

***Interactive comment on “The impact of a
seasonally ice free Arctic Ocean on the climate
and surface mass balance of Svalbard” by
J. J. Day et al.***

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Review: The impact of a seasonally ice free Arctic Ocean on the climate and surface mass balance of Svalbard

This paper needs an author review of intent and structure paragraph by paragraph - the linguistic syntax is poor - which will sharpen the paper's focus (should have been done prior to sending it out to review). I have included a few examples and suggestions from the conclusion section at the end of this review.

More generally the paper does not tell a targeted story and thus has neither a well defined science driver nor specific conclusion. I believe its intent is to assess the prob-

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able contribution of Svalbard to sea level rise, one that may be larger than expected through a retreat of the sea ice. If so then the Authors need to come back to this topic throughout and be explicit about such in the conclusions.

The paper also needs to be written in a quantitative fashion with specifics (methodology and results) stated rather than a qualitative description.

Specific points

Abstract: This should indicate the rationale of the science behind the paper. Why are Svalbard glaciers important? Is it because of their contribution to sea level rise. If so what is the bottom line? Abstract should stand alone – avoid having abbreviations for terms only used once in the abstract. Use the main text to introduce other abbreviations!

Introduction: Include a paragraph on the role of ocean heat transport in the west Spitsbergen current on local climate. It is this which controls the local sea ice extent.

1888: 27. However, is it not the case that Svalbard glacier flow has a long response time to changes in surface mass balance (Raper & Braithwaite). Thus this study can justify ignoring ice dynamics and consider only the net surface mass balance.

1890:16. Might be worth mentioning that B2 is a low end GHG emissions scenario.

1991:16. HadGEM1?? Is this correct or do you mean only as the surface boundary conditions? You later state HadAM3 forcing which will conflict with HadGEM1 surface.

1891: 22. Scenarios – what is the component of A1B and A2 that is classified as ‘severe’? Suggest changing this to something like ‘high end emissions scenarios, selected to generate a large change in sea ice extent’

1892: 21. It is not the case the down scaling ratio should have a maximum of 10. This is only a very rough guideline and should not be taken literally. A slightly larger domain size rather than nesting is a perfectly adequate method to safeguard against it.

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Note that many HadRM3 studies have been conducted with no impact from the forcing (HadAM3) resolution.

1895: 10-14. Has a lapse rate correction been applied to adjust from model to observation elevation? Is a bilinear interpolation use to match point observation within the model gridbox?

1895: 15-23. Orographic effects due to a step change are rare because the model uses a terrain following atmospheric levels. The main problem with the HadAM3/HadRM3 physics is a readiness to form a stably stratified atmosphere over cold surfaces. A shallow boundary layer forms (Murphy at al JGR 2002)

1897: 17:23. What time period from the ice cores record is the accumulation calculated. What time period from the RCM is it compared against. Is the RCM accumulation = solid precip – sublimation?. Note that HadRM3 does not allow any refreeze in the snow.

1899: 2. What is the definition of ‘turbulent heat flux’? I am not aware that this is an available diagnostic from HadRM3!

1899: 3. Use of ‘DJF’ and ‘JJA’ undefined. Indeed, the ‘paper would be more readable by reducing the abbreviations, so at no word cost it would be better to replace these with ‘winter’ and ‘summer’.

1999: 15. Put these temperature changes in context against the equivalent global temperature rise.

1899: 15-24. What periods are the temperature changes averaged over and what is the reference period? Do these changes represent all land or glaciers only? Is there a linear relationship as A1B progresses or are there ‘tipping points’?

1903: 6-12. Suggest changes to this paragraph to something like...

“The RCM performed well against observations [* how well?? *] in summer but in winter

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the climate was dominated by northerly flow leading to a

?? degree C cold bias. A comparison of HarRM3 climate diagnostics with coastal meteorological stations suggests that at 25km the orography was not adequately resolved to represent coastal atmospheric circulation [* this is not a new finding and could just be referenced to any of many regional model studies *]”

1903: 13-17. Suggest changing to ..

Verification of HadRM3 precipitation against the net accumulation derived from ice cores (Pinglot et al., 1999) was good at all 15 sites on Spitsbergen but is biased low over Nordaustlandet. The low model precipitation may be associated with smoothed topographic relief in HadRM3. [* is precip on Nordaustlandet seasonally different than on Spitsbergen? Can the low bias be due to excessive sublimation or northerlies?*

1903: 25. Is there a comparison that can be made with Førland et al. (2009) that would tie in with the introduction section?

1904: 17-21. This paragraph contains repetition and make no sense – rewrite.

End

Interactive comment on The Cryosphere Discuss., 5, 1887, 2011.

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