

## ***Interactive comment on “Random and externally controlled occurrence of Dansgaard-Oeschger events” by Johannes Lohmann and Peter D. Ditlevsen***

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We thank Valerie Livina for her thorough evaluation of our manuscript and helpful comments. In the following, we list all referee comments and our according responses.

1. “the model parameters and statistics (RMSD, p-values) would be good to summarise in a table”

We agree that this would be helpful as a summary. In the revised manuscript, we show a table of (1) model parameters, (2) hypothesis test results (p-values) and (3) Goodness-of-Fit of the model averages (RMSD) for both stationary and non-stationary

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one- and two-process models. In order for the table not to become unmanageably big, we prefer to omit parameters and results for the reduced models, which are still given in the main text.

2. “figures 2, 4, 6, notations P, E, I, S could be used in the same style, preferably in the label of the Y-axis rather than near the curves”

We thank the referee for pointing out the different styles in the figures. We will adjust the figures in the manuscript.

3. “Blue lines are better to replace by black ones, for better visibility”

We agree and adjust the figures in cases where color is not needed for other purposes.

4. “text definitions could be accompanied by a suitable formula, see page 5, lines 13-14”

We included formulas for both  $E_S$  and  $P_S$  and hope that this increases readability.

5. “What is the authors’ definition of “regularity” in page 4, line 12? Stationarity?”

We agree in the lack of clarity with the expressions “regularity”/“irregularity” and “non-stationarity”. We used “regularity” as a colloquial term rather than a mathematical definition, denoting how variable the average event frequency (measured in a sliding window) is over time. We thus use the word to describe what our test statistic  $E_S$  measures. An equally spaced sequence of events is then considered fully regular. A strongly irregular event sequence in terms of  $E_S$  can be both due to non-stationarity or a very fat-tailed distribution of event waiting times. Thus it is not synonymous with “non-stationarity”. Since we give a clear definition of  $E_S$ , we keep the colloquial use of “regularity”/“irregularity” in the manuscript and add a clear explanation of what we mean with “irregularity” in the introduction:

“In order to test the hypotheses, we regard the evolution of the number of warming events in a moving window of 20 kyr. This quantity measures how variable the average

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event frequency is over time, a property which we denote as irregularity, and in the DO sequence it deviates strongly from a constant occurrence frequency of events over time.”

6. “page 2, line 19, it is better to say “consider” than “regard”. The same in page 3, line 3”

ok

7. “page 6, line 9, it is better to say “data source” than “archive” “

ok

8. “page 6, line 23: “as extreme as the observed data” (not “than”)”

ok

9. “page 9, line 17: “it needs not” “

We would prefer the use of a modal auxiliary (“it need not be changing. . .”) in this case. To make the sentence more clear we will change it to “it need not change . . . “ in the manuscript.

10. “page 9, line 19: “we still think it is” “

ok

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