

## ***Interactive comment on “Investigating bias in the application of curve fitting programs to atmospheric time series” by P. A. Pickers and A. C. Manning***

**Anonymous Referee #2**

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The authors bring forward an important issue—decomposition of atmospheric time series—that has been largely overlooked in previous studies. The comparison of three curve fitting techniques is informative, and the recommendations are helpful for the research community.

A main reason why most previous studies only applied one curve-fitting program is probably due to the availability of the programs. The STL method can be easily implemented in the R programming language or FORTRAN (<http://svn.r-project.org/R/trunk/src/library/stats/src/stl.f>), and it is likely the most popular of the three. CCGCRV (or CCGvu) is available on the NOAA/ESRL website the authors men-

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tioned (currently the link is not working), and being a stand-alone program is one of its major advantage. There are a few other sources where the program is available, for example, from <ftp://ftp.cmdl.noaa.gov/pub/john/ccgcrv>, where the documentation gives a default value of 50 for  $f_s$ , the same as the “typical value” used in this study but different from 80 on the NOAA/ESRL website (80 is used in Buermann et al. 2007). In comparison, a quick search on “HPspline” shows only a few results (does this method go by another name since the Keeling et al. (1989) paper?). For a researcher who is unfamiliar with R or cannot get CCGCRV, the choice of curve fitting method may be limited. Some guidelines on how to retrieve the programs (either from public domain or by contacting the authors) would be very helpful for a potential reader. Hopefully this paper can prompt all three programs being made available and easy to use, and that could really improve how curve fitting would be done in future.

Even with one curve fitting package, sensitivity tests of the input parameters are important. As shown in section 3.5, the difference introduced by setting different input parameters is comparable with using different methods. I think this is a very important finding of this paper, and recommendation #11 can be better highlighted. It would be very interesting if the authors conduct more thorough sensitivity testing, and show some figures similar to Figures 1-9 (three or five curves of the same method, but different input parameters). Such analyses could set a great example for future studies.

The paper is well written, and the authors did a great job explaining the HPspline and CCGCRV methods. However, the description of STL method could be improved. In Step 3, a low-pass moving average filter should be applied twice instead of once, according to Cleveland et al. (1990). It is also not clear how the seasonal smoothing in step 2 is extended, and whether Step 3 is applied on each annual cycle-subseries or the whole time series. Although the questions can be addressed by reading Cleveland et al. (1990), some clarifications on several key details can be added in this paper. The authors are correct to state that the STL program is unable to recognize the artificial gaps, however this is a limitation of the currently available programming code – no

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missing values are allowed due to computation speed consideration (bottom of page 21 in Cleveland et al. 1990), not a limitation of the STL method itself (see page 5, design goal 4 in Cleveland et al. 1990). I think this should be stated in the text, and hopefully a future version of STL can handle missing values better.

I hope this paper can have a great impact in the community, and I look forward to seeing the revised version of the paper.

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