

## ***Interactive comment on “Large to submesoscale surface circulation and its implications on biogeochemical/biological horizontal distributions during the OUTPACE cruise (SouthWest Pacific)” by Louise Rousselet et al.***

**Anonymous Referee #1**

Received and published: 4 December 2017

In seeking to explore causes and consequences of spatial gradients in the Western Tropical South Pacific, as part of OUTPACE, this manuscript tackles the role of physical advection at different scales. More specifically it investigates how the circulation at large, mesoscale and submesoscale relates to the observed biogeochemical and biological fields. This is important context for the OUTPACE experiment and should be published. There are issues I'd like to see addressed before I can recommend this.

The most significant issue is that the authors overstate the robustness of their results. It would always have been a difficult task to interpret the influence of the physical circula-

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tion at all scales studied given the linear nature of the cruise. The claim of demonstrating 'the influence of fronts in controlling the distribution of bacteria and phytoplankton' on the basis of 2 transects and a weak (but admittedly significant) correlation is optimistic. An example of this is the interpretation of Fig 6 on page 12 (lines 21-23). The Chl and other fields decrease over a much larger area than the location of the "tip". The "tip" could presumably have occurred anywhere along this section of decreasing biological fields with the authors drawing the same conclusion.

The combination of Results and Discussion risks being misleading as in several places statements based on direct observation are followed by conjecture written in a similar direct way, sometimes with neither data nor further analysis nor reference to support them e.g. discussion of El Nino and winds at end of Section 3.1 ("data not shown"), "eddy-eddy interactions might be responsible for the emergence of complex paths" on page 10 (line 11), lines 13-18 on page 10, talking of microbial growth with no observations of it on p13 line 9, "isolating areas with different biogeochemical characteristics" on line 17 on page 11. The latter in particular is over-played. Figures 6 and 7 are interpreted as showing coincidence of FSLE and organisms or segregating organisms but this might be guided by the eye of the faithful. Interpreting a "relatively better correlation" (page 11, line 27) as evidence for "not randomly distributed" with 75% of cases still not showing a match is another example as the upper threshold of 25% that is possible from satellite altimetry comes with no evidence to support it. I don't have a problem with conjecture as I think it's an important means of directing future research, but I would recommend pushing analysis further to back these thoughts up and either splitting Results and Discussion or else making much clearer where the reporting of observations ends and speculation begins.

The comparison of satellite-based advection proxies with drifter data seems to be a more significant piece of work than acknowledged here and I would like to see it rescued from the Appendix and given a more thorough account in the main body of the paper. As part of this it would be good to see a discussion of the possible bias of

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comparing trajectories of just a few real floats with many more virtual ones and an acknowledgement of the fact that the streamfunctions only really do a reasonable job compared to drifter trajectories for LDC (Figure A1) and why this might be so.

Minor:

- Page 3, line 6: I'm not sure I'd describe the surveyed area as 'relatively high kinetic energy' or 'intense' given that it only visits the high value areas intermittently in Fig. 1.
- Page 4, line 21: how was DIP turnover time calculated and why is it of interest?
- Page 7, line 33: "...and 0.2...as thresholds..."
- In several places 'west' and 'east' are confused. e.g. page 8, line 27; page 10, line 2; page 10, line 28
- Page 8, line 29: explain location/extent of Melanesia
- Page 11, line 7: I think it is debatable that chlorophyll shows a "reasonable correlation in Fig. 5. Scatter plots and correlation n coefficients would be more convincing.
- Figure 4: The backward and forward streamfunctions cross, particularly for LDA. This warrants comment.
- Page 22, Fig 5 middle: why are the data points for the TSG so far apart given that it is a flow-through system?
- Figures 6 and 7: it is difficult to relate top and bottom panels with one labelled in degrees and the other in km.
- Figure 7: what are the white squares? Missing data due to cloud?

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Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2017-456>, 2017.

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