

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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In agreement with, and in addition to, the insightful and constructive comments of the reviewers, I would like to provide the following feedback to this interesting study, which I think will make a valuable contribution to the literature:

- 1) Overall, this paper provides interesting and novel insight into the statistical differences between summer and winter sea ice loss, as well as the evolution of sea ice thickness and volume. It therefore goes beyond previous work, including our paper (Wagner & Eisenman, 2015), where we focused on sea ice area during summer. It further fills in important gaps regarding the effects of different types of stochastic forcing.
- 2) Title and introduction: Regarding the title, I agree broadly with Reviewer 2 that it may be better if the title referred specifically to the statistical indicators, since they are

C1

at the core of this study. Regarding the introduction, I would proffer that the focus could be shifted somewhat toward the evolution of variance and autocorrelation under sea ice loss in general, rather than focusing on their (lack of) utility as early warning signals for critical transitions. Introducing the concept of using variance and autocorrelation to help estimate the future mean state and variability of the sea ice cover is an excellent contribution of this study that could be given more weight here in my opinion.

- 3) Relatedly, a slightly clearer presentation of what has been published on this topic and what is novel, in line with comment 2 by Reviewer 2, may improve the exposition of the paper.

- 4) As a side note, I want to point out that the spatially explicit model results from Wagner & Eisenman (2015) show an increase in autocorrelation before the loss of the summer sea ice, something that single-column models like E07 may not always pick up on. We suggest that the increase in autocorrelation is due to the growth of the (long-memory) open-water region as the ice retreats, in agreement with the conclusions drawn here.

- 5) The analysis and discussion of GCM results appears to me (not a GCM expert) very valuable. It highlights a number of important operational limitations in applying statistical indicators as early warning signals, and it provides the first steps toward the use of statistical indicators in GCMs to predict changes in the sea ice cover. I would hope this motivates fruitful further research in the community.

Reference: T.J.W. Wagner and I. Eisenman (2015) "False alarms: How early warning signals falsely predict abrupt sea ice loss", GRL (23) 42, DOI: 10.1002/2015GL066297

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C2