

***Interactive comment on* “Comparison of airborne radar altimeter and ground-based Ku-band radar measurements on the ice cap Austfonna, Svalbard” by O. Brandt et al.**

Anonymous Referee #3

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GENERAL COMMENTS

Summary: The manuscript compares measurements from ground based VHB radar data to air-borne SAR/Interferometric Radar altimeter data (ASIRAS), along with in-situ snow measurements. The authors conclude that ground based radar measurements are a good validation tool for air- or spaceborne radars, as they observe similar reflection horizons in the ground based and airborne data sets. They also reach the following conclusions:

1. The strongest backscatter comes from low density, large crystal layers surrounding thin ice layers.

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2. The last summer surface frequently gave the strongest response.
3. The first return of the airborne data is a composite of the surface return and returns from the upper ~30 cm of the subsurface, due to the lower bandwidth of the airborne data.
4. The peak position in the airborne data is not necessarily a good proxy for the surface.
5. A 20% threshold retracker (20% of the average maximum ASIRAS peak) for the surface provides a reasonable estimate for depth=0, to allow comparison to the VBH data.

I think that the main message of this manuscript, that you can compare in-situ and airborne data, is important. However, I think that a discussion of the differences between air- and spaceborne radar is required if the authors are to make the statement that this work justifies the use of ground based measurements to validate spaceborne radars.

It would be more useful if this manuscript discussed the implications of these measurements for the validation CryoSat-2. For example, if they wish to address the penetration error, outlined in the CryoSat calibration/validation document, then how does this experiment answer this or what other experiments/measurements are required to do this?

SPECIFIC COMMENTS

Conclusions 1 and 2 are interesting and significant results.

Conclusion 3 has already been shown by Scott et al., (2006b).

Conclusion 4 is true, but it is unclear who is suggesting the peak of the waveform is a good place to retrack the surface in the first place for ASIRAS type echoes.

Conclusion 5 is not true, as the authors say on page 784 that when the 20% retracker gave unrealistic results then they either used a 10% retracker or discarded the data. As the %'s of data retracked by the 10% threshold method and discarded are not given, one cannot assess how well the 20% retracker works. If this manuscript is advocating

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a 20% threshold retracker for analysis of this type of data then it would be useful to have a justification of why this is a reasonable retracker for the ASIRAS data. The authors should also explain why they don't use a theoretical based retracker such as that described in Wingham et al., (2004), which is designed to retrack interferometric altimeter echoes. In figures 5 & 8, the response to the corner reflector is. As I assume that the distance to the surface from the corner reflector is known - why is this not used to justify the use of a 20% threshold retracker to estimate the surface elevation?

TECHNICAL CORRECTIONS

In general I think that the manuscript could be more precise. I have already mentioned replacing "few" with the actual % of echoes retracked using the 10% retracker on page 784. Other examples include p795, line 9, "frequently" the LSS gave the strongest response, this could be quantified.

"large crystals" are defined in the abstract as >3 mm and then again in the conclusions as > 3 -4 mm, but not defined in the text i.e. p786 lines: 17-26, they are then defined again on the next page - either define every where or just once for consistency (there may be more examples).

Section 3.1: Although it is very useful to be reminded about clutter, this section could be condensed.

p 786, line 6: remove "certainly".

Fig 4,7,10,11. In the caption put that b) is the VHB trace. Put what 1,2,3,4&5 correspond to in the caption.

Section 5: It would make the text easier to follow if the stratigraphy was shown in figures 4,7,10 and 11.

p 784, line 16: replace (see below) with (see Section 4).

Interactive comment on The Cryosphere Discuss., 2, 777, 2008.

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