

Interactive comment on “A gridded surface current product for the Gulf of Mexico from consolidated drifter measurements” by Jonathan M. Lilly and Paula Pérez-Brunius

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We would like to thank the reviewer for their careful reading of our paper, and for their enthusiastic endorsement of this effort.

—Future users of these data, and readers in general, should pay careful consideration to the caveats noted in section 4. In particular, the drifters have various drogue depths, and some of the data sets do not include drogue presence flags. It would be very interesting to see a comparison of Fig. 2d with a similar map made from only the drogued drifters, and (for those without a drogue flag) drifters at wind speeds only below a reasonable threshold (using winds from a satellite product). That may extend beyond the

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scope of this study, but would illustrate the impact of drogue loss. The authors should make clear whether the undrogued data (for those subsets with this flag) were used for Fig. 2d, Fig. 3, etc. It's clear how the data are flagged in GulfDriftersOpen, but now if the undrogued data were used here.

The reviewer makes a good point about the importance of the drogue flag status. In recognition of this, we have extended the source binning in GulfFlow to include three separate classes: flagged as drogued, flagged as undrogued, and no flag available. This will assist future users in discriminating the possible effect of drogue presence or loss. We have also made explicit that all data points—drogued, undrogued, or drogue status unknown—we used in making the maps. Section 2 now includes the following statement when Fig. 2c,d are introduced:

“In both cases, all available drifter data has been utilized, regardless of drogue depth and whether the drogue was estimated to be present, absent, or of unknown status.”

And when Fig. 3 is introduced, we state

“The resulting mean flow estimate is shown in Fig. 3a, which again uses observations for all drogue depths and statuses. A subsequent assessment suggests this map, and the corresponding mean streamline plot in Fig. 3b, are likely not significantly influenced by bias associated with drifter sampling patterns or with potential drogue loss.”

Later, in Section 5.4, we follow up this statement.

“Of the hourly data points in GulfDriftersAll, 59% have been flagged during upstream processing as being from drifters that have retained their drogue—including those from shallow drifters whose physical designs (as discussed later) make it implausible for them to lose their drogues while still transmitting—while 16% are from drifters that have lost their drogues, and 25% from drifters of an unknown drogue status. Remaking Fig. 2d using only the drogued, undrogued, or unknown status data points (not shown), one does not see evidence for substantial artifacts arising from the use undrogued drifters.

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Rather, the maps from the drogued and undrogued drifters are quite comparable to each other. Similarly, re-making the circulation figure of Fig. 2d using only drifter drogued at shallow (1 m), intermediate (7.5 m or 15 m), or deep (45 m) depths (not shown), features that are sufficiently well sampled appear comparable regardless of the drogue depth.”

“Thus, while the effects of wind slip and drogue depth variation are no doubt present, they do not appear to be major factors in shaping the mean flow maps compared with the aliasing of annual and interannual variability. An important caveat to this assessment is that both the drogue status and drogue depths present spatial patterns that are largely disjoint, meaning that areas that are well sampled by one class are typically less well sampled by the others. A more thorough treatment of the errors associated with drogue loss and with the use of different drogue depths would be desirable, but is outside the scope of the present work.”

—38-40: "notwithstanding the global study of Laurindo et al. (2017) using exclusively Global Drifter Program drifters, no mean circulation maps for the Gulf of Mexico from a drifter-derived dataset have appeared in the literature since perhaps DiMarco et al.(2005) and Nowlin et al.(2001), .." Why does the map of Laurindo et al. (2017) or earlier versions cited therein, not count? This is unclear.

This has been rephrased as follows:

“Indeed, the only mean circulation maps for the Gulf of Mexico from drifter-derived datasets that we have identified in the literature since DiMarco et al. (2005) and Nowlin et al. (2001), at a time when the data coverage was a fraction of what it is today, are those appearing within global maps that are based exclusively on drifters from NOAA’s Global Drifter Program (e.g. Lumpkin and Johnson, 2013; Laurindo et al., 2017).”

—Section 5: it was very interesting to see the resolved vs. subgrid variance in these data. As noted by the authors, this highlights the energy levels in the submesoscale where large subgrid values are found - for example, in the Mississippi outflow. It would

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be interesting to examine if larger values are found in winter months, when the submesoscale may be stronger, in a future study.

We agree that this is an interesting idea, and indeed, the sub-gridscale variance maps do present seasonal variability, although we have opted not to mention this in the text as it is somewhat outside the scope.

The noted typo has been corrected.

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