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Comment

Interactive comment on “Wavelet-based spatial comparison technique for analysing and evaluating two-dimensional geophysical model fields” by S. Saux Picart et al.

S. Saux Picart et al.

stux@pml.ac.uk

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The authors would like to thank the reviewer for the helpful comments and questions. We have addressed them all and try to improve the manuscript accordingly.

General review

The manuscript describes a technique to compare spatial distribution of two geophys-

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ical data based on a wavelet analysis. The technique improves and adds significant values to the original method suggested by Casati et al. (2004) by making their method generic, so that a priori knowledge of the dataset, which often differs depending on a specific field of science, is no longer required in the method. As a result, the technique shown in the present manuscript became widely applicable to many other fields of geophysical sciences. This is a significant advancement and contribution to a geophysical community, and would provide more applications and benefit to a wide range of GMDD audience. In conclusion, I would recommend this manuscript for publication in GMDD.

Specific comments

L19 P3166: At this point, “the orthogonality” needs to be explained (i.e. the orthogonality in what sense?).

A sentence has been added to clarify the implication of a loss of orthogonality: “...resulting in a loss of orthogonality hence skills at scales subject to occlusion were affected by smaller scale errors”

L8 P3167: I guess “the quantile of the data number distribution” may be more explicit phrase than “the quantile of the distribution”.

This has been changed accordingly.

L13 P3168: Just to be consistent with other variables, ζ_0 (matrix) should be a bold font? (Same in the rest of manuscript)

This has been changed in the whole manuscript.

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L21 P3168: *In the numerator of Eq. 3, there is a term $\langle Zq\zeta_0 \rangle$ where ζ_0 is a weight image that explains valid and invalid data points according to Eq.2. How missing data in the original data set (e.g. satellite SST or Chla) is reflected in Zq at the first place?*

In the original dataset, missing data can be any finite number. In fact ζ_0 is a mask that is applied to each level of decomposition. So the decomposition process any cell/pixel that is masked by ζ_0 is not going to be taken into account.

L16 P3169: *Sigma sign in Eq. 6 misses a range of the summation.*

The summation is in fact done over the whole domain, this was not clear in the first version of the manuscript. We have now added a line after equation 6 to explain that.

L20 P3171 or Fig. 2: *What is the significance of a difference between the skill scores, say, 0.6 and 0.7 (or 0.4 and 0.6 etc.)? Please explain to help a reader.*

The skill score (SS) is defined as the mean square error (MSE) relative to the mean square error of a random no-skill simulation (MSE_{random}):

$$SS = (MSE - MSE_{\text{random}}) / (MSE_{\text{best}} - MSE_{\text{random}})$$

MSE_{best} being the mean square error of a perfect simulation ($MSE_{\text{best}} = 0$). We then have:

$$MSE = (1 - SS) MSE_{\text{random}}$$

Therefore a skill score of 0.6 would mean that the MSE is 0.4 MSE_{random} .

A sentence has been added at the end of section 2.2.3. to help the reader understand the skill without adding more equations: "The skill score is in fact defined as the mean square error relative to the mean square error of a random no-skill simulation (see Casati et al, 2004)."

L7-12 P3173: *Is this the reason? I may also be because the satellite data were calibrated to the optical-depth-averaged in situ measurements of Chla, rather than that a*

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satellite signal to estimate Chla originates from a certain optical depth.

The text was suggesting that the satellite signal used to estimate chlorophyll was coming from one particular depth, which as the reviewer pointed out is not right. The paragraph has therefore been rephrased for clarity.

L15 P3173: *This statement implies that a value of the spatial scale (i.e. a value of y-axis in Figs.2-3) can actually represent a specific area or region in a data set analysed. Similarly, a value (actually quantile) on the x-axis also represents a specific area or region (See Fig. 1). Given that, how a skill score for every combination between a special scale and SST/Chla in Figs. 2-3 could be calculated? (Why each box element in Fig2-3 can have a value?)*

One point on the skill-score plot does not correspond to any particular region, it is only by looking back at the original datasets (i.e binary difference map for each quantile) that we can identify what cause the low skill score during June-August on the 5th quantile.

Fig. 4: *Although I know that it is not really necessary, it may be reader-friendly if the scale for the figure is coloured. Also it would be nicer if the location of threshold is actually drawn in the colour plot, although it should be read from c) and d).*

We appreciate the comment of the reviewer, but we think that this figure is a conceptual example and putting any number on it would generate confusion.

L19 P3174: *"i.e. the orthogonality...". This explanation of the "orthogonality" greatly help readers to understand, if it appears at the earlier stage of the manuscript.*

We have added an explanation of the orthogonality at the beginning of the manuscript as well.

L27 P3174: *"it enable" - "it enables".*

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Changed in the manuscript.

L11 P3157: *"Optical wavelength satellite data" - consider another word.*

We feel that this is the correct term to use, and we cannot think of an other appropriate one, therefore we have chosen to keep it.

Interactive comment on Geosci. Model Dev. Discuss., 4, 3161, 2011.

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