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The Cryosphere Discussions

Interactive comment on "How does internal variability influence the ability of CMIP5 models to reproduce the recent trend in Southern Ocean sea ice extent?" *by* V. Zunz et al.

Anonymous Referee #1

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The paper evaluates the CMIP5 models and their ability to simulate historical Antarctic sea ice extent. The hypotheses is that the model's internal variability and/or an inadequate initialization are the reason for the models' inability to simulate a correct trend. The paper is generally well written and raises an important question. However, the authors mention the possibility that internal variability may play a significant role for the observed trend, but never analyze this. Therefore, before publishing the authors should also include the role of internal/interannual variability in their analysis.

Main points: As illustrated by the authors, internal or interannual variability is an important factor for this region. The fact that some models have ensemble members

with positive trends and negative trends should raise the question, whether the observed trend is more than just noise. Because if this is true, there would be no reason for the models to agree on the sign of the trend. Tebaldi et all. illustrate this concept in their paper (Mapping model agreement on future climate projections, 2011). An other nice illustration of how important variability can be is given by Deser et al. (http://www.cgd.ucar.edu/cas/cdeser/Docs/submitted.deser.communicating_uncertainty.jan1
In Section 3.2 the authors give a trend of 150'000km2, however the standard deviation shown in Figure 2b for this time of the year is of about that magnitude. This could be an indication that the trend might as well be noise.

How exactly was the trend computed?

Minor points: Page 3542: If the variability is large, what does out of phase mean? Is it then necessary that the models are in phase with the observations?

Page 3543: Not sure whether it is fair to say the models are failing for the reasons mentioned in the main points.

Page 3546: the multi-model mean overestimates the sea ice cover. Could this be due to a few models? At least for CMIP3 most models had to little sea ice compared to observations.

Page 3554: Same point again; if variability is large how much information can a correlation tell you?

Interactive comment on The Cryosphere Discuss., 6, 3539, 2012.