

Interactive comment on “Physical and biogeochemical spatial scales of variability in the East Australian Current separation zone from shelf glider measurements” by A. Schaeffer et al.

Anonymous Referee #2

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This manuscript uses an extensive set of observations on the southeast Australian continental shelf to estimate the scales of variability of various factors. As discussed in the manuscript, knowledge of such scales is critical to designing observational and modeling systems that resolve key processes. I find no major faults in the manuscript, but have a number of questions and comments that the authors should address to improve the manuscript.

1. The description of gliders and the sampling (page 20104) is a bit too vague, and at times somewhat inaccurate. A citation to a general glider reference (e.g., Davis et al. 2003 or Rudnick, et al. 2004) would be helpful for the reader. The statement that glid-

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ers 'use seawater to change their buoyancy' is not particularly accurate; each type of glider changes its volume (by either moving oil between internal and external bladders or displacing seawater), thereby changing its buoyancy to rise and fall. This vertical motion is translated into forward motion by wings and controlling the glider's pitch, resulting in a sawtooth path through the water. [I'm sure the authors know this, but they should include it for the sake of unfamiliar readers.] Stating that the 'average horizontal displacement between two dives is around 200 m' is probably true, but somewhat misleading; shallower dives have closer horizontal (and temporal spacing) and so there are more of them, biasing the 'average horizontal displacement' small. Dives to 100 m should be separated by ~ 500 m in calm water; dives to 200 m by ~ 1000 m; and so on. Over the deeper part of the shelf, resolution is much less than the 200 m average reported, so I suggest the authors clarify this point.

2. Are salinity measurements from pumped or unpumped CTDs? If unpumped, how significant is salinity spiking in areas of large temperature gradients? How does this affect the scale analysis?

3. The definition of the structure function (Eq. 1) could be more clearly presented as $1/2$ the mean square difference between values at a given separation. The empirical formulation for the structure function (Eq. 2) needs more description, particularly the empirical constants.

4. Page 20105, lines 4-5: Why pairs within 0.1 degrees? Perhaps give the distance in kilometers for clarity.

5. Regarding homogeneity of the statistics: Lumping observations together to calculate structure functions assumes homogeneity in the statistics. I would expect that there is a change in scales from the inner to outer shelf that could perhaps be diagnosed from these observations. Lack of homogeneity in the vertical is more concerning; surely statistics in the mixed layer differ (vertical scale \sim mixed layer depth?) from those in the thermocline (small vertical scale?) and from those below the thermocline (longer

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vertical scale?).

6. There is a good bit of flipping back and forth between 'semivariogram' and 'structure function'; best to pick one and stick with it.

7. I find the terms 'sill', 'range', and 'nugget' difficult to follow, though the authors make a good effort to clarify them. 'Range' is particularly troublesome in usages like (page 20108, Line 25) 'mean temperature ranges...' since range typical means the difference between minimum and maximum value of a variable. Consider not using these particular terms.

8. Page 20113, lines 12-13: this is not a complete sentence.

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