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Hydrology and Earth System Sciences
Discussions

Interactive comment on "River ice and water velocities using the Planet optical cubesat constellation" *by* Andreas Kääb et al.

Anonymous Referee #2

Received and published: 17 May 2019

General comments

The focus of the research article is the exploitation of PlanetScope constellation satellite imagery to estimate high latitude river velocities through ice floe mapping during formation and break-up periods. The authors creatively exploit an unplanned advantage provided by satellite path overlap to assemble imagery with sufficient spatial coincidence and slight temporal separation to allow velocimetry to be conducted. The potential use of PlanetScope data for this purpose is important to report. However, from methodological and interpretive standpoints, this largely reads like a rewrite of the 2011 article by the first author. The lack of methodological details, literature review and more rigorous uncertainty assessment make this read more like a technical note than a research paper. At the same time, the length required to provide pertinent details of the

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constellation, which is largely a quoted excerpt from another previous work, and factors to be considered when using this technique, specifically likely sources of error, create the length associated with a research article. Caveats regarding use and sources of error are provided in a complete and succinct manner, that is much appreciated. Either the article should be shortened to technical note length by condensing much of the quoted material or revisions should be completed to make this a more useful and therefore impactful research article.

Specific comments

There have been advances in other related application areas (e.g., sea ice monitoring) that should be considered and cited here. Some recent work also cites the 2011 work of the authors – which focused on the analytical approach employed, as opposed to the input data utilized. If this is to be a research article, additional consideration of the correlation technique should be provided.

Physical interpretations of observed velocities, while logical and illustrated by the figures provided, are still rather general in nature. That is, no specific uncertainty assessment is performed. Only qualitative judgement is possible. On the one hand, the method can provide insights regarding the timing, relative magnitude, and morphological information as illustrated – so what is provided has merit. None-the-less, it is important that the procedure one would use to conduct a more rigorous uncertainty assessment be at least outlined. Even reporting the specific challenges to conducting such an analysis so would help move the science forward.

Simply put: what would be needed to convert the velocities shown to a discharge value that might be compared in more quantitative manner to recorded (or in some cases estimated) discharges? For example, in Large Scale Particle Imaging Velocimetry (LSPIV) a relationship between surface and average cross-sectional velocity (i.e., what is used in discharge estimation) is assumed (and sometimes based on calibration). There is mention of friction effects in the 2011 article, but none here. Would the authors have

suggestions regarding an appropriate approach in the case of ice floe tracking?

I believe some further discussion of data coverage by this technique is also warranted. For example, is the Yukon river study area the closest possible to the Pilot Station gauge site or have cloud cover issues prevented selection of scenes in closer proximity? This is not meant as a criticism of the work or method, only as a request to help the reader understand the potential utility of the method.

Especially as you make mention of Sentinel and Landsat satellites for potential use in this application, what are the average sizes of ice patches (or the scale lengths of features in tropical waters) necessary for them to be actually "tracked" (correlated)? I expect this has been covered by the authors in previous manuscripts, but deserves explicit mention here.

A few more comments that are more than typographical or minor grammatical ones, provided in the order in which they arise in the manuscript (as opposed to priority):

Page 2, Line 13: What constitutes "small reaches"? Please indicate the length of reaches used in the studies mentioned as the reader can't rely on figures for more specific information.

Page 7, Line 6: Please clarify what is meant by 'juxtaposed'. At first read, it is easy to presume this relates to processes discussed later in the manuscript. Do you mean that individual ice pieces are NOT colliding and landing on top of one another or twirling in a circular fashion? I find this sentence confusing. Please revise it (add several more sentences if necessary) to clarify what you mean as I suspect the point you are trying to convey is important.

Page 7, Line 9 It seems that the lowest velocities are also at the lowest elevation end of the study reach. I assume the focus is on velocity and not geography in this case. If that is correct, change "close the lower end of the river reach" to "close to the lower end of velocities for the river reach".

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Page 7, line 13: What is meant by “strong and little sensitive contrast”?

Regarding figures: Figure 8 requires a legend (even though one is provided in figure 7). Figure 9 should be a little larger if possible.

Technical corrections

Page 2, Line 11 change to read ’. . .ALOS PRISM sensors. Agile stereo is. . .’

Page 2, Line 20 change ‘prevent from applying the method’ to ‘ prevent application of the method’

Page 2, Line 24 change ‘second’ to ‘secondary’

Page 2, Line 27 change ‘offers thus’ to ‘thus offers’

Page 2. Line 32 change ‘shortly’ to ‘briefly’

Page 3. I don’t believe it necessary to make the statement provided in parentheses or place the large sections of text in quotes. You wrote this text originally. By citing the source and providing the brief statement regarding update and specification (although I’m not sure what is meant by the latter), you can remove the quotes.

Page 4, Line 5 remove period and right parentheses between citations.

Page 5 Remove double quotation marks.

Page 5, Line 9 change “is” to “are”

Page 5, Line 18 remover “an”

Page 5, Line 21 remove ‘strictly’

Page 6, Line 15 should read ‘smaller than 0.7’

Page 6, Line 20 change ‘estimate’ to ‘estimating’

Page 7, Line 6 should read: ...velocities. Ice floes directly...

Page 7, Line 7 The text on this line is confusing. Please revise, paying attention to specific comments above.

Page 10, Line 3 change “choose” to “chose”

Page 15, Line 2 change “necessary completely eliminated” to “necessarily eliminated”

Page 15, Line 5 remove comma following ‘registration’

Page 15, Line 6 remove first ‘actual’

Page 16, Line 4 change indicator to indicators

Page 16, Line 13 change “seems not untypical” to “seems typical’

Page 16, Line 23 change ‘A major purpose of satellite observations of rivers are attempts to estimate discharge in order to spatially. . .’ to “A major purpose of satellite-based river observations is to estimate discharge in order to spatially. . .”

Page 16, Line 25 remove ‘validation’

Page 16, Line 30 change ‘missions, and’ to ‘missions. And,’

Page 16, Line 30 change “actual river surface parameters” to “river width.”

Page 17, Line 3 change ‘and better understanding of’ to ‘as well as provide better understanding of’

Kaab and Leprence 2014 citation seems incomplete.

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