Motivation

The CryoSat-2 satellite is equipped with a Ku-Band radar altimeter which measures the distance $H$ between satellite and surface [Wingham et al., 2006]. In order to convert sea-ice freeboard to sea-ice thickness it is crucial to know the reflecting horizon very accurately. It is assumed that the radar is penetrating a cold and dry snow layer [Willatt et al., 2011]. During the CryoSat Validation Experiment (CryoVEx) in the Lincoln Sea in 2011 CryoSat-2 underpasses were accomplished with two aircraft. Both aircraft flew in close formation at the same time of a CryoSat-2 overpass. The Objective of our study is to investigate how snow cover and surface roughness are effecting the CryoSat-2 freeboard retrieval. Therefore the CryoSat-2 freeboard is compared with freeboard measurements of an airborne radar altimeter and an airborne laser scanner. Laser beams are always reflected at the surface and therefore can be used as a reference.

Data/Methods

Airborne laser scanner (ALS):
1. A manually picked sea-surface height is used to calculate snow freeboard $h_s$.
2. A weighted average is formed of across-track data points.
3. Assigning to the respective CryoSat footprint and averaging the assigned points

Airborne Radar Altimeter (ASIRAS):
1. Laser scanner sea-surface height is used to calculate the freeboard.
2. Same as step 3 of airborne laser scanner methods
3. Removing constant offset by identifying open water spots

CryoSat-2 (CS):
1. Laser scanner sea-surface height is used to calculate the freeboard.
2. Removing constant offset by identifying open water spots

Results

- CryoSat-2 freeboard coincides with laser scanner and ASIRAS freeboard over flat surfaces.
- A penetration of snow cover by the radar is not clearly noticeable.
- Surface roughness seems to cause errors of the range retracking.

Conclusion

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References
