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

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Dansgaard-Oeschger (DO) events are complicated phenomena, and their periodicity as well as their (non-)stationarity are still in debate. By using statistical hypothesis tests on simple event models, the authors test whether the sequence of DO events can be regarded as nonstationary or not. They conclude that we cannot reject the stationarity of the sequence if we focus only on warming events, but we can reject the stationarity if both warming and cooling events are taken into account. Furthermore, based on the model analysis, they propose different roles of external forcings on DO events such that warming events are mainly controlled by the global ice volume and the cooling events

by the boreal summer insolation.

This is a nice work which shows an external control of DO events, in a solid statistical way, with least assumptions. Their statistical hypothesis testing and model estimation look fine. The text is well written. The interesting hypothesis about different roles of external forcings on DO events is worthy to be reported. Thus, I recommend the publication of this article in Climate of the Past with the following minor revisions:

- In my first reading, I confused about the terms, "stadial rate" and "interstadial rate". I wondered if the stadail rate is the transition rate from stadial to interstadial or vice versa. I'm temped to call them "warming (cooling) rate" or " warming (cooling) event rate".

- Eq. (3) sounds counterintuitive because the insolation reduces the warming rate λ_1 and the ice volume increases the warming rate. Similarly, the insolation increases the cooling rate λ_2 and the ice volume decreases the cooling rate. Is there any possible explanation for this?

- Also I suggest to explicitly show the relation between the stadial rate and $S(t)$, and that between the interstadial rate and $I(t)$ for the reduced two-process model, like Eq. (3). Otherwise, it's not entirely clear whether the insolation (the global ice volume) indeed promotes or inhibits the warming (cooling) events.

- The integrated insolation above 350 W/m^2 (Huybers, 2006) is chosen as a forcing. Why don't you choose the summer solstice daily-mean insolation, which is also common? Is it a consequence of some optimization? If so, it is worthy to be mentioned.

- The authors mention "While the distribution of waiting times in between warming events is well modeled by an exponential distribution (not shown here)," (P9. Line 14-15). This is the fact from the observation since Ditlevsen's early works. The exponential distribution is true for the stationary one-process model but not true for the stationary two-process model as shown by by Eq. (1). The latter inconsistency is OK because the authors rejects the model in the end. However, is the exponential distribution consistent with the non-stationary two process model? If so, why?

- How is the observation of the exponential distribution consistent with the following statement?: "In the limiting case of a DO cycle comprised of a very large number of independent processes, one finds a Gaussian distribution of waiting times" (P10. Line 9-10).

- In Eq. (1), both exponents are $-\lambda_1 T$. Is this right?

- P2. Line 12: Is "single events" fine?

- P3. Line 4 and in Fig. 6: "ky" -> "kyr" (if you want to correct)

- P3. Line 24-25: Svensson et al. (2006) -> (Svensson et al., 2006)

- P4. Line 1: "withing" -> "within"

- P8. Line 3: What do you mean by "range 1". Is this the value of the standard deviation?

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