Response to referees in italics:

Referee #1 (V.N. Livina)

The paper is well-written and generally well structured.

Au: Thank you for your positive evaluation!

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.

Au: we have added subdivisions, but it may depend of the policy of the journal, since this structuring is quite deep!

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.

Au: Thanks, we have changed the abstract to take into account the referee's concerns.

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

Au: Yes, this hindcasts of individual series were the subject of a short GRL paper that was submitted a few weeks after the ESD paper. Although the initial referee comments were fairly positive, the paper was held up pending the result of the ESD paper! Therefore the answer to this question is not definitive, but we expect that the hindcast results on individual series (especially during the "pause" since 1998), to be published at about the same time as this ESD paper.

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.

Au: Yes, it would be very interesting to compare; we point this out in the new version. However the paper is already too long and this is work for the future!

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.

Au: We apologize, the original figures 1 and 4 were much better: at the stage of final submission we were asked to combine all the sub parts figures into single massive files and the quality was reduced as a consequence. This should not be an issue in the (final) ESD version.

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).

Au: OK, fixed. The production team can decide how to arrange them in the clearest way, we have improved the readability and labels. We have updated the figures as suggested.

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.

Au: OK.

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

Au: We have renumbered all the tables.

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

Au: The context and contents are different.

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

Au: It is a technical requirement to do with integration of stochastic processes: semi-martingales are the most general stochastic processes with respect to which it is possible to integrate predictable processes in a reasonable way (i.e. the Itô and Stratanovich calculi). Here, we need only integrals of deterministic processes with respect to fGn (Wiener integrals), so we do not need to go into these issues.

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

Au: Thanks.

Page 493, line 24: "see Fig.1a-e" does not need "below" (similarly in other places).

Au: Done.

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.

Au: I understand the reasoning, but fig. 4 cannot properly be discussed so early – it requires comments about the data set being used. On the other hand it is a shame not to indicate to the reader that there will later occur an empirical estimate of the exponents.

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

Au: OK, all the tables have been renumbered!

'SD' is used first in page 513 without explanation of the abbreviation.
Au: Fixed.

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

Au: Yes, thanks.

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

Au: Yes, thanks.

In the caption of Fig.2, at the end of the text "(Sect.4 below)" makes no sense.
Au: Yes, thanks.

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.

Au: Yes, thanks.