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Nonlinear Processes in Geophysics
Discussions
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Interactive comment on "Fractional Brownian motion, the Matérn process, and stochastic modeling of turbulent dispersion" *by* Jonathan M. Lilly et al.

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This is a well written review of the Fractional Brownian motion (fBm) and the less well known Matérn process. The model is applied to the case of particle dispersion in 2D turbulent flow. The review is clear and with the relevant degree of detail to be readable by non-experts in stochastic processes.

Concepts of short and long memory and of diffusive, sub-diffusive and super-diffusive processes are well described as is the whole concept of diffusivity for stochastic processes, which is less known in the "time series community". The treatment of diffusivity, auto-covariance and corresponding spectra is illuminating.

The relevance of the Matérn process is that it provides a way of constructing a stationary process, which on short time scales is similar to the fBm and on long time scales is similar to a white noise process.

The paper is very long, so I propose that the authors perhaps consider rewriting into two back-to-back papers, with the second being the application to turbulent dispersion. Furthermore, for better overview, some of the results, especially in section 4, could be moved to Appendices. I leave that to the authors to decide and recommend publication with pleasure.

Minor points/typos:

P10, L25-30: seems to be irrelevant paragraph, including 4 self-references.

P14, Figure 3: It would be useful to indicate the slope of the "Power Law line", and indicate the relation to the turbulence scaling theory (if any).

P19, L3: faveraging -> averaging

P20, L27: It would be useful with a definition of a Gaussian process in this context, and a little more explanation of why the "original process is Gaussina as well as zero mean".

P26, L6: To me it seems more logical to say "globally white" rather than "locally white", in the sense that points separated in time by $T \gg \lambda^{-1}$ are independent.

P27, L3: This is unclearly written: It is $d^2/d\omega^2(lnS) = 0$ for $|\omega| = \lambda$.

P33, L16: $\Delta \rightarrow \Delta t$.

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