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Interactive comment on “The Scaling Linear Macroweather model (SLIM): using scaling to forecast global scale macroweather from months to decades” by S. Lovejoy et al.

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The paper by Lovejoy et al “The Scaling Linear Macroweather model (SLIM): using scaling to forecast global scale macroweather from months to decades” represents an interesting approach in stochastic long-term modelling of climatic variables with memory, also providing a good review of the background statistical physics.

I appreciate the paper is rather large, and therefore various details require additional attention to be refined, which is partly responsibility of reviewers.

I request a revision of the paper, according to the comments listed below.

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The paper is well-written and generally well structured. However, in pages 503-505 there are three subsections that have no counters (I presume these should be 2.3.2.1-2.3.2.3). On the other hand, the text about forecast skill in section 2.5 may be separated into a subsection.

The abstract, in my opinion, should be re-formulated, to make it shorter and more concise. Terms like “enormous” and “huge” sound vague, whereas the term “stochastic memories” may be unclear to general readership.

It would be interesting to see not only skills of the hindcasts, but also samples of time series compared.

Note that in the paper by Livina et al (Physica A, 2013) “Forecasting the underlying potential governing the time series of a dynamical system”, the scaling effects (long-term correlations) were taken into account in stochastic modelling, with dynamical forecast of probability density, rejection sampling for generation of a forecast time series, and reconstruction of correlations based on the previous part of the record. Similarly, this was validated in hindcasts on real climatic time series, up to 700 days (see the samples of time series in the paper). It would be really interesting to compare performance of the two approaches on the same time series in some kind of a joint exercise; however, as a reviewer I understand I may only recommend the paper as a reference for the revision.

Further comments

The quality of some of the figures is not satisfactory. Multi-panel figures are combined without proper space adjustment. Figure 1 has unnecessary use of colour for labels, which are also placed in such a way as if they were typed over a ready graphic file. Fonts vary, some numbers are not readable. The same applies to Fig. 4. In addition, figure 4 has panel labels a-d in the caption but not in the panels themselves. In Figure 3, labels on x-axis are not readable; the axis can be shifted lower (to a value below $y=0$) for better readability; panels do not have labels a-c, which are used in the caption.

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In figure 8, the label on x-axis is missing. In figure 9, labels on the x-axes in the bottom row are missing. I also suggest reconsider the layout of 3- and 5- panel figures: they may look better if panels are stacked vertically (like matrix 3x1).

Captions of the Figures 1 and 4 are excessively large; they contain comments that are more suitable for the main text discussion than for a figure caption.

It is not clear to me why there are tables 1a and 1b: they may well be separate tables 1 and 2.

Second order statistics is mentioned in pages 494 and 496 – with more explanation in the latter than in the former.

In page 498, the term “semi-Martingales” is given without explanation.

In page 498, line 1, the word “usual” before “gamma function” is not necessary.

Page 493, line 24: “see Fig.1a-e” does not need “below” (similarly in other places). After this reference to Fig.1, the next figure reference in page 496 is to Figure 4 rather than to Figure 2. I think the order of figures should be reconsidered according to their discussions in the text.

Table 2 is mentioned in the text before Table 1 (page 512).

‘SD’ is used first in page 513 without explanation of the abbreviation.

In page 517, line 7: I think the equation should be 46 rather than 47.

In page 517, line 13: $M_{\{tt\}}$ has no comma between indices, whereas in other places it does.

In the caption of Fig.2, at the end of the text “(Sect.4 below)” makes no sense.

After displayed equations, before continuing inline text of the same sentence, commas are systematically missed – this issue is probably to be delegated to the publishing team.

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Valerie Livina

Please also note the supplement to this comment:

<http://www.earth-syst-dynam-discuss.net/6/C346/2015/esdd-6-C346-2015-supplement.pdf>

Interactive comment on Earth Syst. Dynam. Discuss., 6, 489, 2015.

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