

ROBERT SHCHERBAKOV COMMENTS

RC:referees comment, AC:authors comment

RC1: "...the authors should mention and cite two references, where the scaling for aftershock rates was recognised earlier than what is given in David- sen and Baiesi (2016). Specifically this was done in the following works: 1. R. Shcherbakov, D.L. Turcotte, and J.B. Rundle, "A generalized Omoris law for earthquake aftershock decay", *Geophys. Res. Lett.*, 31 (2004) L11613, doi:10.1029/2004GL019808. 2. R. Shcherbakov, D.L. Turcotte, and J.B. Rundle, "Complexity and Earthquakes" in *Treatise on Geophysics*, 2nd ed., Vol. 4, Ch. 24, ed. H. Kanamori, Elsevier, 2015, doi:10.1016/B978-0-444-53802-4.00094-4."

AC1: Both references have been added to the revised manuscript. The first one is referenced just before Eq.(6) (also added reference in page 4 (line 17)) and the second reference was added before Eq.(2).

RC2: "- Page 5. Lines 30-35. I think the reference to the Southern California catalogue to ex- plain the absence of correlations in synthetic data is not clear. The synthetic catalogue should not be affected by the incompleteness issue assuming that the simulations were performed properly. So this indicates that correlations diminish with increasing lower magnitude cutoff m_{th} . Any explanation for this effect?"

AC2: We believe that this refers to the discussion of Fig. 3 (page 7-8, sec- tion 3.2). There the absence of significant correlations for large m_{th} is simply a consequence of a lack of statistics (given the duration of the catalog). This was stated at the end of pag.8 (lines 15-17).

RC3: "- Page 4 Lines 15-24. What are the β and β_{as} values used in the simulations to generate the synthetic earthquake catalogue?..."

AC3: The values were added to the revised manuscript. In page 3 (line 28) the values used in the simulation for g and z are now stated which are related to b_{as} (Eq.(6)), from which β_{as} can be obtained. Page 5 (Line 11) now contains the value of b used in the simulation from which β can be obtained.

RC4: "..How the difference between these two values" $-\beta_{as}$ and β "affects the "trivial correlations" between magnitudes?"

AC4: (Discuss fresh plots)

 ANONYMOUS REF COMMENTS

RC1: "The authors test the existence of magnitude correlations for a self- similar earthquake occurrence rate model. As a first observation I would like to remark that magnitude cor- relations are intrinsic to this kind of models simply

because the occurrence probability cannot be factorized.”

AC1: Correct, but it is necessary to quantify the correlations.

RC2: ”A second crucial observation is that this kind of model was firstly introduced by (; ; ; ;) and all these articles should be quoted.”

AC2: We give the two main references to this previous work and we have discussed the difference of the other model with respect to the SSAR model just after Eq.(7) (also providing reference here to the 2007 and 2008 papers pointed out by the referee).

**Joerns comment:”We can probably add one or two more references and expand the discussion of the differences there and add a sentence around line 34 (page 2) but that’s it. In particular, their model does not agree with the data from SC. In particular, their model does not agree with the data from SC.”*

**Andress comment of the above: Added references to the two 2007 papers in Page 2 (lines 3-5). Not sure how we’d add the 2009-2013 references since these are just an application of their model. The 2016 is just a ’summary’ of their work thus far. Should we add that their model does not agree with SC on page 4 (line 16): ”Unlike another self-similar model (Lippiello et al., 2007a, 2008)...”?*

RC3: ”As stated in the previous section this approach is not new. The only difference is in the introduction of two scaling exponents instead of only one... The authors should discuss the advantage of introducing the two exponents in respect of using only one.”

AC3: Having a second exponent is fundamentally different. The discussion for the advantage of two exponents was mentioned on page 2 (lines 30-34) (i.e. matches the observational data).

RC4: ”The only novelty in the article is represented by the introduction of the sub-catalog randomizing. This aspect remain, however, obscure and should be better described and discussed, In particular, at my opinion, the differences between the sub-catalog randomizing and the full-catalog randomizing are not sufficiently enlightened.”

AC4: Add supplemental material expanding on randomization. Refer to this on pages 7 and 8.

RC5: ”...Moreover I suggest that the sub-catalog randomizing should be applied to real catalogs.”

AR5: For the purpose of our investigation this is outside the scope of this paper. We have added a reference to a paper which does carry out such an analysis on the SC catalog in page 6 (line 18).