

Title: Wind waves in the North Atlantic from ship navigational radar: SeaVision development and its validation with Spotter wave buoy and WaveWatch III

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MS type: Data description paper

Major Review Comments:

1. The English language, both grammar and expression, of this manuscript is significantly flawed (some of the example recommendations are provided in the minor comment section below), it should be thoroughly revised.
2. Use of X-band marine radar for sea surface wind and wave measurements is not new in the literature (see Huang et al., 2017 for examples). More in-depth description of SeaVision, its unique features, and algorithm used to measure the wind waves should be discussed. Comparison with contemporary X-band radar - in design and performance - is recommended.
3. In lines 180 - 185, and in section 2.3, you mentioned that,
“ $H_s = A + B \sqrt{SNR}$ (1)
where A and B are empirical calibration coefficients for each radar. In this study calibration coefficients were calculated on the basis of the simultaneous observations with the Spotter wave buoy (see Section 2.3). Calibration coefficients are also used for calculation of the wave energy spectrum. We also use modulation transfer function (MTF, Nieto-Borge et al., 185 2004) to correct radar antenna effects of tilting and shadowing to correct the wave energy spectral density.”
“We further use wave parameters derived from buoy as the “ground truth” for the SeaVision calibration and estimation of the radar calibration coefficients A and B, these coefficients are further used to rescale the SeaVision wave energy spectrum to match buoy spectrum with least squares”
 - However, nowhere in the paper, the numerical values of ‘empirical calibration coefficients’ A and B have been given. Please, include those important numbers and describe the calibration procedure more clearly and quantitatively.
4. From the standard expression of the linear dispersion relation, $\omega^2 = gk \tanh(kh)$, we know that h is the water depth (even the same is given in the reference Nieto-Borge et al., 2004), not directly significant wave height. But in line 165, you claimed that it is the significant wave height which is the key parameter of your results. Therefore, please, review the relevant theory and justify it more clearly.

5. What quality filters were used? Was there any rain event during any expeditions and data acquisition? Please, discuss these in detail in the data collection section.
6. The data could not be accessed/retrieved from the given link (<https://sail.ocean.ru/tilinina2021/>), consequently, the data could not be verified.
7. X-band radars are usually capable of other wave parameters including sea-swell, which is a very important related parameter. So, authors should justify why the swell measurement was not included in this study.
 - 7.1. In the open ocean, swell and surface current contributions to the wave height can be significant depending on the location and time of the year. Therefore, results should be presented on the basis of different sea states. You may use different colors in your scatter plots to indicate different sea states.
 - 7.2. How have you estimated significant wave height without swell and surface current information, or how have you separated them?
8. Validation with the satellite altimeter/SAR or other observational data product (for the possible range) is recommended besides the Spotter wave buoy and WaveWatch model.
 - 8.1. Overall description of the WaveWatch III model experiment in section 2.5 is not sufficient. Describe more about the model input, output, and also discuss model limitations. Models usually have their inherent bias/uncertainty, furthermore, the native spatial resolution of ERA5 reanalysis is 31 km. You should include its possible effects on the results.
9. The focus of this manuscript is validating the SeaVision radar, not the Spotter buoy. So, I recommend presenting “Spotter minus SeaVision (Fig. 5a) and WW3 minus SeaVision (Fig. 5b)” in Figure 5, instead of “Spotter minus SeaVision (Fig. 5a) and Spotter minus WW3 (Fig. 5b)”. Same recommendation applies to Figure 7. Also, plot the ground truth along the x-axis, and SeaVision measurement along the y-axis.
10. Solid line must be a 45° line originating from {0,0} in all scatter plots of Figure 6. Quantitative information, i.e., Numerical values of the bias and the STD/root mean square error should be included in the scatter plots (Fig. 6).
11. It is recommended to include the validation results of the wave energy frequency spectrum measured by the SeaVision system in a separate plot.

Minor Review Comments:

1. In line 21, “Simultaneously with SeaVision observations of the wind waves we *were collecting* data in the same locations and time”, use simple past tense. Same as in line 99 -- “we were using Spotter wave buoys”; line 120 “we were collecting”; line 121-122 “vessels were drifting”.
2. Please, clarify what you mean by ‘wind waves’ (possibly, in the introduction section) for the general audience and state specifically which wave parameters the SeaVision system measures. Although you mentioned it later in the abstract, “The dataset that supports this paper consists of significant wave height, wave period and wave energy frequency”, I think it’d clearer if you mention it at the beginning when you first describe it “In this paper we present the SeaVision system for measuring wind waves’ parameters in line 19.
3. The data link can be given in the data section, instead of providing in the abstract.
4. In line 33, “The history of wind waves studies” - should be ‘The history of wind wave studies’. Same as in line 114, “the wind waves data”, should not be a plural adjective.
5. For lines 33-40, cite proper sources.
6. In line 41, use the simple present for “Remote sensing datasets of the wind waves are *dating back*”. Same for lines, 50, 53.
7. In line 41, “when the first satellite radar altimeters missions began measurements of the elevations of the ocean surface” -- should be the first satellite radar altimeter mission.
8. In line 41, “when the first satellite radar altimeters missions began measurements of the elevations of the ocean surface” -- which satellite radar altimeter? Please, cite.
9. In line 44, “Buoys are measuring vertical and horizontal displacements of the ocean surface”, -- please use simple present tense instead of progressive.
10. In line 48, “buoys cover only a few locations” -- it is true that buoy networks are sparse for global coverage, nevertheless, it is not “a few”.
11. In line 53, “collecting wind waves observations” -- should be ‘wind wave observations’.
12. Line 88, “**2 3 Spotter wave buoy data**”, please use a dot to indicate a subsection. Same as in line 109 - “**2 1 Expeditions**”; line 125 - “**2 2 SeaVision system**”; “**2 2 1 Radar**

signal preprocessing”; **“2 2 2 Analysis of the sea clutter images”;** **“2 3 Spotter wave buoy data”;** **“2 4 Meteorological data”.**

13. Please, use a dot (instead of a comma, which is misleading) to represent fractional numbers, such as in line 117 (59,5°N), line 289 (2,5s), table 1 (231,5) and some other places.
14. Lines 57-58, “(i) collecting wind waves observations in the open ocean using navigational marine X-band radar and (ii) to monitor in real time wave heights, direction and period along the ship track in the open ocean.” - use parallel sentences (either gerund or infinitive noth mixed)
15. In line 108, I prefer “2. Data collection and analysis” to “Data collection and analysis principles” as the section heading.
16. In Figure 1, indicate the start, end and direction of the expeditions. For a large portion of the track, especially for figure a and c, data were not collected, why? Please, mention this in the description.
17. In section 2.2.1, and 2.2.2, indentations are used for paragraphs, and nowhere else it is used. Please, make it consistent throughout the paper.
18. In line 133, you mentioned “For our purposes we used the shortest possible pulse length of 0.08 μ s”, please explain why.
19. Please, follow the custom to abbreviate megahertz as MHz in Table 1.
20. Line 157-158, you mentioned, you chose “minimal distance from the ship of 300 m (to avoid potential impact of the ship to the wave field and illumination of the radar signal by the ship).”, but for the Spotter wave buoy, in lines 195-196, you mentioned that it was selected to be 200 m. Please, make it consistent. However, if there is any particular reason, please, include your explanation.
21. In line 165, please, correct the unit of gravitational constant ‘g’ (ms^{-2}).
22. In line 195, “200m” vs “300 m” in line 158. Please, make the syntax (space between quantity and unit) consistent throughout the paper.
23. Line 206, “We further use wave parameters derived from buoy” -- please, specify the parameters.

24. Line 228, What is ST6 parameterization? Please, explain ST6 parameterization and the discrete interaction approximation (DIA) scheme a little more about it considering the general audience.
25. Line 255, ‘’worsen’’ should be worse.

References:

Huang, W., Liu, X., & Gill, E. W. (2017). Ocean wind and wave measurements using X-band marine radar: A comprehensive review. *Remote sensing*, 9(12), 1261.

Nieto Borge, J., Rodríguez, G. R., Hessner, K., & González, P. I. (2004). Inversion of Marine Radar Images for Surface Wave Analysis, *Journal of Atmospheric and Oceanic Technology*, 21(8), 1291-1300. Retrieved Apr 4, 2022