, several experiments were conducted at the FRF at Duck, NC, and the paper further presents data processing procedures, the results of which are compared with measurements from a fixed AWAC. The need for more nearshore measurements is unquestionable, and every related research efforts are thus welcome. I appreciate the authors detail the conception of the microSWIFT and how to manage the deployment and some aspects of data processing, although I have some technical concerns regarding the latter (see specific comments below). More generally, I have some doubt regarding the concept of employment, but I guess further research efforts beyond the scope of this study are needed, building on the dataset that have been constituted and made available to the community.

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Specific Comments

1. l.42 “However, it is challenging…” In situ measurements in the nearshore area are indeed challenging, however it is worth mentioning here some recent studies that reported comprehensive field campaign using fixed sensors in such environment (e.g. Guerin et al. 2018, Pezerat et al. 2022, Lavaud et al. 2022)

2. l. 43 “As an alternative…” I rather disagree, the use of Lagrangian device such as wave buoys faces inherent limitations for measuring steep waves that are typically found in the surf zone owing to the simultaneous vertical and horizontal motion of the buoy, the waves in the record tend to look more symmetrical around the mean sea level than they actually are such that non-linear effects cannot be properly investigated with a buoy (e.g. Magnusson et al., 1999; Foristall, 2000). Furthermore, remote sensing techniques, which ability to measure nearshore waves have been demonstrated in a myriad of studies, should be mentioned here.

3. l. 44 “Free drifting buoys…” This assertion should be supported with some appropriate references, furthermore the sentence reads oddly (it looks like a word is missing), I suggest you reword it.

4. l. 51 “… however, they are limited to…” As pointed out above, I would say it is actually an inherent limitations of wave buoys.

5. Fig. 3. The cap on the bottle seems fairly “standard”, have you encountered any problems with the seal?

6. l. 99-107 Is there an SD card to keep a record of the data, if not would it be worthy?

7. l. 123-124 “For nearshore applications…” After reading section 2.3, I see nothing in the processing method to account for non-linear effects. As pointed out above this is quite an important limitation of the concept of employment of these buoys, could you thus please elaborate a bit more?

8. l. 136-139 “The microSWFTS were retrieved…” have there been any losses, if so it is worth mentioning the rate of lost bottles such as the reader can have a proper idea of what involve such deployment?

9. l. 153 “Gaps are rare…” Is it also true for GPS data, as it seems to me it is quite common to find some gaps in GPS wave buoys measurements, presumably associated with waves passing over the buoys?

10. l. 201-202 “we use data when an individual microSWIFT…” Why not considering measurements from buoys inside a circle, centered on AWAC location, with a given radius, according to the bathymetry constraint? Here you might have considered data from buoys at quite different locations along the isobaths.

11. l. 204-207 “The spectra are computed…” I get a bit lost here with the estimate of the number of DOF and the resulting spectral resolution. My understanding is that the 10 min (600 sec) records are divided into three overlapping windows (Nw=3) of 300 sec with a 50% overlap, and then, the average spectrum is band-averaged on five frequency bins (M=5). The number of DOF could be thus roughly estimated as: DOF = 2*Ns*(M+1)/2 = 18, as opposed to 51. Could you detail a bit more the way spectra are computed?

12. l. 210-211 and l.247-248 I am not convinced by the robustness of the spectral analysis. As pointed out in the two comments above I have some doubts on the way spectra are computed. Furthermore, the spectra show discrepancies that might result in quite important differences on bulk parameters, maybe not Hm0, but what about mean periods? These statements should be tone down, I would rather speak of a relatively good qualitative agreement.

13. l. 215-218 “Since the microSWIFTs…” In practice how individual waves measured by different buoys are tagged? Could you detail a bit more the “sampling with replacement method”?

14. l. 222-226 and Fig. 8e I am not convinced of the relevance of such an aggregated distribution, as the buoys did not measure the same sea state as they drift; what is the meaning of this significant wave height? The following of the paragraph makes more sense to me. I suggest to remove Fig. 8e and the associated discussion.

15. l.233-247 Did you processed AWAC measurements the same way, i.e. zero-crossing processing method using AST measurements or did you consider the spectral estimates of the significant wave height? For sake of clarity, I suggest you dedicate an appendix to the processing of AWAC measurements.

References:

Forristall, G. Z. (2000). Wave crest distributions: Observations and second-order theory. *Journal of physical oceanography*, *30*(8), 1931-1943.

Guérin, T., Bertin, X., Coulombier, T., & de Bakker, A. (2018). Impacts of wave-induced circulation in the surf zone on wave setup. *Ocean Modelling*, *123*, 86-97.

Lavaud, L., Bertin, X., Martins, K., Pezerat, M., Coulombier, T., & Dausse, D. (2022). Wave dissipation and mean circulation on a shore platform under storm wave conditions. *Journal of Geophysical Research: Earth Surface*, *127*(3), e2021JF006466.

Magnusson, A. K., Donelan, M. A., & Drennan, W. M. (1999). On estimating extremes in an evolving wave field. *Coastal Engineering*, *36*(2), 147-163.

Pezerat, M., Bertin, X., Martins, K., & Lavaud, L. (2022). Cross-shore distribution of the wave-induced circulation over a dissipative beach under storm wave conditions. *Journal of Geophysical Research: Oceans*, *127*(3), e2021JC018108.

Technical Corrections

l. 73 “our team” and elsewhere, please avoid the “we” and the “us”.

l. 84 and below the positions should be given with the appropriate distance unit from the origin of the local frame, I assume meters.

l. 93 “mean wave period” are you referring to Tm01 or Tm02 or the mean period issued from wave-by-wave analysis? This is in line with my comment 15 above.