Hydrology and
Earth System
Sciences
Discussions

*Interactive comment on* "A non-stationary stochastic ensemble generator for radar rainfall fields based on the Short-Space Fourier Transform" *by* Daniele Nerini et al.

Anonymous Referee #2

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GENERAL COMMENTS AND RECOMMENDATION

The manuscript illustrates the use of the Short-Space Fourier Transform to simulate non-stationary rainfall fields. This technique has been applied to Switzerland to simulate the properties of four radar rainfall fields.

This is a very interesting topic, and the proposed approach might be able to solve some of the limitations of the currently existing methods for characterizing the uncertainties in radar-based QPE and nowcasting (among other topics) using the concepts of stochastic simulation.

The manuscript is well written and organized and provides insightful discussion and,

consequently, I recommend the publication of the manuscript in Hydrology and Earth System Sciences. The authors could also take into account the following minor comments.

MINOR COMMENTS

1) I find the presentation of the technique somewhat unbalanced: while most of the concepts presented in detail in section 2 can be found in a number of books and are, in general, well-known (it could be moved to an Appendix), almost no detail is provided about the method used to impose the local anisotropy (based on the Generalized Scale Invariance model; Niemi et al., 2014). I would strongly suggest to add a brief description (if necessary, in an Appendix, as well).

2) The figures should be sequentially cited in the text. Currently, Figs. 8 and 9 are cited in page 7 (before first citation of Fig. 2), and Fig. 11 is cited in page 14 before Fig. 7.

3) Figs. 8 and 9. It is unclear to me why the authors have chosen to rotate the 3D power spectra by 90° and use a decreasing y axis to display the 2-D autocorrelation functions. Why is it better to use these configurations?

4) I miss the color palette in Figs. 3 – 5 and 10. It is clear that the simulated fields have arbitrary units, but this could be explicitly stated in the text.

SPECIFIC COMMENTS

1) Page 1, line 11. "Differences" could be replaced by "variability".

2) Page 4, line 17. To my knowledge, Ciach et al. (2007) did not propose the use of any stochastic noise generator. The sentence "A major limitation and concern of all the cited stochastic generators is that they assume spatial stationarity..." (page 4, lines 26-30) might be misleading because some of the references provided in section 1.1 (e.g. Germann et al., 2009; Villarini et al. 2009) did not assume spatial stationarity of the rainfall field.

3) Page 6, lines 27 – 34 and elsewhere. The term "spectrum" is used indistinctively to refer to the Fourier spectrum, $X(f)$, and to the power spectral density, $S(f)$. For clarity, it could be better to use it for $S(f)$.

4) Page 9, lines 26-30. At first, I found this paragraph a little misleading: although the title of the section is "Short-space Fourier transform", this first paragraph (and up to Page 10, line 4) focuses on the time-frequency signal analysis.

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