Ocean Science
Discussions

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Interactive comment on "Simulated melt rates for the Totten and Dalton ice shelves" *by* D. E. Gwyther et al.

M. Thoma (Referee)

malte.thoma@awi.de

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This is a very interesting study, which I recommend to publish after a minor revision. Most of my comments should be addressable quiet easily, and addressing the reaming few should take not to much effort.

p.2110 l.2 From my understanding "much of it marine based" refers in a grammatical sense to "East Antarctic ice sheet", which is not correct. The EAIS is mainly ground-based.

l.2 & l.26 East Antarctica has about 14e6 km^2 if only 5e^5 km^2 ($\sim$4%) are drained through Totten Glacier, I would not consider this *large*.

p.2111 l.4-6 More recent studies than Weertmann indicate, that lateral stresses allow

an ice shelf/sheet system to be stable even for downward sloping. I suggest to mention this here.

l.17 The way the 2800 m are mentioned here sound as if this would be some kind of mathematical limit. I suggest to reformulate this sentence to clarify, that the deepest part of AIS reaches down to 2800 m at present.

l.21 I suggest to cite an article describing the sea-ice pump.

l.28 There are more publications out showing the acceleration of LIS, I suggest to add "e.g., De Angelis ..."

p.2112 l.6 In the abstract you mention 9.1 m/yr of melting for TG, here you report a thinning rate of only 1.7 m/yr. I assume I missed something, but maybe this discrepancy could be explanaed somehow?

l.8 Until now you have not reported any "rapid retreat rate". I suggest to present an example here.

l.20 "Moscow University Ice Self", and in the following all named ice shelves should be capitalized with search-&-replace.

p2113 l.6 The PIIS is better known to me as PIG, is there any reason why you choose the uncommon name? I also would like to see a number how many m/yr and Gt/yr are drained through PIG/PIIS.

l.20 This sentence puzzles me, you just introduced "proposed hypotheses" in the previous paragraph (l.9-l.15) and now you claim you present them is section 2. I suggest to remove paragraph 9-15 and/or include its content into section 2.

l.25 I find the title improper: The "causal factor for basal melting" is (from my point of view) that $ T_ocean > T_ice_at_pressure_melting_point $ I suggest a reformulation.

p.2114 l.11 I suggest to cite Thoma (2008) here as well.

l.20 Please reformulate the expression "can not be definitely attributed as"

l.22 Actually the "Circumpolar Deep Water intrusions" do depend on "bathymetric features", therefore I do not understand why these are two different subsections.

p.2116 l.10 This sounds as if the polynya is a steady and everlasting feature - which might be the case for the observed era, but that should be mentioned. Some sentences about the duration and variability of this specific poynya would be nice.

p.2117 l.7 A informative as this section is, the placement puzzles me. I suggest to exchange sections two and three.

l.26 To my knowledge, it is not possible to separate the ACoC and the ASC apart from the areas where the coastline is far away from the shelf break. The latter is only the case in the Ross and FRIS-area, but not in the Totten area. Therefore the authors should explain why they discuss mainly the ASC and where the differences to the ACoC are in there area of investigation.

p.2119 l.16 I miss a figure indicating that the model has reached a quasi-steady state after these 32 spin-up years and that there is no model trend after this time any more. The polynya seems to play an important role is this feature somehow prescribed by an input data set and/or is this variable in time?

p.2121 l.6 What do these observations show?

p.2122 l.4 I can identify three periods of decreasing melt rates and two periods of Fig.2c increasing melt rates in Fig.2c. The decreasing seems to take be longer than the increasing, but I do not see an *increasing* from 1992 to 1994, but a slight decrease.

p2123 l.24 I am not convinced yet, that the atmosphere-ocean exchange through the polynya is the cause or "dominant mechanism determining melt rates". If warm water is available, than the potential for both, the heat exchange through the polynya as well as basal ice melting is increased.

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p2128 l.2 The remote sensing shows the thinning only for a specific time frame. You should mention this.

l.4 The phrases "It is generally believed" and "a series of possible processes" sound a bit colloquial, I would prefer a reformulation and maybe some references for the "generally believed" facts.

p.21 Reformulate: "... and provides valuable information ..."

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Fig.1 I have great difficulties to identify the many details within this figure. I would consider the "white shading" a "bright shading", because there is nothing *white* in the figure. From the caption I have the impression, that "Dalton Rise" is an Iceberg, because the arrow points towards the dark shading, is that meant? I am unable to identify any "blue shading" polynya in the figure. CORRECTION: After I looked on the pdf, I can identify the mentioned features, however, I would prefer a figure that is also understandable as printout.

Fig.2 As far as I know, a polynya is defined as an area of open water surrounded by sea ice. How can this be "stronger"? I assume you mean "more heat is lost through the ocean"? The "1 standard deviation" should have a unit. The order of (c) and (d) and (c) seems awkward.

Fig.3 This figure shows very interesting results. However, the order of the figures seems arbitrary and the notation within the figures (e.g.,1995.9 for OCTOBER) is confusing.

Fig.4 I would like to have a much larger figure. There arrows are barley visible and very hard to interpret.

Fig.5 I really like this very instructive figure :-) However, the bold *P* is hard to read.

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