

Review of revised manuscript “A method to predict the uncompleted climate transition process”

There are still some major changes that need to be made before I feel this paper is suitable to be considered for publication. This first issues I will note are related to some of my previous referee comments that were not properly addressed in the new version. I will list these and expand on them below. I also include additional general and specific comments for the revised manuscript.

Original comments not addressed

1. **General comments #2** *There is not enough introduction to the methods section before discussing the details of time series analysis.*
 - The authors responded to this by rewriting some parts of the Subsections 2.1 and 2.2. I still feel as though a few sentences of introduction to this general Section 2 are necessary before there is a jump to Subsection 2.1.
2. **General comments #3** *Variable k appears to be often interchanged with κ*
 - Figure 7 still uses κ on the x-axis.
3. **General comments #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 ...” 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.*
 - The reply from the authors does not address my comments at all. The authors discuss the stability behaviour of k rather than the behaviour of the distribution for different sub-sequence lengths. They mention that the text around this discussion in the manuscript is changed when it has not been. Additionally they still do not specify how they define a peak.
4. **General comments #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.*
 - The phrase was changed in many places to read “transition change”. This is redundant. I have noted all the instances below (in specific comments) where it needs to be fixed to “transition process”, along with a few instances of “abrupt change” that were missed.

5. **General comments #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.*

- The authors' response does not address the colour bar mismatch at all. The labels on the colour bar still do not clearly represent years from 10 to 60 in intervals of 1.

Additional general comments on revised manuscript

1. The statements "According to Thom's theory ... the general potential energy is obtained as follows" (pg 4, lines 21-24) are not clear. What is meant by "the system described by a quadratic function" and how is it related to the general potential energy? Do you mean that the potential energy should be described by a quadratic function?
2. Equations 5 and 6 need to be incorporated into sentences and full punctuation is needed for all equations. Additionally, h is defined twice. If I understand the rest of the section correctly I believe one should be h_0 .
3. The introduction of location parameters α, β (pg 5, line 14) seems out of place. They are not used in any equations up to that point. Please explain more formally how these are related to the system states x_a and x_b in Eq. 5?
4. Equations 7 and 8 should be incorporated into the sentences where they are introduced for improved clarity and understanding for the reader.
5. What does the term "indefinite" mean here (pg 7, line 4)? It seems to be used synonymously with "unknown".
6. In Eq. 9 the random terms are just labeled as " $random_t$ ". It would be more appropriate to label with a variable name (e.g. σ, η , etc.) and state from which distribution the random variable is chosen.
7. The sentence "Therefore, for the entire sub-sequence, there are many transition changes" (pg 9, line 19) is unclear what the message. In particular the phrase "the entire sub-sequence" is used multiple times throughout the paper and I am not sure what is meant by it.

Specific comments/technical corrections

1. pg 1, lines 16-17 - Add reference to previous paper in sentence "Thus, we had proposed ...".
2. pg 1, line 25 - "Since" \rightarrow "as"
3. pg 2, line 14 - "kind" \rightarrow "kinds"

4. pg 2, line 16 - “like” → “such as”
5. pg 2, line 18 - “suggests” → “suggest”
6. pg 2, line 22 - “change occurs” → “change that occurs”
7. pg 3, lines 4-5 - “as uncompleted” → “as an uncompleted”
8. pg 3, line 11 - “climate” → “abrupt”
9. pg 3, line 14 - “this” → “of these”
10. pg 3, line 15 - “researches” → “research”
11. pg 3, line 17 - “its” → “their”
12. pg 3, line 27 - “an” → “a”
13. pg 4, line 4 - “Where” should be lowercase and no indent
14. pg 4, line 5 - “continuous even” → “continuous; it is”
15. pg 4, line 5 - “troduced” → “introduced”
16. pg 4, line 9 - “of Logistic” → “of the logistic”
17. pg 4, eq 2 - “,” → “.”
18. pg 4, line 14 - “as instability” → “as the instability”
19. pg 4, line 22 - “change which” → “change in which”
20. pg 4, eq 3 - “,” → “.”
21. pg 5, line 6 - “by regression” → “by the regression”
22. pg 5, line 8 - “of second” → “of the second”
23. pg 5, line 16 - “.” → “;”
24. pg 5, eq 6 - “,” → “.”
25. pg 7, line 17 - “hasn’t” → “has not”
26. pg 7, line 18 - “is” → “are”
27. pg 7, line 22 - Remove “apparently”
28. pg 8, line 3 - “noticed” → “noted”
29. pg 8, line 9 - “represent” → “represents”
30. pg 8, line 14 - “of prediction” → “of the prediction”
31. pg 8, lines 25-26 - “We determine parameter k firstly” → “We first determine parameter k ”

32. pg 9, lines 7-8 - “transition changes of the PDO mainly” → “main transitions of the PDO”
33. pg 9, line 9 - “this two transition changes” → “these two transitions”
34. pg 9, line 10 - Remove “the” before $k < 0$
35. pg 9, lines 16-17 - “The dots in the left side region are more than the dots” → “There are more dots in the left side region than”
36. pg 9, line 20 - “transition change” → “transition process”
37. pg 9, line 21 - “begins” → “begin”
38. pg 9, line 22 - “transition changes” → “transition processes”
39. pg 9, line 23 - “transition changes” → “transition processes”
40. pg 9, line 25 - “abrupt change processes” → “transition processes”
41. pg 9, line 27 - “abrupt changes” → “transition processes”
42. pg 10, line 4 - “there are two kind of transitions” → “the two transitions”
43. pg 10, line 23 - “transition changes” → “transition processes”
44. pg 10, line 25 - “transition changes” → “transition processes”
45. pg 10, line 26 - “stated” → “shown”
46. pg 10, line 26 - “transition change” → “transition process”
47. pg 10, line 28 - “when the transition change” → “for the transition processes”
48. pg 11, line 1 - “20 years or 30 years” should be 10 and 20 to be consistent with the figure
49. pg 11, line 1 - “transition change” → “transition process”
50. pg 11, lines 4-5 - “transition change” → “transition process”
51. pg 11, lines 5-6 - “-0.45 and -0.03, respectively” - Respectively of what? Not clear to what the two values refer. If it is the two choices of subsequence please make that clear.
52. pg 11, line 7 - “transition change” → “transition process”
53. pg 11, lines 9-10 - “Why does the length . . . ?” - Should not use a question here.
54. pg 11, line 11 - “transition change” → “transition process”
55. pg 11, line 12 - “transition change” → “transition process”

56. pg 11, line 13 - What is meant by “anyway”?
57. pg 11, line 13 - “change” → “transition process”
58. pg 11, lines 14-15 - The sentence “When the sub-sequence is set to be 10 years . . .” is unnecessary. The 10-year sub-sequence was already previously discussed.
59. pg 11, line 17 - “transition change experiences a period” → “transition occurs over a period of time”
60. pg 11, line 17 - “as” → “the”
61. pg 11, lines 18-19 - “looks like the increasing part” → “appears to be increasing”
62. pg 11, line 19 - “transition change” → “transition processes”
63. pg 11, line 20 - “sub-sequence one year by one year” → “the sub-sequences to yearly intervals”
64. pg 11, line 21 - “and” → “up to”
65. pg 11, line 22 - “transition changes” → “transition processes”
66. pg 11, line 22 - “figure 9, the” → “figure 9, when the”
67. pg 11, line 23 - “about” → “approximately”
68. pg 11, line 23 - “transition changes” → “transition processes”
69. pg 11, line 25 - “transition change” → “transition process”
70. pg 11, line 26 - “abrupt change” → “transition process”
71. pg 11, line 27 - “sub-sequence” → “sub-sequences”
72. pg 11, line 28 - “transition change” → “transition process”
73. pg 11, line 29 - “sub-sequence” → “sub-sequences”
74. pg 12, line 1 - What is meant by “threshold”? Should it be parameter v ?
75. pg 12, line 3 - “transition change” → “transition process”
76. pg 12, line 4 - “transition change” → “transition process”
77. pg 12, line 8 - “transition change” → “transition process”
78. pg 12, line 9 - “transition change” → “transition process”
79. pg 12, line 11 - “transition change” → “transition process”

80. pg 12, lines 19-20 - “to explain how the prediction method works briefly”
→ “to briefly explain how the prediction method works”
81. pg 12, line 20 - “as black” → “as a black”
82. pg 12, line 26 - “as green” → “as a green”
83. pg 13, line 2 - Remove comma after 2011
84. pg 13, line 2 - “end” → “ends”
85. pg 13, line 5 - Remove “As we all know”
86. pg 13, line 2 - “this” → “these”
87. pg 13, line 20 - “transition change began” → “transition process beginning”
88. pg 13, line 24 - “Accord” → “According”
89. pg 13, line 25 - “been happened” → “occurred”
90. pg 13, line 25 - “parameters. Then, we” → “parameters and”
91. pg 13 & 14, lines 26-28 & 1 - The statements “However, if the transition process has not begun . . . only by time sequence.” are unnecessary.
92. pg 21, line 7 - “panel” → “Y-axis”
93. pg 21, line 8 - “panel” → “Y-axis”
94. pg 21, line 9 - “transition changes” → “transition processes”
95. pg 21, line 12 - “abrupt change” → “the transition processes”
96. pg 22, line 5 - “sub-sequence” → “sub-sequences”
97. pg 22, line 9 - “is” → “represent the”
98. pg 22, line 9 - “sequences” → “sequence”
99. pg 22, line 10 - “of transition change” → “of the transition process”
100. pg 22, line 11 - “line” → “lines”
101. pg 23, line 2 - “transition changes” → “transition processes”
102. pg 24, line 3 - I am not sure what is meant by “the line with starts is the PDO index after 2015”
103. pg 24, lines 3-4 - “start moment” - should this be start and end moment?