

## ***Interactive comment on “Physical-biological interactions to the west of Hawaiian Islands: impact of submesoscale dynamics on biological productivity” by P. Xiu and F. Chai***

**Anonymous Referee #1**

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General comments: In this paper the authors explore the relation between the eddy activities and biological productivities to the west of Hawaiian Islands. By discussing links among Eddy Kinetic Energy (EKE), finite-size Lyapunov exponent (FSLE), chlorophyll, primary productions (chlorophyll-based: VGPM PP; carbon-based: CbPM PP), mixed-layer depth (MLD), they claim that there's a positive correlation between eddy activities and CbPM PP. The manuscript is generally well written and clearly structured. However, I found those linkages between discussed variables relatively weak and it is difficult to believe the robustness of the conclusion. At this stage, it is hard for me to recommend publication in Biogeosciences.

Major concerns: 1. Page 6, line 122: There is a clear mismatch of spatial patterns of C5347

mean FSLE and EKE. I would not call it “similar”. 2. Page 7, line 154-155: Spatial correlation between carbon-based primary production (CbPM PP) and Eddy Kinetic energy/mixed layer depth is weak. High CbPM PP is found between 21°N–24°N, but high EKE locates between 18°N–24°N and low MLD appears between 22°N–30°N. 3. Page 7. Line 160: Choosing two boxes to calculate correlations between EKE and MLD, and wind speed and MLD is arbitrary. Justification is needed. How sensitive are the results to the sizes and locations of the boxes? 4. Page 8, line 167: “. . . enhanced CbPM are associated with high FSLE values.” is not clear to me. Again, spatial mismatch. Figure 5 is not showing spatial correlations from climatological perspective, and the actual plot (color bar missing) is not discussed in the text. 5. Page 8, line 179-181: Positive CbPM PP and negative MLD from year to year do not necessarily suggest the relations among high EKE, high CbPM PP and low MLD. You are claiming this based on previous results, which are not robust. Besides, how large is the correlation coefficient between CbPM PP and MLD on interannual scale? 6. Page 9, line 187-194: Interesting discussion on decadal oscillations. However, a 10-year record is too short to characterize the relations. Considering the small degrees of freedom of the time series, how significant are those coefficients?

Minor comments: 1. Page 2, line 37: should Fig.1 be Fig.2? 2. Page 5: Original temporal and spatial resolutions of AVISO map are 7-day and 1/3° (not 0.25°). How reliable are the interpolated fields in calculating FSLE? What is the characteristic spatial/temporal scale in this region?

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