

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.

G. Pegram (Referee)

pegram@ukzn.ac.za

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What a pleasure to read an innovative, well written, well-argued and well-constructed paper on the difficult procedure of generating and forecasting radar rainfall fields which exhibit spatial and temporal inhomogeneity. It is so rich in ideas it could have been written as a series, but the authors are at pains to keep the reader properly informed at a moderate pace with full explanations of their thinking and how the pieces fit together.

Section 1.1 is a very fair review of the current status of radar-rainfall forecasting, summarised in the first sentence of section 1.2, which is: "A major limitation and concern of all the cited stochastic generators is that they assume spatial stationarity, i.e. uniformity of the generator across space." and time. This sets the stage and got my attention.

I want to highlight some of the passages that made me sit up, with the remarks I made in the margin as I was reading through, located by page and line number in the pdf.

p8:21 "...we mostly alter the spectral phase of a rainfall field, without significantly modifying the amplitude". That's neat. p16:19-23 "The choice of the rainfall threshold and of the value associated to zero rain in dBZ is quite critical and affects the Fourier spectrum, in particular at high spatial frequencies. In fact, a larger step at the rain/no-rain transition has the effect of increasing the power at high frequencies, thus decreasing the absolute value of the spectral slope 'beta'. As a consequence, the generated noise fields will have more power at high spatial frequencies (more spatial detail and shorter correlation structure)." I'd never thought of that - what a good point and solution. P27:33 "An interesting scientific question would be to analyse the persistence and predictability of the local Fourier spectra, which in turn will control the future evolution of the local properties of the stochastic rainfall fields. This question is particularly important to design ensemble precipitation nowcasting systems that better represent the forecast uncertainty". That's a very important and wise observation.

Finally, Section 7 provides a good summary and the last paragraph points the way forward.

This is one of the best papers I have reviewed for a very long time and I unreservedly recommend its publication in HESS.

Geoff Pegram 2 February 2017

For the authors' convenience I am noting some small grammatical changes that should be made to the text.

P9:26 remove 'an' P11:15 change 'cantering' to 'centring' P13:26 change 'on' to 'one'
P16:17 change 'to' to 'in' P18 In axes of spectra, change 'wavelength' to 'wave-
length' P18:6 change 'comprised' to 'constrained' P22:18 change 'Such' to 'This' P23:1

change 'by' to 'using' P25:33 change 'are' to 'is'

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