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Nonlinear Processes in Geophysics
Discussions
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Interactive comment on "Efficient Bayesian inference for ARFIMA processes" *by* T. Graves et al.

T. Graves et al.

christian.franzke@uni-hamburg.de

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Dear Michel,

Thank you very much for reviewing our manuscript and your valuable comments.

The reviewers comments are in italics while our responses are in normal font.

1) p. 578 : Introduce new line before "fXtg is said to be an auto-"

Done.

2) p. 579 : Before the "restriction |d|<1/2" ... : the condition sounds awkward given that the previous paragraphs concerns the ARMA process and not ARFIMA. Introduce a sentence clarifying that we return to the discussion of the more general ARFIMA

process.

Done. Much of this has been moved to the appendix, and extra text has been added to clarify which part of that expression applies to the ARFIMA model, Eq (1), and which to the ACF discussion preceeding.

3) p. 581 : approximate expression after eq. 11 : there is a bit more than the Stirling's approximation involved here, since one also needs the asymptotic limit d « k.

Yes, there is more involved but we thought it might be a distraction to lay out the details considering we were summaryizing textbook results. In any case, these passages have been moved to our Appendix.

4) p. 581, l. 19 : "And noting that" : add "in this case" (to be specific).

Done.

5) p. 582, l. 11 : This "f" introduced here is not the same as the spectral density function introduced eq. (5). Consider having distinct notations for the two quantities.

We have changed the notation for the spectral density function.

6) p. 582, l. 15 : You probably meant "there is no lambda":

Yes, we corrected this. Thank you for spotting this.

7) p. 583, l. 21 : Is this common practice to denote the statistical software "R" using the mathbb font R? I have never seen this before.

Corrected. Thank you for spotting this.

8) p. 584, l. 1 : Make it clear that the likelihood is conditional on "xA".

Done.

9) p. 584, l. 23 : The authors may want to further justify their prior choice for sigma by observing that the asymptotic limit is equivalent to a log-uniform prior.

Done, thanks.

10) p. 585, ll. 19-20 : The variables mu and sigma may be mistaken for the process mean and standard deviation. I would propose to introduce straight away the particular case N(d; sigma2d) to avoid unnecessary confusion.

Done.

11) p. 585 eq 16 and following equations : the function phi introduced here seems to stand for exponential of the minus squared, and PHI the erf function. These symbols have thus not the same meaning as in equation (4). Please clarify and change notation if needed. The use of phi as in eq. (4) is reestablished on page 588, further strengthening the possible confusion.

Thanks for spotting this. We have replaced Phi and phi, the usual standard normal CDF and PDF, by versions which have a N superscript in caligraphic font so they are less likeliy to be confused with the parameters to the ARMA model.

12) p. 586, l. 14 : "P = n is sensible". Please explain.

Sensible was a poor choice of words. We have replaced this with a "for example“ clause. It is important to choose P large enough to retain low-frequency effects, however having P be too big (e.g., bigger than n) complicates inference because then there are more latent variable than actual data. Choosing P = n is a common middle-ground in the literature.

13) p. 589 : words 'trivial' and 'clearly' may be felt as slightly annoying when trying to go into the details of a notation that is not always clear and trivial.

We deleted the words trivial and clearly where appropriate.

14) p. 589, l. 26 : again clarify the meaning of here.

Done, thanks.

15) p. 589, l. 28 : 'since the normalization terms would cancel' : is that so obvious ? Normalisation terms to do not cancel on eq. 17 and I must confess that it is not clear to me why they cancel here.

The normalization constant is a function of d. In Eq. 17, which is an acceptance ratio for d, they don't cancel because the normalization constants in the numerator and denominator are for different d. However the discussion here is for the short memory parameter, and so d is fixed. Therefore the constants in the numerator and denominator are the same.

16) p. 589, last sentence (wrapping on p. 590) : clumsy grammar

We have improved the wording here.

17) l. 592 l. 3 : "In other words" : withdraw

Done.

18) l. 594 : More explicit details need be given about how $\sigma\theta$ and $\sigma\varphi$ (bold θ and σ) are determined. This is with this kind of detail in mind that one can see that supporting code will be welcomed by readers wishing to reproduce the algorithms proposed here, and use it for other applications.

It may not be attractive, but by "pilot tuning scheme“ we literally mean: try a value (e.g., sigma=1) and adjust based on observed acceptance rates, autocorrelations, effective sample sizes, from the resulting Markov chains. This is obviously more of an art than a science, but is standard fare in general purpose MCMC libraries for Bayesian inference, like BUGS. We are happy to provide our code, and in fact have provided it on several occations in the past when we have gotten requests. We would like to turn it into a R package but Tim Graves who developed the code now works outside of academia, so this might take some time.

19) l. 597 : "Those of Beran" clarify or add exact reference (papers by Beran are cited a couple of times, but one needs to be specific and informative here)

We have added the specific references here.

20) l. 599 : Provide the true value of dl (sorry, if it is there I couldn't see it).

Thanks, we have added the true values to the figure caption.

21) Figure 8 and 9: indicate true values of parameters when known (e.g.: d and on Figure 9)

Done. Of course, true values for the Nile are not known (Figure 9).

Interactive comment on Nonlin. Processes Geophys. Discuss., 2, 573, 2015.