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Interactive comment on "A multiscale ocean data assimilation approach combining spatial and spectral localisation" *by* Ann-Sophie Tissier et al.

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We thank referee #2 for his/her careful reading of the manuscript and for his/her appreciation for the work done in the paper. Comments are reproduced in bold italic to ease the reading. Text changes in the manuscript are in italics.

Answer to general comments

The manuscript is clearly written and presents a data assimilation approach focusing on more accurate retrievals of the large scale SSH components from the data.

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Discussion paper

The authors should better justify the use of eigenmodes of the laplacian on a sphere for scale separation. These basis functions are natural in atmospheric applications, but in the oceanic data assimilation (into regional configurations in particular) it might be better to employ alternative expansions (e.g., laplacian eigenfunctions defined for the domain in use). Apart from being orthogonal, they have number of additional attractive properties, including spatial inhomogeneity of the supported scales and their implicit relation to model dynamics (e.g., tides).

Yes, we agree with the reviewer that this point was not sufficiently explained in the paper. The following paragraph has been added in section 3.2 to better justify the choice of spherical harmonics to separate scales :

"The use of spherical harmonics is not the most natural way to separate scales for fields that do not extend over the whole sphere. In principle, it would for instance be better to use the eigenfunctions of the Laplacian operator defined for the model domain. They would account for the land barriers and would display a better relation to the system dynamics. However, they would also be much more expensive to compute than the spherical harmonics, and would need to be stored and then loaded each time they are needed to separate scales. This is why we preferred using spherical harmonics in this study : they make the method numerically efficient and they are sufficient to obtain a relevant spectral decomposition of the input signal."

Answer to minor comments

1) Referring to the impact spatial localization, I would rather say that large scale correlation structures are "heavily suppressed", but not "removed" or "not used" in the analysis associated with spatially localized covariance.

Yes, this is true. Long-range correlations are removed, but the something certainly remains from the large-scale correlation structure. This has been corrected in the paper.

2) grammar issues (p.2: "spatial space", l.30, p.4: lines 7,14,20 etc..; caption to Fig. 11: description of panel c missing..). please correct

Yes, thank you. This has been corrected. In particular, we changed "spatial space" and "spectral space" to "spatial domain" and "spectral domain" everywhere.

Interactive comment on Ocean Sci. Discuss., https://doi.org/10.5194/os-2018-132, 2018.