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Interactive comment on "Trends in sea-ice variability on the way to an ice-free Arctic" *by* S. Bathiany et al.

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We are grateful to Till Wagner for these constructive comments which help to clarify several points in the discussion and will help to improve the manuscript.

1. and 5. We fully agree on these comments concerning what is novel in our study. We emphasise these points in our revised manuscript.

2. We have chosen this general title because our study has relevance beyond the phenomenon of slowing down and early warning signals. What we analyse is the relation between the mean state of Arctic sea ice (or its annual cycle in equilibrium with a certain forcing) and the fast variability around this state. Our main result is that we find a relation between these properties that is fundamental (arising from physical processes) and robust (independent of the model and the description of its variability).

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Discussion paper

Regarding the idea of early warning signals, this is a negative result. Regarding the prospects for stochastic climate models or the inference of past and future climate variability, it is a positive result. Hence, we like to reflect the genericity of our result in the title. We think that this argumentation is in perfect agreement with the rest of the comment, suggesting to focus more on what can be inferred from observations instead of focussing too much on false alarms.

3. We fully agree that we should inform the reader more clearly about the novelty of our manuscript, something we have considered in the revised version.

4. We agree that the inertia of the open ocean causes the increase in autocorrelation in both models. As stated in Wagner and Eisenman (2015b), the autocorrelation of sea-ice volume decreases before Arctic summer sea-ice loss in their model, in agreement with our findings. We note that this happens in all models, also including MPI-ESM which is spatially explicit. As shown in Wagner and Eisenman (2015), there seems to be a somewhat different timing in the onset of slowing down in other variables, like polar temperature and total hemispheric sea-ice area, which tend to increase already before Arctic summer ice is lost. This can occur due to the spatial coupling of grid cells via the atmosphere: As more and more grid cells become ice free with increasing long-wave forcing, the variability of the whole coupled system slows down, which can also affect latitudes where sea-ice is still present, and which can cause a slowing down of the fluctuations of the sea-ice edge's position. For a strict model comparison regarding this issue of the timing, more analysis would be required. We leave this to future studies because it does not affect our results.

Wagner, T. J. W., and Eisenman, I.: Early warning signals for abrupt change raise false alarms during sea ice loss, Geophys. Res. Lett., 10333-10341, 2015b.

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