

Interactive comment on “A combined analysis of geomagnetic data and cosmic ray secondaries in the September 2017 space weather phenomena studies” by Roman Sidorov et al.

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Dear Anonymous Referee, Thank you very much for your reviews of our manuscript and for all your valuable comments and remarks regarding its improvement and resubmission. This reply will contain also the list of changes in the future revised version of the manuscript according to your comments.

On your comments: 1) "Main point of concern: It is not clear (to me), from the explanation of the statistical analysis given in sections 3 and 4, if the authors are analyzing only data for September 2017 or if it possibly includes other data. Note, if it is only for data from September 2017, I then wonder if the authors are using all of the data for

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this month and whether or not they have removed its autocorrelation. It is important to recognize that autocorrelated time series (such as space-weather indices covering only a single month) are not statistical data (which are assumed to be independent). In this respect time series analysis and statistical analysis are fundamentally different. It would, therefore, be a serious mistake to simply lump all values of a time series into a statistical analysis and fit distribution functions to them, and, even, apply tests of significance (as the authors do with Kolmogorov tests). I refer the authors to the following reference material: Priestley, M. B., 1981. Spectral Analysis of Time Series, Academic Press, London, UK, Chapter 5.3.2. Thiebaux, H. J., and F. W. Zwiers, The interpretation and estimation of effective sample size, J. Climate Appl. Meteorol., 23, 800-811, 1984. von Storch, H., Misuses of statistical analysis in climate research, in Analysis of Climate Variability: Applications and Statistical Techniques, edited by H. von Storch and A. Navarra, pp.11-25, Springer-Verlag, New York NY, 1995. The issue of autocorrelation needs to be clearly addressed before this manuscript is considered acceptable for publication".

- All the data sets refer only to the period September 6-11, 2017 during the geomagnetic storm, no other data for that month were used. We did not remove the autocorrelation from the data time series, as the generalized function approach does not require this procedure before the distribution laws determination. The smoothed muon flux intensity data (as well as the raw data) does not seem to contain significant diurnal variation contribution. For Dst index, the autocorrelation due to the contribution of trend or cyclical components is negligible, as the Sq variation is commonly eliminated during the index calculation, and the low-frequency secular variation does not affect the 5-day period data. The same refers to TEC time series which is the result of multiple ionospheric monitoring data processing. Actually we have not done the full statistical analysis but only built the distributions for the data sets and performed the tests for determination of their distribution laws that would be enough. We thank the anonymous reviewer for a valuable comment on the autocorrelation problem. The data preprocessing including the effective size estimation and the autocorrelation removal

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should be a part of our further studies in this field, dealing with the analysis of the geomagnetic variations instead of their indices. The statements on the autocorrelation removal problem were added in the text (p.8, line 9–14).

2) "Smaller issue: The abstract of a paper should be a terse summary of results. It should not be an introduction to the article (we have the "introduction" section for that). I don't easily understand what the results are from reading the abstract. This needs to be entirely redone."

- The abstract was shortened and rewritten.

Thank you again for your comments.

Roman V. Sidorov (on behalf of all co-authors).

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