The Cryosphere Discussions

The Cryosphere Discuss., referee comment RC2
https://doi.org/10.5194/tc-2021-346-RC2, 2022

Comment on tc-2021-346

Anonymous Referee #2

Referee comment on "Ice ridge density signatures in high resolution SAR images" by Mikko Johannes Lensu and Markku Henrik Similä, The Cryosphere Discuss., https://doi.org/10.5194/tc-2021-346-RC2, 2022

Ice ridge density signature in high-resolution SAR images by Mikko Lensu and Markku Similä

Overview

The work presents a new method to derive sea ice ridge height through bright pixels and ridge sail number in one high resolution and one medium resolution TerraSAR-X image. The paper uses a statistically derived method to connect the SAR images to the ridge density.

Major comment:

The text would benefit from being shortened, it's presently very long, 30 pages excl. references, and it deters from making the work shine. The text is in places composed of short sentences making it a bit difficult to read, and some of these sentences are not grammatically correct. This unfortunately lowers the quality of an otherwise nice manuscript build on solid physics. It would therefore be nice to see the work going through a thorough language check.

It is stated that the work can be used to aid safe navigation, but it could perhaps be explained a bit more thorough how that is planned.

This study is conducted using X-band images, which possibly due to the high resolution offered by TerraSAR-X, is renowned for being very good for ridge detection. Would it be possible to transfer this study to the operational used C-band SAR images? Perhaps the authors could speculate if this would be possible and what implications it would have. As the study is done by authors at FMI is it perhaps possible to also find overlapping C-band images for the time and area of the X-band images used in this study?

The air temperatures were quite high during the time of the SAR image acquisitions, up to -1C. How will this affect the analysis? As ridges often trap more snow than the level sea ice, would the method presented here be more sensitive to a temperature change than a level sea ice area.

HEM thickness measurements tend to underestimate underestimate thick and deformed ice (see, e.g., Haas et al., 2009; Mahoney et al., 2015), how will this affect the results presented here? What is the resolution for the laser data?

Minor comments:

It is fair to say that the ground truth data from 2011 was used for both datasets. Perhaps this could be rephrased slightly as it may come across as using 5-year-old data as in-situ could unfortunately question the study in the abstract.

P4R20. Please provide reference/s for this.

P6R32. "…is used a" -> "a" and move "is used" to later in the sentence.

P7R20. Is 1/km km^{-1}.

P8R4. There is a reference to annual maximum extent, could this perhaps also be indicated in Figure 1, also as it is referred to this figure in the end of the sentence.

P8R13. Where is this temperature sensor located?

P8R26. How were these observations derived? From FMI ice charts? Ice observations?

Figure 4 is referred to before Figure 3.

P17R16. Equation number is missing.

P23R18. Could the rubble field also be referred to as brash ice?

P25R9 (?)

P28R12-16. How were the scaling factor derived? Was there a statistically based fitting?

P29R8. Which frequency would be suitable for ridge detection?