

Interactive comment on “The Copernicus Surface Velocity Platform drifter with Barometer and Reference Sensor for Temperature (SVP-BRST): Genesis, design, and initial results” by Paul Poli et al.

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We are grateful to Reviewer2 for the time and efforts assessing our work, and for providing comments.

These comments are reproduced below, in italics.

Modifications proposed to the manuscript are shown in bold.

The submitted paper presents the new generation Copernicus drifting buoy, which has

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a reference sensor for SST measurements providing more accurate results than standard drifters. The paper is well written and on time for the validation of the SLSTR SST. Thus, it deserves publication in Ocean Science once the following comments are addressed. Although, there is in practice one major comment about the wind speed dependence, which requires a little bit of extra work, this is straightforward and it is not expected to cause difficulties to the authors.

Indeed, inclusion of wind speed results could easily be done. (see later)

1) Page 5, Lines 14-15. Although, the dependence on significant wave height is very interesting and useful, the majority of past SST studies (e.g. Donlon et al. (2002), Morak-Bozzo et al. (2016)) have used the wind speed as the parameter from which the sea-state mixing can be deduced. Thus, it is important to make the link with previous studies and add a panel to Figure 2 of the SST difference against wind speed (e.g. taken from ERA-5) and discuss it in the text.

Indeed, the relationship between wind and waves is strong and well-established (e.g., Beaufort scale). Figure 2 has been modified to include a panel on wind speed (collocated from ERA5). The following text is proposed for inclusion in section 2.2, just after “information about sea-state”:

“In past SST studies, wind speed is generally used to describe sea-state mixing (e.g., Donlon et al., 2002, Morak-Bozzo et al., 2016). In this study, we also consider significant wave height. Information about both parameters can be obtained by co-locating. . .”

The in-text discussion of Figure 2 results is also proposed to be modified: **“when the wind speed is up to moderate (under 8-10 m/s) and when the wave heights are up to moderate (under 2-3 m). . .”**

2) Page 11, Line 7. Similar to the previous comment, add a wind speed panel in Figure 9 and respective discussion in the text.

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A panel was added in Figure 9, showing wind speed collocated from ECMWF operational analyses. The discussion of that figure in section 4.2 is proposed to be modified as follows: "It is largest when the significant wave height (estimated by the ECMWF analyses) is largest, **in line with stronger winds at the same times.**" Wind is also to be mentioned in two other occurrences in the same paragraph.

3) Page 2, Lines 12-15: *This sentence is not clear given that AATSR, the precursor of SLSTR, it was also a dual-view radiometer with two on board blackbodies for the calibration of the TIR channels. Please rephrase or clarify.*

We agree with this remark, so we propose to change the text to **"gives it comparable accuracy to similar sensors"**.

4) Page 2, Line 20: *"... earlier generations of sensors." Please indicate the sensors that are talking about.*

We propose to remove ", at a higher level than earlier generation of sensors".

5) Page 5, Line 9: *"There are fewer ... at night and ...". Please rephrase as it does not make sense.*

This sentence is proposed to be rephrased as follows: **"The differences are smaller at night and when the Sun is more than 30 degrees below the horizon"**

6) Page 5, Line 12: *Please add a comment about the differences at 1 K in Figure 2. Also, it is not clear if there are differences larger than 1 K or not. Please clarify.*

There are about 87,000 data points in input of Figure 2 (information indicated in the text). To avoid hiding any information, the figure shows at the minimum and maximum all the points that fall outside the range. This represents 154 data points at or below -1 K and 289 data points at or above 1 K. This information is proposed to be added in the text, as follows: **"Differences that are out-of-range (below -1 K or above 1 K) are also shown for completeness (at -1 K and +1 K, respectively); they represent about 0.5% of the entire data record."**

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7) Page 6, Line 13: *The reference to Table 3 is missing. Probably, it would be better to move the sentence of lines 18-20 a few lines above, as there is reference to Table 3 in line 13, but a description/presentation of Table 3 is introduced below.*

This change will be made.

8) Page 7, Line 3: *It would be useful to add a comment about the above average lifetime of the 3 buoys in Table 3 and also interpret the trends under this light. The drifters have a mean lifetime of approx. 450 days, e.g. Lumpkin et al. (2012).*

The 3 buoys mentioned in Table 3 had lifetimes that can be found by look-up in Table 1. The following comment is proposed to be added in section 2.3, as follows:

"The three recovered buoys achieved lifetimes of (respectively) 580, 515, and 453 days (see Table 1). These durations are close to or above the average drifter lifetime of 450 days (Lumpkin et al., 2012). Considering all the estimated temporal drifts shown in Table 3, the temperature biases of these drifters (averaged over the mission duration) would range between -0.002 K and -0.010 K."

9) Page 7, Lines 9-10: *This sentence is true if the assumptions behind the analysis are true. For example the representativity error is not taken into account. Gruber et al. (2016) provide a mathematical framework indicating how triple collocation penalizes the point instrument (in this case the drifters). This is in line also with the results of the authors e.g. in Figure 9d for differences occurring only within 5 minutes for which the percentiles have been calculated.*

The referee is correct - but the analysis presented later in the paper, based on Corlett et al (2014), does not use triple-collocations, where the point is space (representativeness) contribution is explicitly included. Consequently, on this comment, the text does not need modifying.

10) Figures 4 and 5 (or in the text): *Please provide the number of match-ups and the step of the SST uncertainty.*

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“All drifters” relate to 15,551 matchups, and “HRSST” relate to 625 matchups. The uncertainty bins are 0.01 in the upper plot and 0.001 in the lower plot. This information is proposed to be added in the manuscript.

11) Page 8, Line 29: *Why not the 25 and 75 percentile (instead of 30 and 70) from which the interquartile range (IQR) can be calculated?*

There was only very limited space in the Iridium message to include additional information (without incurring increased transmission costs, and hence also increased battery consumption costs, with longer messages). The percentiles were chosen to document as much as possible the potential asymmetry of the measured distribution, at even spacing, hence the 20% increments, starting at the 10th percentile. However, as indicated in the conclusion section, we hope to deploy at a later stage a (limited) number of buoys that will report the full set of 1-Hz measured data (at full resolution of 0.001 K), which will yield even more information for detailed investigations.

12) *Is Figure 7 useful?*

We acknowledge that Figure 7 does not show any scientific results. It has been moved to supplement material. This results in figures being renumbered, from former figure 8 onwards.

13) Page 9, Line 20: *Probably add the clarification that the drifters have been in the Mediterranean, as it is confusing with the previous sentence.*

This information is proposed to be added for clarity, in the first paragraph of section 4 (noting that Table 4 cited just after clearly mentions the deployment area).

14) Page 8, Lines 23-24: *Deployment in Brest? Please clarify.*

The deployment area is now clearer after the modification above.

15) Page 11, Lines 19 and 21: *Change the numeration of the figures, as Figure 13 appears in the text before Figure 12.*

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The two figures have now been swapped.

The PDF attachment includes the paper with all changes (in track-changes) as well as the new supplement.

The following references are to be added to the revised paper:

Donlon, C.J., P.J. Minnett, C. Gentemann, T.J. Nightingale, I.J. Barton, B. Ward, and M.J. Murray, 2002: Toward Improved Validation of Satellite Sea Surface Skin Temperature Measurements for Climate Research. *J. Climate*, 15, 353–369, [https://doi.org/10.1175/1520-0442\(2002\)015<0353:TIVOSS>2.0.CO;2](https://doi.org/10.1175/1520-0442(2002)015<0353:TIVOSS>2.0.CO;2)

Lumpkin, R., N. Maximenko, and M. Pazos, 2012: Evaluating Where and Why Drifters Die. *J. Atmos. Oceanic Technol.*, 29, 300–308, <https://doi.org/10.1175/JTECH-D-11-00100.1>

Please also note the supplement to this comment:

<https://www.ocean-sci-discuss.net/os-2018-109/os-2018-109-AC2-supplement.pdf>

Interactive comment on Ocean Sci. Discuss., <https://doi.org/10.5194/os-2018-109>, 2018.

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