

Response to reviewer's comments on "Techniques for analyses of trends in GRUAN data" by G. Bodeker and S. Kremser

In each case the reviewer's comment is repeated in blue with our response in black.

Response to reviewer #3

Specific comments

11962, 20: Are the coefficient estimated using a multivariate least square regression? Please specify.

Yes. We have now clarified that in the text.

11965, 22-27 (to 11966, 15): Something doesn't sound right. Please check signs and subscripts (e.g. at line 2, X should be negative and BFT2 should be BF2 instead; at line 11 in the right term BFT3 should be BF3, at line 15, in the right term BFTn should be BF_n).

We have corrected the equations accordingly.

11976, 24: It would be interesting to investigate quantitatively the sensitivity to orthogonalization order, in the synthetic and/or the real measurements. The authors have all they need, so I'd strongly encourage to do that.

The reviewer is correct in stating that the order in which basis functions are orthogonalized has an impact on the regression model fit coefficients. While in an academic sense it may be interesting to quantitatively evaluate the effects of orthogonalization order, there is nothing to be gained in terms of utility in the context of this paper. Consider this example: If we were to orthogonalize the basis functions in the order of offset, QBO, trend etc. we would have no basis function that represents the pure linear trend – the linear trend basis function would be modified to be orthogonal to the QBO which almost certainly has a non-zero trend. So now we would have a regression model from which we cannot extract a linear trend which is the term we are interested in. If we more realistically maintain the order of offset, trend and then other basis functions whose order we shuffle, this has no impact on the trend fit coefficient. Therefore, while such an investigation can easily be done, there is nothing of value to be learned by investigating the re-ordering of the basis functions for orthogonalization. Including such an assessment would be an unnecessary diversion in this paper which we are trying to keep as straightforward as possible. We have therefore not followed the recommendation by the reviewer.

11977, 28: "then interpretation (1) above could be excluded"; maybe I'm lost, but shouldn't be interpretation (2) to be excluded?

The reviewer is correct and we have corrected that error.

The whole discussion is difficult to follow. Please rephrase.

We have added to this section/discussion, and reworded it, to improve the clarity.

11988, Figure 7: Only trends that are significant at 2-sigma level are shown. I'd suggest to make this clear in the figure caption as well.

We have now made this clear in the figure caption.

Technical corrections:

11975, 5: Please, explicit QA/QC.

We have included the expanded form of the acronym, i.e. Quality Assurance/Quality Control.

11977, 24: "on it's own" maybe a typo?

We have corrected that mistake.