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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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Thank you for your time in assessing this work and providing constructive comments (reproduced below, in *italics*).

The manuscript is very well written and suffers from few problems needing minor revision. I recommend that it be published after addressing this minor concern. The only significant addition that the paper needs is a discussion of drogue presence, and how the drogue [a]ffects the depth of measurements. This is never brought up in the paper *(unless I missed it), but is very relevant and important.*

The need to discuss drogue presence and how it affects the depth of measurements is duly taken into account. However, the data from the two SVP-BRST prototypes deployed so far are not sufficient to document this effect. Consequently, to look into this, we revisited the data record from previous HRSST-2 buoys, most particularly the SVP-BS, since they presented the advantage of providing two high-quality SST measurements located at different depths. As a result, we propose to insert a new section before “2.5 Limited traceability” (text proposed is in **bold**):

2.5 Influence of the drogue on drifter SST measurements

This section investigates the effect of the sea anchor or drogue on drifter SST measurements. By exerting its own weight and by following currents centered at 15 meter depth, the drogue pulls the float downwards, via the tether. This maintains the float and its drogue aligned in the vertical, in wave troughs. When the drogue is lost, the float has more freedom to oscillate by roll and pitch, and the temperature probe can sometimes be exposed to waters closer to the surface. Also, when in that situation, the float is more likely to reach wave crests. There, the sky visibility is improved, reducing the GPS Time To First Fix (TTFF), which can serve as an additional indicator of drogue loss (Petolas, 2013).

To investigate the influence of the drogue, the SVP-BS data record is revisited. These buoys used submergence sensors, whereas drifters nowadays use strain gauges, e.g. as indicated by Rio (2012), who developed an advanced method to identify drogue loss using drifter currents, satellite altimetry, and wind reanalysis data. The submergence (or tether strain gauge) readings are neither straightforward to interpret, nor fully reliable on their own (Rio, 2012). However, the SVP-BS drifter data considered here (available from the Coriolis In-Situ Thematic Assembly Centre) are not found in the drifter dataset of Rio and Etienne (2018), which includes drogue presence flags. Consequently, for this analysis,

we use the submergence and GPS TTFF data. A visual inspection indicates that 10 of the 20 buoys in Table 2 have lost their drogues during their mission. For these buoys, two series of data records are extracted: (1) before drogue loss, and (2) after drogue loss.

During day time, the median of the differences between the twin SST measurements is -0.04 K in (1), whereas it is -0.03 K in (2). The reduction in differences may appear insignificant, but it is consistent with the CT sensor being more often exposed to depths similar to the sensor integral to the hull when the drogue is lost, than when the drogue is present. Similarly, the robust standard deviation of the differences between the twin SST measurements is 0.03 K in (1), whereas it is 0.01 K in (2). Again, this reduction is consistent with drogue loss, for the same reasons.

During night time, no influence of the drogue loss is expected, if the temperatures are homogeneous just below the surface. This is indeed what is observed. The median of the differences is -0.04 K in both (1) and (2), and the robust standard deviation of the differences is 0.03 K in both (1) and (2).

In other terms, the SVP-BS data record confirms the expectation that once the drogue is lost, the SST probes on a drifter are more likely to be exposed to water immediately below the surface, than when the drogue is present, and this effect is more visible in the presence of stratification (e.g., during day-time). To keep track of the drogue effect on SST measurements, it is important to monitor drogue loss as well the immersion depth and its variations.

In addition, we propose to replace the following sentence in section 3:

“The result is the SVP-BRST, based on the SVP-B design (Sybrandy et al, 2009), but adding the HRSST-2 requirements presented earlier, as well as others, described hereafter.”

by

“The result is the SVP-BRST, based on the SVP-B design (Sybrandy et al, 2009), with a strain gauge to detect drogue loss. In addition, the HRSST-2 requirements presented earlier are included, as well as others, described hereafter.”

Pg. 3: "Based on lessons learnt, ... a new type of drifter has had to be developed ...". This is overly-harshly worded. It’s a new sensor package for an existing type of drifter (the SVP drifter).

Indeed, this sentence will be modified as suggested (in other places, too). However, the data to be reported by SVP-BRST will eventually feature also 5-minute samples of 1-Hz data.

Pg. 5: "There are fewer large-magnitude differences are smaller at night..." Unclear; reword. The authors may wish to note Dong et al. (2017) [http://dx.doi.org/10.1002/2017JC012894] as well, although those differences are for a larger vertical separation of 5m.

We propose to reword this sentence as follows:

The differences are smaller at night and when the Sun is more than 30 degrees below the horizon.

Also, a reference to Dong et al. (2017) will be added as suggested. We note that the differences found by Dong et al. are indeed for a different layer, and not the top-most levels where the effects of cooling by wind (in normal conditions) may be expected, and where one expects a reversal in the water temperature profile in the top decimeters in the case of day time, light winds (consistent with the GHRSST schematic defining SST foundation). However, a reference to Reverdin et al. (2013), who had investigated the issue of temperature stratification effects seen by drifters, will be added.

Pg. 7: "Recent adjustments have actually recognized buoys as being cooler than ships in terms of SST". Isn’t this believed to be due to the sampling bias introduced by ships

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Discussion paper

avoiding intense storms which mix cooler waters to the surface?

We were not referring here to the sampling bias, but to the rather well-documented result that ship SSTs tend to be warmer than drifter SSTs, even when considering co-located measurements: to support this, we propose to add references to Emery et al. (2001) and Rayner et al. (2010).

Pg. 11: "What is more, during this period of fairly stable SST, we see that the sensor depth is at its greatest". This is confusing. The text had been talking about period B, when SST is far less stable than A. Are they now talking about period A again? The sensor depth appears to be relatively shallow during period B according to Fig. 9c. This sentence needs to be made more clear.

There is indeed some confusion in the text at this point. We propose to remove that sentence ("What is more…"), as it brings the discussion back to time period A, at a point when the text has moved to discussing time period B.

References to be added to the revised paper:

Dong, S., Volkov, D., Goni, G., Lumpkin, R., and Foltz, G.R.: NearâĂŘsurface salinity and temperature structure observed with dualâĂŘsensor drifters in the subtropical South Pacific, J. Geophys. Res. Oceans, 122, 5952–5969, doi:10.1002/2017JC012894, 2017.

Emery, W.J., Baldwin, D.J., Schlüssel, P., and Reynolds, R.W.: Accuracy of in situ sea surface temperatures used to calibrate infrared satellite measurements, J. Geophys. Res., 106, 2387-2405, doi:10.1029/2000JC000246, 2001.

Petolas, B.: Status and Performance of MetOcean Iridium Drifting Buoys, DBCP-29 Sci. Tech. Workshop, https://www.jcomm.info/index.php?option=com$_{o}etask = viewDocumentRecorddocID = 11847[Lastaccessed27November2018]$, 2013.

Rayner, N.A., Kaplan, A., Kent, E.C., Reynolds, R.W., Brohan, P., Casey, K.S., Kennedy, J.J., Woodruff, S.D., Smith, T.M., Donlon, C., Breivik, L-A., Eastwood, S., Ishii, M. and Brandon, T.: Evaluating Climate Variability and Change from Modern and Historical SST Observations. Hall, J., Harrison, D.E. and Stammer, D. (eds.) In Proceedings of OceanObs'09: Sustained Ocean Observations and Information for Society, Vol. 2, 819-829, European Space Agency, 2010.

Reverdin, G., Morisset, S., Bellenger, H., Boutin, J., Martin, N., Blouch, P., Rolland, J., Gaillard, F., Bouruet-Aubertot, P., and Ward, B.: Near–Sea Surface Temperature Stratification from SVP Drifters. J. Atmos. Oceanic Technol., 30, 1867-1883, doi:10.1175/JTECH-D-12-00182.1, 2013.

Rio, M.: Use of Altimeter and Wind Data to Detect the Anomalous Loss of SVP-Type Drifter's Drogue, J. Atmos. Oceanic Technol., 29, 1663-1674, doi:10.1175/JTECH-D-12-00008.1, 2012.

Rio, M.-H., and Etienne, H.: Global Ocean delayed mode in-situ observations of ocean surface currents, SEANOE, doi:10.17882/41334, 2018.

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