Nonlin. Processes Geophys. Discuss.,
https://doi.org/10.5194/npg-2020-2-RC2, 2020

Nonlinear Processes in Geophysics
Discussions

Interactive comment on "A method to predict the uncompleted climate transition process" *by* Pengcheng Yan et al.

Anonymous Referee #2

Received and published: 23 March 2020

This article needs major revisions before it can be considered for publication. There are many issues with consistency, clarity, grammar, and the discussion of the major results. I will outline my concerns below.

General comments

1. The abstract needs to be made more clear. The phrase "more details of climate change" is too broad and does not explain what exactly is being addressed by the methods presented in the paper. The PDO is also not explained, nor its relation to climate change.
2. There is not enough introduction to the methods section before discussing the details of time series analysis.

3. The mathematical notation is inconsistent and unclear.
   - Variable k appears to be often interchanged with κ
   - Parameter k is referred to as both a stability (Fig. 10 and Section 3.3) and instability parameter (Fig. 10).
   - μ is never formally introduced and is potentially being exchanged with u.
4. There is terminology that is used but not defined.
   - continued process (pg 1, line 12)
   - the filtering process (pg 2, line 16)
   - ramp function (pg 2, line 24)
   - crush (pg 4, line 21)
   - percentile threshold (pg 11, line 21)
   - augmented abrupt change (pg 11, line 28)
5. There is inconsistency between Section 2.2 and Section 3. In Section 2.2 it is stated that the parameter k cannot be obtained from the data (with no explanation as to why), so it is fixed *a priori*. In Section 3 the parameter k has been estimated from a time series, but again with no explanation as to how one would estimate this.
6. In Section 3.1 it is stated "When the length of the sub-sequence is 20 years and 30 years, there is only one peak in the distribution of k values. . ." (pg 10, lines 21-24). This seems strange, as there are said to be multiple peaks for a smaller subsequence (10 years), a single peak for 20 and 30, and then multiple peaks for larger subsequences. I would assume there would be a more continuous relationship. This is not discussed why this is not the case. Also, a quantitative measure is not specified of what defines a peak.

7. The motivation for Section 3.2 is absent and it is not obvious how this section relates to the overall goal of Section 3.

8. “Abrupt change” appears to be used synonymously with “transition process” in Section 3.2 and this does not seem consistent with the rest of the paper. Please maintain the same terminology for clarity.

9. The final paragraph of Section 3.2 (pg 12, lines 10-24) discusses three abrupt changes. The previous paragraph discussed four. There is much confusion as to what abrupt change events are being discussed throughout this paragraph.

10. The lengths of the subsequences mentioned in Section 3.2 do not match the numbers on the colour bar in Fig 9. It is therefore not clear what Fig 9 is showing.

11. There is no discussion as to which abrupt change detection (year 2007 or 2011) is correct, which leads to a lack of motivation for studying only the 2011 event. It needs to be more clearly explained why the 2011 event is chosen for the prediction experiment.

12. The “variation situation of parameter μ” (pg 13, lines 6-7) was never introduced nor explained.

13. The “prediction result” (pg 13, lines 13-14) was not specified. Additionally, it is not clear which prediction is being shown in Fig. 11.

14. Conclusion needs to be expanded upon much more.

    - The sentence “The abrupt change with smaller time scales has a continuous process, and the abrupt change with larger time scales becomes abrupt change point.” (pg 14, lines 8-10) is not easily understandable and alludes to material that does not appear to have been discussed in the paper.

    - The phrase “a detected abrupt change beginning in 2011 appears relatively close to the end of the 115-year sequence, and it is difficult to identify by using other methods” (pg 14, line 11-13) was not previously discussed in the manuscript. Please expand on why the abrupt change is difficult to identify through other methods.
    - There is not enough evidence in the manuscript to support the claim “The findings increases the possibility of resolving the problem associated with difficult processing at the end of a time sequence” (pg 14, lines 14-16). Please add discussion of the problem of difficult processing at the end of a time sequence.

Specific comments

1. pg 1, line 14 - Change “self” to “itself”

2. pg 1, line 15 - Add full reference to paper on PDO

3. pg 1, line 16 - Remove “And” from beginning of sentence

4. pg 2, lines 4-6 - Add references for each of the fields mentioned

5. pg 2, line 6 - Change “famous” to “observed”

6. pg 2, line 8 - Add reference for “Thom’s research”

7. pg 2, line 8 - Remove “And” from beginning of sentence

8. pg 2, line 24 - “Ramp Function” does not need to be capitalised

9. pg 2, line 26 - “Non-linear Function” and “Ramp Function” do not need to be capitalised

10. pg 2, line 29 - Remove “Besides” from beginning of sentence
11. pg 3, line 1 - Change “got reach to” to “reached”
12. pg 3, line 3-4 - Capitalise “decadal oscillation”
13. pg 3, line 4 - Move reference to end of sentence
14. pg 3, line 5 - Remove “has”
15. pg 3, line 20 - Change “change” to “changes”
16. pg 3, line 22 - Change “more short” to “shorter”
17. pg 3, line 24 - Change “change” to “changes”
18. pg 4, eq 1 - Add punctuation to equations (including all subsequent equations in paper)
19. pg 4, lines 7-8 - The sentence starting “The population changed. . .” is not clear.
20. pg 5, line 5 - Change “would” to “could”
21. pg 8, line 11 - Change “which” to “that”
22. pg 8, lines 20-21 - Please write out the equation for the logistic model with noise
23. pg 8, lines 21-22 - Please specify the difference between the “three uncompleted changes”. Is the same noise realisation used but for different lengths of trajectories?
24. pg 8, lines 27-29 - The sentence starting with “The results show. . .” is not clear.
25. pg 10, line 9 - Add “of the largest peak” after “The k value”

26. pg 10, line 10 - Change “are distributed in the” to “also have”
27. pg 10, line 26 - Please quantify what is meant by “tiny”
28. pg 11, lines 1-5 - Percentages of what?
29. pg 11, line 8 - Add “in the PDO” after “abrupt changes”
30. pg 11, line 10 - Add “the” before “two”
31. pg 11, line 13 - Write out the set of sub-sequence lengths in words
32. pg 13, line 1 - Remove “after the abrupt change”
33. pg 13, line 9 - Remove the “a” after each year in the brackets
34. pg 13, line 23 - Remove “the” before “uncompleted” and change “process” to “processes”
35. pg 13, line 24 - Remove “the” before “ideal”
36. pg 13, line 26 - Remove “started”

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