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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 the reviewer for his constructive criticism, and in particular for pointing out two references that we should have cited in our publication. We will do so in a revised version of this manuscript, and we will clarify the relationship between our work and these two existing studies:

1. We do not assume the existence of a bifurcation in Arctic sea ice. A main result of our paper is that we demonstrate and explain a robust link between the mean state and the variability of sea ice. As we show, this link does not depend on whether there is a bifurcation or not, neither does it matter how abruptly the ice loss occurs. For example, the abrupt winter sea-ice loss in the model by Eisenman (2007) is not due to a bifurcation, and it is not in conflict with the findings of Wagner and Eisenman (2015).

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Discussion paper

The mechanism in Eisenman (2007) resembles the one found in complex models. We demonstrate this in a recent paper where we also show that Arctic winter sea-ice loss is more rapid than the preceding summer sea-ice loss in all models where it occurs (Bathiany et al., 2016). MPI-ESM is no outlier in terms of the underlying mechanism, and we will clarify this point in the revised version.

2. We do use the extended RCP8.5 simulations, and this can be seen in Fig. 8 where most time series extend beyond 2100. As Hezel et al. (2014) point out in their abstract, "In RCP8.5 the Arctic Ocean reaches annually ice-free conditions in seven of nine models." We simply adopted their notation of calling the extended RCP8.5 by their initial name. We do not claim that the models would lose their winter ice before 2100. This is only true for two of the models (GFDL-CM3 and MIROC-ESM) where the Arctic winter ice area drops below one million square kilometers. Moreover, our results do not depend on the timing of the winter ice loss. In a revised version, in addition to clarifying these points, we will include a plot of sea-ice volume time series, as suggested by the reviewer.

References

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