The Cryosphere
Discussions

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Interactive comment on "Elevation and elevation change of Greenland and Antarctica derived from CryoSat-2" *by* V. Helm et al.

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R: Brief discussion of error sources (roll/pitch), time variable backscatter A: We are not discussing those e errors here in detail. Galin (2013) gave an good estimation of errors resulting based on baseline bending and the mispointing in roll/pitch direction. We refer to this in some detail in A4. Corrections of time variant backscatter are not applied and therefore we don't discuss this in the paper. We also assume, that our new re-tracking is insensitive to a changing volume backscatter as stated in the text an shown in Fig. 1

R: What domains used (ice mask) A: We used the ice mask for Greenland from the GIMP study and rock outcrops and coastlines from SCAR Antarctic data base.

R: Reorder manuscript, to give the full methodology to the reader A: We reoredered

C1216

the paper.

R: Abstract more focused A: we changed the abstract and shifted the references and some parts to the main text

R: 1674, l7 A; corrected

R: 1674, l8 A: not changed, since in the abstract it is not explained how we derive dh/dt and we would like to focus first the 3 years of data used.

R: 1674, l27 A: corrected

R: 16745 l1-14 A: Introduction has been extended.

R: 1675, l18 A: changed to: The newest and since the loss of ENVISAT last remaining

R: 1675, l24 A: changed

R: 1675, l28-29 Reference to wingham and make mor clearer A: changed and reference to wingham (2009) added

R: 1676, l9 A: removed from text

R: 1676, l5-19 consider if description is sufficient to reproduce the results A: Our explanation of the methods is more detailed. We hope that the reader can easily follow.

R: 1676, l19: A: changed

R: 1676, l25 A: changed

R: 1676, l28 How variable is the real dt? A: We changed the processing to a modified version of Soerensen (2011). We added some statistics of the covered dt as well as the number of points used for each regression.

R:1676, l29 A: We changed the processing and use now a block mean. However we also calculated distance weighted mean and median. The differences are within the error bar. We chose mean since this gives usually values between the weighted and

C1217

the median. As example for GIS: mean: -375 km3/yr, weighted mean: -378 km3/yr and median -367 km3/yr. The uncertainty is estimated to 24 km3/yr

R:1686, L22 Baseline B A: ESA term, describes the processor version. We replaced all Baseline B with CryoSat level 1B data.

R: 1687, l7-9 A: changed

R: 1689, l2 A: changed to standard deviation

R: 1689 l6 A: changed

R:1689 , l15-16 A: changed.

R: 1690, l10 Ewert, GC correction applied? A: No, Ewert did not apply the G-C correction for release 33. However we made an own check over lake wostok and found only minor differences between G-C corrected and uncorrected data.

R: 1690, l3 A: changed, we don't use Baseline A data.

R:1690, L16 A: changed

R: 1690, l23 statistics to number of dt points and dh and dh requirements A: added

R:1691,l2 A: We added some more detailed information in section 2.3

R: 1691, l5 Clarify A: added

R: 1691, l16-21 move equations to section before A: Paper is restructured and equations are now in A4

R:1690,l15 A: : I don't know what is mentioned. Is there the wrong page given?

R: 1690, l13-19 add to introduction A: I don't know what is mentioned. Is there the wrong page given?

R:1677, l20 A: changed

R:1678, l17 logarithmic scale? A: changed

R:1678, l27 A: changed

R: 1681,l25 Explain better A: changed

R:1682, L1 A: changed

R:1682, l1-12 add to introduction A: paper is restructered R: 1682,l15-18 add to methodology A: paper is restructered

R: 1682, l25 A: changed

R:1683,l8 A: changed

R:1683, l17 A: changed

R:1684, l26 And R: 1685, l6 make clear why this strong spatial averaging is necessary

A: We now use the mean instead of the median. On global scale the difference between mean and median is within the error bars (R:1676, l29). However the effect of local averaging is larger in limited areas of strong elevation change. The strong averaging is needed to interpolate data gaps, occurring e.g. at the higher elevations as well as at the lower part of Jacobshavn. This can be clearly seen in Fig.14. Also the track spacing ICESat in southern Greenland is up to 30 km. Therefore we used such a large radius to make comparisons between ICESat derived dh/dt and CryoSat derived dh/dt. Furthermore we minimise the overall error budget for the whole ice sheet. A comparison between 50 km and 25 km averaging gave the following numbers for Greenland: -375 +/- 24 compared to -357 +/- 40

R: 1685 change wording of conclusion A: changed

R:Table 6 A: we put a vertical line to clearly indicate that the right side is a continuation of the left side.

R: Fig 6 A: changed

R:Fig 9 icesat points are missing A: changed

Fig 10 explain why points are missing at higher elev. A: due to very high roughness – waveform filtering

Fig11 A: changed

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C1220