Atmos. Meas. Tech. Discuss., 7, C4860–C4863, 2015
www.atmos-meas-tech-discuss.net/7/C4860/2015/

Atmospheric Measurement Techniques
Discussions

Interactive comment on "New calibration noise suppression techniques for the GLORIA limb imager" *by* T. Guggenmoser et al.

Anonymous Referee #1

Received and published: 9 February 2015

General comments:

A principal component noise filter is applied to the calibration measurements of the GLORIA limb imager. This is a very interesting application, which is nicely introduced in the paper. However, the details of the proposed method are somewhat ad hoc and, in my opinion, not always properly justified. Furthermore, some information (for example the typical temperatures of the two black bodies or how many calibration measurements are obtained in each calibration sequence), which could be useful for a better understanding of the subject are omitted.

Specific comments:

Section 2.1: Three different calibrations are achieved by using two of the three (D,

BBC and BBH) calibrations measurements to determine the calibration coefficients. It seems natural to use all three calibration measurements simultaneously to derive a single calibration using a line fitting the three points best in a least squares sense. There might be reasons why this is not done, but as long as the reader is not told, he might wonder why not.

Figure 1: Shows that the parallelization speed up of a single measurement is far from perfect, so the reader asks himself why bother when, supposedly, different measurements can be processed completely independently of each other.

Eq.(7): Was found by trial and error and does not always seem to be appropriate (P.12659,L6), a very natural and more generic alternative would be to use a low rank approximation determined by an SVD. Has this been tried?

P.12659,L17: I am not sure that the size of the NCO correction can be compared with the size of recorded spectra, which apparently has been done, to arrive at the quoted 8%. The NCO errors arise from extrapolation of noise in the BB measurements, but surely the effect of this noise is lower at the temperature of the recorded scenes.

Figure 2: [bbbb_nh] As discussed in the paper the noise originates from noise in the BB measurements. It is a major weakness of the paper that this plot has not been redone after the PC noise filtering of the BB measurements.

P.12660,L13: Replace "Contributions to the original data which are fully uncorrelated, such as white noise, are distributed evenly among these principal components," with "If the original data is noise normalised, such that the random noise becomes uncorrelated and uniform (white), any direction will carry the same amount of noise,"

Figure 3: There is a distinct shape of the IG, (a bit simplified) being highest in the bottom left corner and decreasing towards the upper right corner. What is the explanation for this? Even if no explanation is known, this should be mentioned in the paper.

Figure 5: The green curve is almost always to the right of the blue curve. This does

not seem right - when bbbb_nh is fitted with a pseudo-hyperbola we do not expect to introduce a bias, also not when averaged over rows.

P12661,L1: True, that a training set based on previous measurements is not necessary. But it would likely be better - for instance by increasing the number of spectra, the noise distribution would improve - and faster.

P.12662,L1-2: I am puzzled by this sentence and the long-winded steps of "normalisation" it leads to. My approach would be to apply the PC noise filter directly to X (with noise normalisation of course) and would expect that the detector differences are easily accounted for by a few PCs. I do not have any evidence for this, but the authors do also not present any evidence of the benefits of their "normalisation".

P.12663: Yes, the noise can be estimated by PC techniques, but to get the full noise, the part which is retained in the first 400 PC scores must be added. To estimate this part of the noise a first guess of the full noise is needed (with possible iterations). In parallel to this I was wondering if if wouldn't be possible to derive noise estimates directly from the BB measurements?

Figure 10: What is meant by "Normalised covariance eigenvalues"? In any case this plot seems to confirm that the noise normalisation is not correct. Not even consistent between DS and BB. I would expect the noise for the two to be different, thus needing different N matrices, but this is not discussed in the paper.

Figure 14: This plot is showing a single spectrum. Yes? So how can you speak about a bias here?

P12666,L3: Really it is not the homogeneity (a simple average would be enough to capture this), but the spectral correlation.

Figure 15: It is misleading to refer to the reconstruction residual as reconstruction error. Reconstruction error normally refers only to the fraction of the signal which is lost in the residual.

Technical corrections:

Eq.(9): Isn't NCO missing here?

Eq.(12): Shouldn't X"' be X"'* to get the dimensions right?

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 12649, 2014.