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Atmospheric Measurement Techniques Discussions

Interactive comment on "Evaluating two methods of estimating error variances from multiple data sets using an error model" *by* Therese Rieckh and Richard Anthes

Anonymous Referee #2

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General comments
The authors compare error variances as generated from the three-cornered hat (3CH) and two-cornered hat (2CH) methods from simulated and real data sets. As expected, the 3CH results were less noisy and less sensitive to biases. The authors do a good job of presenting their widespread findings (from simulated and correlated data, as well as collocated real observations); however, I have some comments and suggestions that I would like to see addressed in the their revision.

The 3CH assumes independent, uncorrelated observations, and its usefulness can be

limited by the sample size, as well as the variability the source data itself. The authors do mention several times that finite sample sizes will cause the cross-correlation terms to be non-zero. However, they do not seem to address the point that the error variances produced by the 3CH method (and likely 2CH as well) can be dominated by a data source that is largely different than the other two in the trio being analyzed. Thus, the size of the relative errors from the RO, GFS, ERA, and RS observations comes into play in the accuracy of the 3CH results in Section 6.

Some of the equation development is either incomplete or hard to follow. For example, on Pages 11-12, the authors derive equations for the estimated error variance of X,Y,Z. They start with the traditional equation for the variance (equations 2,3, and 4), but cross out some terms, then neglect the covariance term in the next step (because it's the 3CH estimate), then plug it back in. It took me a while to put it all together, so maybe the authors can add some additional text or format differently to help the reader along.

The authors also seem to already possess knowledge regarding climatological processes and models to set up and normalize their model profile (section 3.1). Perhaps these numbers are taken from some of their previous work, but some additional text or references pertaining to the source or reasoning behind these numbers would be helpful.

Line edits
The grammar and sentence structure is quite good and easy to read, I only have a few line edits to offer.
Page 2
Line 11: Should be W.J. Riley, not W.J. Wriley
Line 13: 3CH, not 3HC

Page 8
Line 17: Should x,z be capitalized?
Page 9
Line 3: Should be There, not These

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