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Nonlinear Processes in Geophysics
Discussions
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Interactive comment on “Spectral characteristics of high latitude raw 40 MHz cosmic noise signals” *by* C. M. Hall

Anonymous Referee #1

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NPGD-2-969-2015 Spectral characteristics of high latitude raw 40 MHz cosmic noise signals by C. M. Hall

General

The author presents the measurements of cosmic noise at Ny Alesund for the year 2014-2015 (about 18 months) and study the data using the probability distribution function (PDF) and the power spectrum. The author concludes that the Cauchy distribution reasonably explains the PDF, and that the spectrum shows three frequency ranges with different power-law indices: small scale (minutes to an hour), intermediate scale (hours to a day), and large scale (days).

I think the manuscript has a potential to be published as a paper in NPG. The subject

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Interactive Discussion
Discussion Paper

is geophysics, and the data are studied in spirit of finding a non-Gaussianity and the power-law behaviors. The manuscript is well structured, and the message is clearly stated.

I have two major questions, and would like to see that these issues are clarified before publication for the benefit of the future readers. There are some problems in English and figure preparation, but they are minor and can easily be solved.

Major comments

(1) Why does the author study the measured PDF for a Gaussian distribution and a Cauchy distribution only? The non-Gaussianity may have different realizations, and the Cauchy distribution is just one example. Moreover, the existence of an analytic expression for the PDF is not always guaranteed. In my opinion, a more general and straightforward treatment to analyze or characterize the measured PDF is to determine the higher order moments, say up to 4-th (flatness or kurtosis) or 6-th order cumulants. I am saying this because people working on theories and modeling of cosmic noise absorption can evaluate their results directly with the data presented in the manuscript. Or is there any theoretical or observational justification that the Cauchy distribution is the best alternative if the measured PDF is not explained by Gaussian?

(2) The main conclusion is rather weak because there is no clear connection to physical processes. The manuscript stays mostly with a statistical description of the data, and the possible physical processes causing the cosmic noise variation are addressed only quickly. For the readers, this is rather a frustrating situation. The author associates the scaling exponents with absorption or generation of cosmic noise (in abstract), and with space weather effects and other physical processes in section 4 (conclusions). Can the manuscript be more explicit in conclusions? For example, can the author elaborate more about the solar activity (page 980, line 20), the space weather considerations (page 980, line 25), the precipitating particles (last sentence) in terms of their time scales and the non-Gaussian nature? Then the readers can have a clear picture of the

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cosmic noise variation as a nonlinear geophysical process.

Minor comments

(3) The frequency is uncertain. The title says 40 MHz while section 3 and 4 mention 30 MHz.

(4) Power spectrum (Fig. 4) does not show a confidence interval. How are the errors in the exponents estimated (page 979, line 8-9)?

(5) in graphical presentations, the drawing lines on the axes and the data plot are too thin. All the figures are difficult to read, particularly the axes and the ticks.

(6) English style is mixed between the American and the British. For example, "ionization" with "z" on page 970, line 26 (American style) and "analysing" with "s" in the same line. Please do not mix the styles because it distracts the readers from reading.

(7) There are errors or mistakes in English. For example, "og" (page 972, line 8) should read "of". Another example is that the sentence on page 974, line 5 starting with "On the other hand" is not a complete sentence. Please check the entire manuscript carefully.

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Interactive Comment