The Cryosphere Discuss.,
https://doi.org/10.5194/tc-2019-190-RC2, 2019

The Cryosphere Discussions

Interactive comment on "Accuracy and Inter-Analyst Agreement of Visually Estimated Sea Ice Concentrations in Canadian Ice Service Ice Charts" *by* Angela Cheng et al.

Anonymous Referee #2

Received and published: 24 October 2019

General Comments

The paper presents a comparison of ice analyst assessments of sea ice concentration values at the Canadian Ice Service, both between analysts and against an automated retrieval method. It is well written and I see only some minor issues that can be fixed or explained better. The study is limited to Canadian Ice Service analysts, and finds very good agreement between them. With more analysts, including from other ice services, it is likely the range of opinions will increase. However running this type of exercise is time intensive, so only a limited number of such studies have been performed (i.e. Karvonen et al, 2015). Other studies have tried examining the areas

where ice charts overlap, for example a comparison between Norwegian and Danish ice charts at *https://www.ecmwf.int/sites/default/files/elibrary/2018/17968-satellite-observations-sea-ice-concentration-and-drift.pdf* (p.14-15). More of this type of paper evaluating ice chart data are needed to provide quantitative measures of uncertainty that can be used when ice charts are used as training data for automated classification algorithm developments and as climate records.

Specific Comments

P2 L2 Analysts at the CIS delineate boundaries around regions with similar ice conditions. This raises the question, what was the rationale for the example polygon areas in Figures 3 and 4 as these contain dissimilar ice conditions?

P2 L28-34. This uncertainty is not limited to ice charts, automatic satellite-derived sea ice concentration products also have varying levels of uncertainty.

P3 L31 and P5 L25. How does limiting the analysts to only HH affect their choice of concentration? As noted at L29, the addition of HV has improved distinguishing between ice and water, and Canadian analysts have had access to this from RADARSAT-2 for over a decade. One would imagine limiting to HH-only would be generating additional analyst uncertainty. It would be interesting in a further study to provide one set of images as HH, and another as HV.

P4 L8. The egg code is a World Meteorological Organization international standard. Reference should be made to WMO publication 259, Sea Ice Nomenclature.

P6 Figure 3. The example provided shows an area containing both dark areas of open water and lighter areas of concentrated sea ice. The open water areas are large and contiguous enough that most ice analysts would delineate them as separate areas, and some explanation is needed as to why these should be grouped with large areas of concentrated ice. MAGIC looks to have done a good job of marking these open water areas.

P8 Figure 4. Similar question, why does the polygon contain areas of areas of very open drift ice that are continuous with adjacent areas outside the polygon?

P13 L11 - P14 L3. 181 disagreements, or almost a third, is a large proportion. MAGIC provided lower estimates in 175 of cases, but analysts tend to err on the conservative side, and if the mix of ice concentrations shown in the example image polygons is representative of the dataset, it is to be expected that there would be more disagreement, as shown by only 36.8% of examples having unanimous agreement between analysts.

P18 L31-32. A 84% at plus/minus one-tenth accuracy shows very good analyst skill, most ice services only work in concentration ranges.

P19 L22-23. Agree, the definition of the polygon is critical. The examples provided appear somewhat ambiguous so some explanation as to why the areas shown in the examples are as they are would be useful.

P19 L35, P20 L1. The ice charts are for maritime safety so will err on the cautious side.

Technical Corrections

Figure 2. Difficult to view at this size and could be larger.

Figures 2 and 4. The red and green lines are hard to see and could pose an issue for color-blind readers.

Interactive comment on The Cryosphere Discuss., https://doi.org/10.5194/tc-2019-190, 2019.