HESSD

Interactive
comment

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

Anonymous Referee #1

Received and published: 1 May 2019

The manuscript presents very interesting results of estimation of the velocity of the ice floes on the Yukon and the Amur rivers for ice-break and ice set-up periods. The authors state that the ice velocity is retrieved with unprecedented accuracy of +- 0.01 m/s. They provide detailed and very valuable figures of across channel velocity distribution along 60 km (the Amur R.) and 200 km (the Yukon R.) reaches. For the Yukon River, the authors calculate the average velocity and measure river width along 180 km river reach and provide an estimation of the surface flux. The manuscript contains a section dedicated to the errors estimation and short discussion on difficulties of the Planet cubesat velocities retrieval and potential application of the constellation.

The manuscript provides very valuable snapshot on the river hydraulics for such a long river reaches, which cannot be measured or evaluated otherwise.

The manuscript is suitable for a publication on HESS. However, it needs a significant improvement.

1. The section Data and Methods needs an amelioration. More detailed (and separate) information on data used will ameliorate the reading. It seems that the authors, in addition to main Planet images dataset, use the Landsat images for river mask. However, they do not describe them in the Data section. In the section 4.2. the comparison with the ASTER derived results is made. Are these results new or already published? As it follows from the text, the only methodology is published. If the results are new, please, add their description into the Data and provide short paragraph of the method applied.

Moreover, the method section on 2/3 consists of the text cited from previous publication. I have never seen it before in journals of natural science domain and recommend re-write this section.

2. Calculation of the mean velocity and river width is the most interesting for potential applications part of the manuscript. However, the manuscript is lack of details on the method of calculation of these parameters. How is the multi-brunch geomorphology handled in this estimation? How does the variable floe density across the river affect the estimations of both parameters? How is the floe-free areas considered? What is the accuracy of the width calculation from the ice velocity vectors considering previous issues?

3. The main accent in the manuscript is done on the Yukon River, while the Amur River is treated by side. Please, explain what the reason was. I would like to see the same details for the second river with the plot of the mean velocity and the width. As well, it will be interesting to compare in the Discussion the similar events (freezing) on these two rivers.

4. For the Yukon River, the fig.7 presents the fields of velocity difference. What is the massage that we could retain from the difference plots? Please, explain it in the text.

5. Paragraph 20 on the page 16 (Discussion) repeats very interesting finding of the periodicity in spatial distribution of the velocity peak along the river, presented in paragraph 10 of the page 11. The manuscript will gain if the authors add more explanation and discussion on this phenomenon. Moreover, overall impression that the article is really lack of general Discussion and of comparison with other studies.

Other comments. line 20 page 5. "Over the limited width of rivers, water..." Please, simplify the sentence. Fig. 5. low panel. Please, explain in the sec 4.1. the noise on the islands and banks, or plot the river mask for clarity.

Figure 6. This is very interesting figure demonstrating the directions of the flow. The caption tells us that presented velocities are after thresholding of the correlation co-efficient. Please, give more details. The arrows are small. If the directions can be guessed, the length (== to velocity is invisible). Please, colour the arrows.

line 25-31 page 6. Check the English.

line 1 page 8 "ice velocities" RETRIEVED "from near-simultaneous Planet"...

line 11 page 8 "The images used.....to current sensors" ... Please, explain this sentence. What does it mean?

line 12 page 10. One Landsat image of 16 Sept 2013 was used to create the mask of the Yukon River. This mask is created using blue/TIR band ration. Please, explain the choice of the bands used or give a reference on work, where the performance of this ratio was investigated.

line 21 page 10. Please, provide the standard deviation for mean discharge value at 4 November.

lines 25-31 page 10. This paragraph is rather subject for discussion section.

line 29 page 16. ICESat is not widely used for monitoring the water height in rivers as its repeat cycle is of 91 days. I would cite recently launched Sentinel -3 missions instead

of ICESat2. If the authors prefer to keep ICESat2, this will need a comprehensive discussion about potential application.

If all these questions will be addressed, I will recommend this manuscript for publication.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2019-62, 2019.