The Cryosphere Discuss.,
doi:10.5194/tc-2016-21-RC1, 2016

The Cryosphere Discussions

Interactive comment on "Near Real Time Arctic sea ice thickness and volume from CryoSat-2" *by* R. L. Tilling et al.

Anonymous Referee #1

Received and published: 28 February 2016

General comments:

This study considers the use of CryoSat-2 Near-Real-Time (NRT) data from ESA, for calculating sea ice thickness and volume. The authors present a quality assessment by comparing the NRT product with the ice thickness and volume derived from the archived level1b data from ESA. They analyse this data for one sea ice growth season from October 2014 to April 2015 and conclude that NRT ice thickness is of comparable accuracy to the product, derived from archived data. The authors pronounce the benefit of NRT thickness data for climate models and industry, e.g. shipping and tourism.

Indeed, the availability of NRT CryoSat-2 thickness is a great achievement. However, the methods to derive sea-ice thickness (and volume) are the same as described in Tilling et. al. (2015). Many parts of the methods are already discussed in the Nature

paper. The novel part is given by statistical analysis of data coverage and differences in thickness and volume of the NRT product on a basin scale.

In general, my concern is that this manuscript lacks of an in-depth analysis. The focus of this paper is set on the comparison and difference between the NRT and the final released product. But more elaboration of these differences is needed. There are substantial questions that I think should be addressed, going along with further analysis:

1. The volume comparison in Figure 2 reveals higher values for the final release product. You state that this is mostly because of the the use of different ice concentrations, but also due to the absence of orbits in the NRT level1b data. Nevertheless, Figure 1, 3, 4 and Table 1 only show statistics with respect to the NRT product. Can you include the same statistics for the final release product (as in Figure 3 and Table 1 for the NRT product) and also the different ice concentrations, you used? I think this is needed in order to proof your statement above and to turn out the differences.

2. Although many readers are interested only in the final thickness product, comparing only the thickness histograms of both products, is not enough from my point of view. I suggest to show freeboard (and thickness) maps of difference between the NRT and the archive product in autumn and spring. This would give further information about the spatial distribution of differences between both products.

3. The CS-2 data processing starts with the NRT level1b data and the processing of each orbit segment. Therefore I would suggest also to consider differences on the orbit-scale, like the comparison of freeboard along track between both products or even just the comparison between the ellipsoidal elevations (after retracking). And what about the detected leads? Is it the same for both products?

Detailed comments:

P2 L38: The oil and gas sector requires sea ice information for feasibility studies. Why

is the reduction of plans for exploration and drilling a consequence? I think it needs one more sentence to explain this.

P2 L28-30: So you use NRT SAR and SIN, right? Is there a difference between handling both modes in the NRT product. Or to be more specific, are the differences between NRT SAR and archive SAR the same as between NRT SIN and archive SIN? Would it make sense to separate between the modes in this study?

P4 L5: Can you be more specific: Which geophysical corrections are missing in the fast delivery data? What does 'often' mean in this statement?

P4 L15-19: How do you justify using the Warren climatology in regions where W99 is not based on measurements, for example in the Baffin Bay. W99 is a 2d fit and therefore it is not constraint in such areas and can produce substantial biases which are not considered in the uncertainty estimates. In some ares like Barents Sea in November, it can even cause negative snow depths.

P4 L27-29: Why do you use the same weighting for all points? If you project on a 5 km grid, but using a 25 km radius for averaging, this means that the grid cell covers only 1% of the area which goes into the average (5x5 km = 25 kmˆ2, pi x (25km)ˆ2 = 1963 kmˆ2)? Is that right? But then the grid cell is hardly representative for the thickness at this location. What is the circular operator doing? Would it make sense to apply a distance weighting?

P4 L33-34: How is the gap filled at the pole?

P6 L1: . . . absence 'o'f . . .

Figure 3: Can you add the data for the final release product? I think it would be helpful to understand the differences in coverage between both products.

Figure 4b: Can you add the data coverage of the final release product (see previous comment)?

Interactive comment on The Cryosphere Discuss., doi:10.5194/tc-2016-21, 2016.