

Dynamics of island mass effect from space. Part I: detecting the extent

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Summary

The manuscript titled “Dynamics of island mass effect. Part 1: detecting the extent” describes updated algorithms to detect mesoscale and sub-mesoscale processes near remote islands and atolls, termed the “Island Mass Effect” (IME) using satellite remote sensing data. The authors state that existing algorithms for detecting the IME (Messie et al., 2022) underestimate the effect due to using low temporal and spatial resolution satellite data. This study utilizes remote sensing data from multiple sensors to increase temporal resolution and apply a different atmospheric correction scheme (POLYMER) that results in more data. These updated IME algorithms are applied to merged satellite data collected over four island groups in the South Pacific. The results indicate the ecological influence of the IME near these islands is more significant and dynamic than previously thought. The results indicate large phytoplankton blooms that can be advected 1000 km away from their source, seeding the nearby oligotrophic ocean. The overall results of this study indicate that the IME has a greater impact on food web dynamics and biogeochemical processes for waters in close proximity to these remote islands. The authors recommend future studies use higher temporal and spatial resolution satellite products and modeled surface currents to better identify and track sub-mesoscale filaments and eddies associated with the IME around remote islands.

Major comments

Introduction

- No major comments

Methods

- The Methods need substantial reorganizing and clarification:
 - More details should be added to the POLYMER atmospheric correction description. Why does it improve data recovery in areas impacted by glint and adjacency effect? What version did you use? Where was it downloaded from? What was it run on? What flags were used? What ancillary data was used?
 - You should also be citing this paper as well: François Steinmetz and Didier Ramon "Sentinel-2 MSI and Sentinel-3 OLCI consistent ocean colour products using POLYMER", Proc. SPIE 10778, Remote Sensing of the Open and Coastal Ocean and Inland Waters, 107780E (30 October 2018); <https://doi.org/10.1117/12.2500232>
 - The headings in the Methods section seem disorganized to me. For Section 2.1 Level-3 Multi-satellite composites, you start with an intro paragraph and then have several subheadings. Consider merging the intro paragraph into the 2.1.1 section. The 2.1.2 In situ data sub-section seems out of place in this section,

consider adding a new section just for in situ data and matchups. Perhaps this organization with just two sections?

- 2.1 Level-3 satellite products computation
 - (This section will include the writing in the opening paragraph. 2.1.1, 2.1.4, 2.1.5)
- 2.2 In situ data and matchups
 - (This section will include section 2.1.2 and 2.1.3)
- The description of running POLYMER and l2gen should be in same paragraph/section. Right now, you have text on l2gen in the in situ and satellite matchups section which seems out of place.
- In Section 2.1.1, there is no description of how data was processed to Level-3 format. It seems to stop at L2.
- Figure 1 seems okay in the Methods because it is a figure of the workflow. However, should Figures 2-3 be in the “Assessment” section since it is showing the results of the workflow? I don’t think you should be referencing results figures in the Methods, save that for the Results (or “Assessment”).

Assessment

- Some of the text in the Assessment section would better belong in the Methods such as the description of merging and binning and the chl iteration step size

Minor comments

The title on the preprint PDF is different than what is in the system.

Line 5: Consider adding *a* after chlorophyll. Same on Line 20.

Line 8: Define POLYMER

Line 18: The way this sentence is written makes it seem like “their wake downstream..” refers to the winds and currents. Reword to make this more clear.

Line 28: Consider adding the citation to the end of this sentence.

Line 35: Consider changing “They” to “The authors”

Line 77: Should define these satellite mission acronyms

Line 79: More information on the POLYMER atmospheric correction scheme should be included here. See major comment above.

Line 84: Include the time frame of data collected. What is “all”?

Line 84: Why did you download L1A data instead of L1B? Review differences here:

<https://oceancolor.gsfc.nasa.gov/resources/docs/product-levels/#:~:text=Level%201B%20data%20are%20Level, had%20instrument%20radiometric%20calibrations%20applied.&text=Level%202%20data%20consist%20of, the%20source%20Level%201%20data.>

Line 85: What Copernicus repository? Provide link(s).

Line 88: What did you use to project the satellite data onto a plate-carre reference grid using NN interpolation?

Line 91: Confused on how this is surface-integrated chl_a when you're just summing chl_a concentration in each pixels by the area? Where does depth come into play?

Line 96: Not sure you need to hyphenate hyperspectral

Line 110: Capitalize Python

Line 112: You describe how all satellite data is processed to Level-3 using same scheme as aforementioned but this was never described.. You don't introduce the terms reprojecting, nudging, or merging until now. What is nudging?

Line 114: OCSSW stands for Ocean Color Science Software

Line 119: Consider adding the satellite overpass times for each sensor. How do they match up with the 10:30am local time for in situ data collection?

Line 120: The sentence about recommended Level-2 masks needs a citation. Masks or flags? Did you use recommended L2 or L3 flags? <https://oceancolor.gsfc.nasa.gov/resources/atbd/oc2flags/>

Line 120: Are you working with Rrs or nLw? Are these both included when running l2gen and POLYMER?

Line 136: What is GlobColour?

Line 138: Why would this described merging strategy require simulation of 510 nm band?

Line 162: This sentence should have a citation

Line 168: Did you use the 300m spatial resolution of OLCI?

Section 2.1.4: Did you merge data from all 6 satellite sensors? What spatial resolution did you use for merged product? If 1km, then OLCI data was "upsampled"?

Line 174: Keep consistent- change to 1 km

Line 175: Need citation

Line 176: Arc-seconds seems like a weird unit here.. can you convert to degrees or m?

Section 2.2.1: What did you use to create masks and "manually correct" discrepancies? Python? GIS?

Line 207: This needs a citation

Line 247: Are the equations in the paranthesis supposed to be exactly the same?

Line 249: What does SEM stand for here?

Lines 307-310: Do these sentences belong in the Methods?

Line 311: I don't think these figures are considered time-series? They are just snapshots, right?

Line 435: Change to [chl_a]- keep consistent

Figure 2: I wonder if labeling the islands on the map will help orient the readers?

Figure 4: What does "average or properties within the IME" mean?

End of review