**Biogeosciences
Discussions**

Interactive comment on "Investigating the effect of historical treatments on wheat yield over multiple spatial frequencies" *by* A. E. Milne et al.

In this study wavelet methods are used to investigate the impact of historical nitrogen fertilizer, irrigation treatments and cropping on wheat yield. Specifically, maximum overlap discrete packet transform (MODWPT) is applied to identify spatial frequencies at which, effect of applied nitrogen and melon cropping can be detected on wheat yield. While the application of the method is original and the results are valuables, the manuscript requires considerable revision to bring it to the standard of a publishable journal papers. Below, I listed some comments that the authors might want to consider.

Comment 1: The abstract content is too technical and the style is not appropriate for an abstract. Too much detail about the experimental methods (lines 3-8). Hypotheses formulation such as "In this example we have good reason to believe this: " needs to be completely rewritten. Also sentences like "this analysis is ideally suited to the

elucidation of…... stationary in variance" are not very clear and informative for an audience who is not familiar with the wavelet methods.

Results need to be better highlighted in the abstract.

Introduction:

Comment 2: The introduction needs to be reconsidered and extended. As it is now, it does not give a good overview of neither similar experimental studies, nor applications of wavelet transform within similar contexts. Except for some references on applications of wavelet methods, there is hardly any relevant reference to be commented there.

Comment 3: The information at lines 35 to 60 is part of the methods and it should not be presented there.

Comment 4: Some words are missing: line 28, able "to" understand and line 34 insight "on" their effects.

Methods:

Comment 5: line 172, the cost function should be specified there.

Results:

Comment 6: Exploratory data analysis lines 206-209. ANOVA tests should be performed for the statistical significance of the different factors.

Comment 7: Subsection 3.2 is still exploratory data analysis so it should be presented under section 3.1.

Comment 8: Sections 3.5 and 3.6. These are the main results. While the findings are very interesting, more effort should be given in the formulation of the results. What the wavelet method tells in addition to a standard factorial analysis (in practical terms)? If the selling point is the method (and it should be), more emphasis should be on that.

Comment 9: Why so unstable estimates in the WP variance (Figure 7). Is this normal for this type of method? Maybe, it's worth bringing this in the discussions.

Conclusions:

Comment 10: Lines 272: " At higher frequencies there is negligible variation..." what does this means in practical terms, it should be explained there.

Comment 11: Same as for the introduction; this section needs to be expanded, we expect here to see some critical comparison with previous studies, is this the first time the method is applied within such a context, if that is the case, then the authors should clearly state it there.

References:

Comment 12: Milne et al. 2010, should removed if the paper is still under review.

Figures

Comment 13: In figure 4, indices (a) and (b) need to be added to the figure.

Comment 14: Figures 7 and 8. It should be stated in the legend (as well as the result section) that the dashed lines represent 95% confidence intervals

Interactive comment on Biogeosciences Discuss., 7, 2143, 2010.

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