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Earth System
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Discussions

Interactive comment on "A consistent dataset of Antarctic ice sheet topography, cavity geometry, and global bathymetry" *by* R. Timmermann et al.

Anonymous Referee #1

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(The same text is also attached as a pdf file)

The manuscript of Timmermann et al. presents a new data set that contains consistent fields of bedrock and ice bottom topography, surface elevation, and an auxiliary mask. The steps, that have been taken to compile this consistent data set with a focus on Antarctica, are well described. This work is highly beneficial for the modeling community who wants to simulate the interaction between ice sheet, ice shelfs, and the regional ocean in Antarctica. I recommend the publication of this manuscript after minor correction. I am looking forward to see you manuscript published.

General comments ==========

For a data set like the RTopo, I would like to see some error or uncertainty estimates

of the presented topography and elevation fields, beside the cited error of 25Âăm for the ice shelf thickness of Filchner-Ronne (P 238,L 17ff). Could you please provide additional information or state/declare that these are not available.

Two times you talk about a minimal water depth of 10Âăm below floating ice shelfs (P 238, L 16 and P 240, L 2). Do you apply this threshold generally? Please clarify this point.

To determine the ice bottom surface height from surface elevations (ice draft), assumptions about the densities distribution in the ice and of the ocean are required. In the Filchner-Ronne Ice Shelf the sea water density is approximately 1028 kg m-3 and the ice shelf has density ranging from 917 kg m-3 for meteroric ice to 896 kg m-3 for marine ice (Lambrecht et al., 2007). In contrast the GeorgeÂăVIÂăIce Shelf's ice density is 910Âăkg m-3 without any firn correction. Do have have done also these calculations and if so what have been you densities and have you used a firn correction?

Does you data set map a particular year?

On your web page you are asking for an e-mail address to keep the user about you data set updated. You might add this request also in our manuscript under section 4 (Data access).

Specific comments ==========

Before I am coming to the more specific comments, who should know that I am not a native speaker and, hence, you should take some commands with a gain of salt.

Text —- P 233, L 17ff You might shift the "consistent" to the beginning of the sentence to highlight that not only the masks are consistent: "The resulting consistent global 1-min topography data set (Rtopo-1) contains maps . . ., and masks for . . . ."

P 233, L 17 Would you please be so kind to explain the meaning of the acronym RTopo.

P 234, L 7 To make the point you should rephrase for example:"The rate of ice mass

loss from the Antarctic ice sheet (might) contribute to the eustatic global sea level as stated in the IPCC's Fifth Assessment Report."

P 234, L 11 Our final goal is to reduce errors and not bars and, hence, you should rephrase:"In order to reduce errors in high-resolution simulations ..."

P 234, L 11ff Your should split the long sentence (line 11-15) in two parts, like "In order to reduce . . . consistent maps for Antarctica ice sheet/shelf topography and global ocean bathymetry. Therefore we combine available . . . ."

P 234, L 22f Does it sound better? "In contrast to the ongoing activities to compile the International Bathymetrie Chart of the Southern Ocean (IBCSO, eg. Schenke and Ott, 2009), our . . . ."

P 235, L 7 Since your surface elevation is the upper surface of bare ground, ice sheets/shelfs or caps, regardless if it's label "ice" or "ground" (for example Greenland), you should skip "Antarctic" and rephrase: "surface elevations (upper ice surface height for sheets/shelves; bedrock elevation for ice-free continents; zero for ocean)"

P 235, L 15ff What do you think about this formulation: "Ice not connected to the Antarctic ice sheet, including glaciers on subantarctic islands and the Greenland ice sheet, is not covered in our data set; these areas are labeled as bare land surface under preservation of the surface elevation."

P 236, L 11 Do you mean details?: " ... with an impressive amount of details."

P 236, L 15ff I find it misleading in the text to declare all disconnected ice caps from the ice sheet as bare land. Since in the below mentioned data set of Greenland (see below) disconnected caps exists in close neighborhood to ice sheet, for the main land of Antarctica it would be of great value to label these points as ice caps. In this case it would help ice sheet/shelf modelers to distinguish between glaciated and ice-free areas. If, as you figure caption 2 suggests, these caps are located only on the the island of Antarctica, then I am fine with it. However, you should clarify this point in the

main text and not in the figure caption.

P 237, L 10 You might erase Antarctic:" ... the transition line follows the ice shelf front or coast."

P 237, L 10ff Since the sentence that begins with "In order to avoid" is long and conveys several information, you might skip the embedded brackets "(which is the latitude between the Larsen B and Larsen C Ice Shelf areas)" or split the sentence.

P 237, L 21 You might replace the word "use" by "incorporate" to obtain: "In order to incorporate topographic information . . . ."

P 238, L 4 Since inlets are not really filled with values you might rephrase: "Given their small scale . . ., the inlets downstream from Hennen Ice Rise are represented by interpolated values."

P 238, L 8 You probably mean floating condition and should rephrase: "In order to maintain floating condition in the . . . ." At the end of the sentence I would rephrase: " . . . grounding line positions of Rignot and Jacobs (2002) instead, which has also been suggested by Makinson and Nicholls (1999) and Lambrecht et al.Âă(2007).

P 238, L 19 Figure 3 suggests, that the width of the transition zone between data sets varies. Would you please provide some information about the width range like: "The width of the transition corridor varies between X to Y and be seen in the left panel of FigureÂă3." In the view of the utilized tanh a per-se threshold defining the transition from one end to the other does not exists. Which threshold have you used in your left figure 3.

P 238, L 21 Erase localized to obtain: "... and occur in a narrow band along the grounding line."

P 238, L 22 I prefer in the running text "Figure" instead of "Fig", as long as they're not part of a pair of parentheses.

P 238, L 26 You might rephrase by replacing “with” against “from” and by replacing “datasets” against “data set” : “ . . . which is a combination of ship data from the “Airborne Geophysical Survey of the Amundsen Embayment” (AGASEA) and the BEDMAP data set.”

P 239, L1 Do you mean ”The former data set has already . . . “ instead of “This dataset has already . . . ¿‘

P 239, L 2 Erase “here” to obtain: “ use the original Nitsche et al.Âă(2007) data.”

P 239, L 10 Please introduce the abbreviation PIG in the main text, for example in line 7: “An important exception is Pine Island Glacier (PIG), where . . . .”

P 239, L 21 You might add “observations” to obtain: “ obtained from ICESat altimetry observations.”

P 239, L 23 Delete “,” (comma)

P 239, L 24 You might rephrase: “ . . . in a sense that all areas denoted as ice shelf are characterized by floating ice in reality.”

P 240, L 2 Add a subject:” . . . based on ALBMAP, but it has been modified . . . .”

P 240, L 5 You might erase “The existence of” to obtain:”Such deep troughs . . . .”

P240, L 9 You might delete “indeed”: “ . . . show that troughs of very similar depth and . . . .”

P 240, L 14 You might rephrase “... February 2002, respectively, transformed the former cavities into open water embayments.”

P 240, L 19 You might erase “as a basis”: “... spherical triangulation is used to fill the gaps between cruise tracks.”

P 240, L 20 Of course we all do our job carefully and hence you should delete carefully: “... embayment has been corrected wherever the existance . . . .”

P 241,L 2 You might erase “in the area”: “... cruise ANT-XI/3 (Rottmann et al., 1996) near the Ronne Entrance (Fig.Âă6).”

P 241, L 7 It is not completely clear to which data sets refer the “these” (from the sentence: “In contrast to the representation..., THESE data taken together ..). Please clarify this point.

P 241, L 10 Please rephrase the sentence that begins with “Note that we ..” to obtain for example: “The data gap in the bathymetry in the northern part of the George VI Sound is filled with an assumed profile that is fully consistent with the Potter and Paren (1985) plume line profile along the the northern ice shelf front.”

P 242, L 2 You might replace the second “Smedsrud et al.Âă(2006)” against “they” to obtain: “They interpolated original seismic . . . .”

P 242, L 6 Do you meant plural data: “ . . . no seismic data are available, ice shelf draft . . . .”

P 242, L 8 Please erase one “at”, like “... deepest grounding line at the Fimbul ice shelf ...”

P 242, L 10 Do you really need for a single sentence a now paragraph, which isn’t a perfect style?

P 242, L 13 If you had discussed the mask already, you would not need to do it again. Hence replace “discussed” by “mentioned”: “As mentioned, we provide a global mask that . . . .”

P 242, L 15 You might also discard “as already mentioned” to obtain: “However, coast and grounding line locations . . . .”

P 242, L 21 Since you have a enumeration of more than two items, you might add the missing “,” (comma) to obtain:“... Amery Ice Shelf (ice front, grounding line, ice rumbles), and Fimbul Ice .. .”

P 242, L 23 Since you state that subglacial lakes are ignored, have you reduced the ice thickness by the water depth or have to add the water depth to the ice thickness? Please clarify this point.

P 242, L 25 Since you haven't a mask value or type labeled "continent", you probably mean "bare ground".

P 243, L 8 You might rephrase because you data set comprises a mask and data fields: . . . that are consistent with the mask and all other (data) fields."

P 243, L 18 To be consistent with the tense of the first sentence in this paragraph you might rephrase to: "... the southeastern Bellingshausen Sea), we have presented data . . . ."

P 243, L 18 You might replace "next to" against "beside": "Beside maps for bedrock topography and the upper and lower surface . . . ."

P 243, L 20 You surely have "systems" in mind: " . . . heights of the Antarctic ice sheet/ice shelf systems."

P 243, L 22 Is it really of natural origin? You might rephrase "Of course, this kind of data set can . . . ."

P 243, L 22 Since you summarize your manuscript, you have already mentioned all aspects that you discuss here. Therefore, delete all "mentioned" parts. You might rephrase: "The bathymetry under Larsen C Ice Shelf is, for example, not more than an educated guess. Therefore contributions to improve the data set are more than welcome."

P 243, L 27ff I guess you would like to obtain new data right away. Therefore, you should change the tense of the last sentence to: "Any additional contribution regarding local ice shelf/cavity geometry are more than welcome and are used to update the data set as soon as possible."

Figures ——- Figure 2: In the sub sections from 2.2.3 (Filchner-Ronne Ice Shelf) to 2.2.9 (Fimbul Ice Shelf) you describe certain aspects of the topography and refer therefore to the figures 4 to 6. However most of the named locations are not labeled in the corresponding figures. Please add the missing notations. In addition it might be informative in some cases if you would also refer to the given data set number of table 1 and/or figure 3 to guide the reader directly to the right location.

Since the grounding line seems to be often congruent with the coast line on your plots and therefore barely detectable as gray line, please notice it for example in the caption of figure 2.

Figure 3: The colors of the data sources 3 and 4 as well as 6 to 8 are barely separably. In particular the spatially close located neighbors 6 to 8 should have distinctively different colors. Please spread the colors differently, use an other color map, or use additional characteristics like strips, points.

Figures 4-6: Please add the notations to referred locations from the main text.

Data set ——— I suggest to add the attribute "coordinates" to all fields, with the exception of lon and lat, in the NetCDF files, because it helps some visualization programs to draw proper figures. foreach FIELD (bathy draft . . .) ncatted -O -a coordinate,${FIELD},c,c,"lon lat" FILENAME end Further on I would like to see the coding of the mask values given as attributes or as part of the long_name attribute like "mask (ocean:0, ice sheet:1, ice shelf:2, rock:3)"

In addition, I recommend to add global attributes explaining the origin of the data set and give proper citation hints (The nco – netcdf climate operator – suite helps to perform the task).

Wish list =========

I understand the restriction on the ice sheet of Antarctica, which is enough for one data set. However, the global coverage of the presented data set calls for the integration of

the Greenland ice sheet as the second largest ice sheet on earth for the next release. To restrict the effort in this case it might be possible to integrate an other freely available data set into RTopo as for example the data set provided by the SeaRise project available under http://websrv.cs.umt.edu/isis/index.php/Present_Day_Greenland.

I personally prefer the “data set” instead of “dataset”, but I am also fine with the latter one.

In my humble opinion is a data set a selection of fields and, hence, a data set like the BADMAP calls for the single form. Please consistently use either the single or plural form in your manuscript.

Please also note the supplement to this comment:
http://www.earth-syst-sci-data-discuss.net/3/C100/2010/essdd-3-C100-2010-supplement.pdf

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