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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Assessing historic water extents in rapidly changing lakes: a hybrid remote sensing classification approach" *by* Connor Mullen and Marc F. Muller

Anonymous Referee #2

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In this study, the authors developed a a hybrid remote sensing algorithm to estimate the time series of water surface areas over several lakes with rapid changes. The major novelty of this paper is that the proposed algorithm is still workable when the remote sensing images are partially covered by clouds/low-quality pixels. To enhance the capability of working under cloud condition, the authors first utilized unsupervised algorithm to classify pixels with high quality and then create a high-confidence inundation frequency (IF) image. Next, the supervised algorithm and the IF image were used to interpret masked pixels. The validation results against in situ observations indicate that the algorithm is able to monitor water surface changes with a high accuracy. This paper is well-written and easy to follow. However, there are several major concerns

related to the following aspects: (1) incomplete literature review (2) the applicability of the algorithm and (3) the design of the validation.

(1)Some efforts have been made to monitor surface water on global scale using remote sensing. It is not only necessary to acknowledge those work in this paper, but also meaningful to highlight the difference. For example, Pekel et al. (2016) developed a global water map by applying Machine Learning algorithm to Landsat images. Khandelwal et al. (2017) developed a method to monitor global lakes using MODIS images. Very similar to this paper, Zhao and Gao (2018) used an automatic approach to correct the contaminated images for assessment of reservoir surface area dynamics over 6,817 global reservoirs. They used the water occurrence map derived by Pekel et al. (2016) to correct the pixels with low quality, which is very close to the idea of IF image in this paper.

Ankush Khandelwal, Anuj Karpatne, Miriam E. Marlier, Jongyoun Kim, Dennis P. Lettenmaier, Vipin Kumar, An approach for global monitoring of surface water extent variations in reservoirs using MODIS data, Remote Sensing of Environment, Volume 202, 2017, Pages 113-128.

Pekel, J., Cottam, A., Gorelick, N. et al. High-resolution mapping of global surface water and its long-term changes. Nature 540, 418–422 (2016). https://doi.org/10.1038/nature20584.

Zhao, G., & Gao, H. (2018). Automatic correction of contaminated images forassessment of reservoir surface area dynamics. Geophysical Research Letters, 45, 6092–6099.

(2)The applicability of the algorithm needs to be further demonstrated given the fact only a few lakes were tested in this study. Besides this, all the selected lakes are very large considering the 30-m spatial resolution of Landsat. And the majority of the global lakes are much smaller than 1 km2. It would be interesting to add a section discussing the performance of the algorithm over small lakes. We can find the lowest

accuracy was obtained over the smallest lake in this study which raises a question - if the accuracy goes down when the size of lakes decreases.

(3)To validate the results, the authors compared all remotely sensed water extents with in situ observations. However, one of the highlights of the proposed approach is to interpret the masked pixels. So I am wondering how the algorithm performs during the cloudy season when lots of pixels are masked.

Other specific comments:

(1)Line24, miss a space in ‘consequenceof’. (2)It would be better to increase the font size for all figures.

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