

Interactive comment on “Wind-induced upwelling in the Kerguelen Plateau Region” by S. T. Gille et al.

Anonymous Referee #1

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This manuscript by Gille et al. provides an overview of large scale wind stress curl fields and SST and some analysis of wind stress, upwelling, mixing and SST. Though there are limited contributions to novel science and methods, the manuscript is an essential part of physical background and forcing mechanisms in the Kerguelen Islands and its vicinity and necessary information needed for the KEOPS 2 project. I recommend this manuscript for publication on BGD. Here are some specific comments:

1) Abstract: “. . .High wind speeds typically correlate with cold sea surface temperatures, implying that wind mixing leads to enhanced vertical mixing. Negative wind-stress curl also correlates with cold SSTs, implying that Ekman pumping can further enhance upwelling, and coupling between winds and SSTs associated with mesoscale eddies can locally modulate the wind-stress curl. . .” This is a general concept and not

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necessarily included in the abstract while it is difficult to understand from this abstract what detailed studies conducted in this manuscript. There is a need of outline what this manuscript studied and conclusions.

2) Introduction: In the first paragraph, a better literature review is needed such as the papers by Measures et al (2010) on iron source and transport in the Drake Passage, by Hopkinson et al (2007, 2013) on iron limitation and enhancement on primary production, Park et al (2008) on vertical mixing of iron, van Beek et al (2008), Charette et al (2008) and Dulaiova et al (2009) on iron source and horizontal/vertical transport. The literature provides a useful background information for the study in this manuscript.

3) Page 8375, last paragraph: “. . .While wind-driven upwelling appears to play a central role in determining variability. . .” Suggest changing “central role” to “one of key roles” because there are many other important processes such as wind mixing as discussed, and upwelling associated with fronts and eddies.

4) Page 8378, line 1: “. . .Fig. 1f shows mean SST from . . .” Suggest changing to “Mean SST from . . . is shown in Fig. 1f.” This suggestion is also applied to other “Fig. xx shows . . .” in this manuscript.

5) Page 8378, the 2nd paragraph: “. . . Sea surface geostrophic velocity anomalies (relative to a temporal mean from 1992–1999) were produced by the SSALTO/DUACS project, which computes them based on a multi-satellite altimeter product . . .” I have some difficult to understand what is the definition of “which.” Do you mean “. . . Sea surface geostrophic velocity anomalies (relative to a temporal mean from 1992–1999) were produced by the SSALTO/DUACS project based on a multi-satellite altimeter product?”

6) Methodology: Reading through this section, my comments are (1) most of information is well developed and used in the past so that they just need to be mentioned with citations, (2) the justification using these variables based on previous studies by others should be mentioned in the Introduction recognizing their original contributions, and

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then validated these variables in the Discussion section, and (3) because the methodology will be relative short, the data and methods can be combined into one section.

7) Results: Though I am in favor to mix results from the study, validation of results, discussions and comparisons to literatures in one section, there is a need of a clear pattern for a reader to follow. If it is getting too difficult, the traditional separation between results, discussion and summary is a better way to organize the manuscript. I am not against the current way to organize this section which the authors decided to take. But I do suggest having a clear organization from results, comparison to others and hypotheses based on results. For example, in Page 8380 Section 4.1, the first paragraph starts from a literature review, and then followed by discussions on Figure 2. It is difficult to understand if the results in Figure 2 supports the results from literature, or they agree/disagree to each other.

8) Summary and Discussions: There are significant discussions in the Results section on variations of stress curls and correlations. But the discussions on the comparison of this work with results from other studies are quite weak. There are a series of studies done by Park et al on small-large circulation patterns and mixing, and by McCartney and Donohue (2007) on large circulation. There are significant similar patterns in results between this and those studies.

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