Referee 2

Review of “Review Article: Scaling, dynamical regimes and stratification: How long does weather last? How big is a cloud?” by S. Lovejoy

This article reviews the developments of scaling approaches over the last few decades. Scaling approaches have led to novel insights into atmospheric dynamics and recently provide the building blocks of novel prediction models and climate response models. A review on this topic is needed and will be helpful in spreading the scaling approach to a wider range of scientists.

While such a review is needed, I am not sure if the article in its present form will be able to reach a wider audience. My major issue is with the length of the article. In my opinion the article is too long for a paper, which one could read in one sitting. I could imagine it as a foundation of a book by adding more background material to make it easier to understand the topic.

SL. Thanks for the positive reaction!

This is an “old school” review, i.e. one that seeks to be fairly complete. However, you are right that it could be used as the foundation for a longer book. I could add that it isn’t easy to find the appropriate venue for this review - NPG is in fact designed for this type of subject matter. However, the resulting publication will be open access, so that I hope that it can still circulate widely.

NPG has no formal page limit for review articles but I encourage the author to shorten it with the reader in mind. The article is well written and I find it hard to point to any obvious location which can be easily shortened. One possibility could be to have a ~20 page overview article and put the remainder into supplementary material.

SL: At this point a shorter review would simply be another paper! I anticipate writing a shorter review of the climate part of the paper in the next months.

Some more detailed comments:

1) Line 23-24: This sentence reads awkward.

SL: Thanks, fixed.

2) Line 67: Why “lag”? An interval is not a lag. Am I missing something?

SL: “Lag” is sometimes used in autocorrelation functions for example. I removed it since it didn’t add clarity.

3) Line 96: cloud -> clouds

SL: Thanks.

4) Line 125: range scaling -> range of scaling

SL: Thanks.

5) Line 134: levels quantify -> levels to quantify

SL: Thanks.

6) Line 135: would expected -> would be expected

SL: Thanks

7) Eq. 3: Hz -> H_z

SL: Thanks, z is a subscript.

8) The citation style is often incorrect. E.g. line 277: [Mandelbrot, 1981] termed -> Mandelbrot [1981] termed

and many other locations

SL: Thanks

9) Eq. 9: An explanation for 2 in \zeta(2) is missing.

SL: Added.

10) In many parts of the article the author relies mainly on his own studies and of his collaborators. It would be good to include a more diverse set of studies which independently confirms the conclusions.

SL: I will add more references, it would be helpful if the referee could make some suggestions?

11) Line 592: that is only true for \zeta(2)<-1

SL: I'm not sure what is suggested here. The text seems to be correct as is?

12) Line 597: There is a huge class of wavelets. Which wavelet are you actually referring to?

Later it becomes clear that Haar wavelets are used.

SL: The paragraph is valid for all wavelets, - their relationship with fluctuations - it is a preparation for the discussion of Haar wavelets and fluctuations that comes later.

13) Line 604-605: Haar wavelets have some nice properties but in my experience their spectra are more noisy than DFA spectrum for example.

SL: The DFA fluctuations are less noisy only because they are fluctuations of the running sum of the process, not of the process itself. When DFA fluctuations of the process are used, they are just as variable as the Haar fluctuations. In fact the smoothness – lack of noise – in the DFA fluctuations is actually a spurious hiding of the true noisiness. This has been demonstrated by numerous numerics including in the cited references. (I added material).

14) Line 821-822: This sentence is odd.

SL: Fixed.

15) Line 911: It might be good to use H only for the Hurst exponent and another symbol when a more general exponent is implied. That would potentially avoid any confusion.

SL: I added a paragraph on this included the suggestion on notation.

16) Lines 933-935: How GCMs become effectively stochastic on time scales longer than 10 days needs to be better explained.

SL: I added a sentence:

"Due to their sensitivity to initial conditions, there is an inverse cascade of errors [*Lorenz*, 1969], [*Schertzer and Lovejoy*, 2004] so that beyond the predictability limit, small scale errors begin to dominate the global scales so that the GCMs effectively become stochastic."

17) Line 949 and following: I am having a hard time understanding this part.

SL: I have added some extra equations to make this more explicit.

18) Section 5: This is a nice summary but a good review article should also point out knowledge gaps and future research directions for the community.

SL: Yes, I will add material on this.