Nonlinear Processes
in Geophysics

Discussions

NPGD

Interactive
comment

Interactive comment on "Application of Lévy
Processes in Modelling (Geodetic) Time Series
With Mixed Spectra" *by*
Jean-Philippe Montillet et al.

Anonymous Referee #1

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Current manuscript is a revised manuscript, and it has been significantly been made
better. However, many issues are still left, especially with the writing style, and this
makes the text unreadable.

However, I think that this time a major revision is sufficient.

I have two main criticisms, and these affect the results section, which should be rewritten after the basic work is done.

1. The mathematical model is really messily written, and it is hard to understand it.
Take all the definitions from the appendix, and put them in the text, and remove all the
speculative/descriptive material. It is totally impossible to understand as the model is

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Discussion paper

not explicitly defined. Something like:

" Let us model a GNSS observations as an additive model

$$x(t) = s_r(t) + n(t) \tag{1}$$

" ... and then define the different choices for $s_r(t)$ and $n(t)$, and also write explicitly what their corresponding discrete versions are.

2. After you have done the basic model, you can construct an a posteriori distribution of the unknown parameters, and then the target is to sample these parameters with MCMC methods or obtain optimisation-based MAP/ML estimators. Define explicitly your estimators with respect to posterior distribution. Of course you can use some other constructions as well, but define your estimators explicitly. The N-step method is totally heuristic and should not be included in the manuscript. Please come up with some mathematics/stats-based parameter estimation algorithm.

Some minor comments:

p. 2, line 27, long-memory processes (i.e. coloured noise). – Coloured noise is not necessarily long-memory process.

p. 2, line 43 – Gaussian distribution is part of the Lévy distribution, be precise.

p. 3 Equation (1) – Explain the whole model here, it is impossible to guess what the model is, write the formula out explicitly. What is s_0? What is $s_r(t)$? Is noise $n(t)$ a continuous-time variable? What is the mean of $n(t)$?

p. 3 Equation(3), please don't use $\mathbf{J}$ as a full covariance matrix – it is often used to denote identity matrix. Use something very distinctive, like $\mathbf{C}$.

p. 3: "Note that the length of the geodetic time series (L) considered in this study is at least 9 years (3285 observations)." Can you plot this data?

p. 3: "which states that the noise is Gaussian distributed, therefore n follows a multi-

variate Gaussian probability density function. " ... this is a tautology.

p. 3: Line 82 – You have not defined β, and for all $\beta < 0$, the matrix $\mathbf{J}(\beta)$ does not exist. Be more precise.