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Nonlinear Processes in Geophysics
Discussions

Interactive comment on "Non-local deformation effects in shear flows" *by* A. V. Popova et al.

Anonymous Referee #1

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This work defines a method to link earthquakes, which takes into account also the shear. The method is then applied to study some seismic catalogs. I had some troubles understanding this manuscript because, I think, it is not well written. Below there is a long list of sentences or concepts that I found not clear. For these reasons, unfortunately, I think that this text does not meet the standards for publication.

The construction of the sentences is quite heavy, always in the passive English form, and the sentences are very long, which makes the flow of the reading not easy. More importantly, there is another problem of clarity related to science, because several sentences especially in the introduction refer to subjects which are vague and not well developed. Some parts are also repetitions, and other might just be misleading, other ignore some the progress in the field.

For example, the abstract starts with "The method for detection of clusters....generally

accepted" as if there were only one method for doing this task. The Authors seem to ignore that Marsan and Lengline (Science, 2006) put recently forward a method based on the ETAS model, and that the paper by Zaliapin et al (last citation) is based on the method by Baiesi and Paczuski (Phys, Rev, E 2004). Moreover, before we had works by Frohlich and Davis, besides the mostly used box counting methods. I was thus pretty curious to find out which of the literature's method was THE one, to finally not succeed in this. Then unexpectedly at page 72 there seem to be multiple methods: "In the present paper, the methods for timescale and space scale decomposition of foreshock and aftershock catalogues, filtered from events with small magnitudes, investigate the structure of the shear flow in the region and its deformation characteristics.": what does it mean?

Also the results are not presented in a very lively way, there are some maps where it is not so clear what is going on, and many tables. Given that I did not understand much of the paper, I can just add that it is not clear whether the results are relevant. They might have been compared with different analyses where one or more ingredients of the method were changed, to have a reference (even better would be to compare them with other methods). For example, how would they change if the shear was not considered in the algorithm? Answering this point should be useful, to see if considering the shear is a crucial step in the presented methodology.

List of specific points:

page 70) "From the point of view of the specialists of the earth sciences, seismic events with the given energy concentrated in some volume form a Poisson flow of independent events": I do not understand this sentence, how can be earthquakes considered as independent?

Page 71: "connectedness of seismic events" should be defined.

Page 71, L 24: "conditions close to critical ones": what does it mean?

Page 71, L 25: “non-localness“: what does it mean? “and in statistical distribution” also not clear

Page 72, L 10: “Poisson complicated process”: what is it?

Page 72, L 20 : “The generalization of such kinds of discrete random processes is the process of random walks“: I do not understand it, what are these random walks in the field of seismicity?

Page 74, L 2: “Thus, the events are almost simultaneous and the spatial correlation radius is estimated by the number of events in linear constructions, and goes to infinity in critical conditions”: what does it mean?

Page 74, L 18:“This pair forms the simplest non-locality, the pair one.”: what does it mean?

Page 74: “...the cluster length of which may be interpreted as a measure of non-locality in a Markov sequence.“: What is a non-locality of a Markov sequence?

Page 76, L 4: “Note that cluster formation should not be considered a manifestation of local effects.”: not clear

Page 76: The time scale defined in (1) seems related to what appeared in Baiesi & Paczuski (2004). Where does this idea come from? Why is exactly T/n relevant and not, for example 1/10 o 10 times such value?

Page 77: In the same spirit of the previous point, in the Dobrovolskiy model could one put a prefactor? Why is it exactly pure a power of 10?

Page 77: After (3), there is the Mindlin model mentioned. From the description in the text it is not possible to understand what it is.

Page 77: the definition (4) is very technical and in general the whole consideration of shear properties (e.g. shear single vector sampling) sound for specialists and not clear at all for the average reader.

Page 78: point 3 says “Among the set of events falling within the spatial–temporal region with regard to the shear direction, an event with a comparable energy (or magnitude Mmax) is chosen. “. This sounds arbitrary. Let say we had another event with M1< Mmax, yet very much closer in space and time to the j event we are considering: why should we still consider the one with Mmax?

Page 78: “As a rule, in three or four steps, the nodal state is achieved in the sequence of related events, after which the walks repeat their ways”: what is the nodel state and what are the walks?

Page 79: the Authors say that “the Mindlin spatial radius values are 3.5 times less than the Dobrovolskiy radius.”. Is there any way to asses which of the two radii is more meaningfull?

Page 85: “the tendency to “jumps” appears in the process”: I do not understand it. “Probably, approximation to critical condition changes the..”: what are these critical conditions?

In general, finally, the whole discussion about the shear is for specialists. I think that it should be described in more details for a broader audience.

Some problems with the English:

*) the abstract passes from the use of the present (“is”) to the use of the past (“was”)

page71) “Another class of paper “

“Summary energy” probably should be “total energy”

Page 85: “between the vents in space “

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