

# ***Interactive comment on “Assessing the capabilities of the SWOT mission for large lake water surface elevation monitoring under different wind conditions” by Jean Bergeron et al.***

**Jean Bergeron et al.**

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*Italicized text:* Reviewer's comment

**Blue text:** Authors' response

*This paper describes the capabilities of the soon-to-be-launched SWOT ocean/hydrology mission to measure lake water surface elevations under different wind conditions, using a high-resolution hydrodynamic lake model and the JPL SWOT hi-res simulator.*

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*The paper is very well written and should be of interest to a wider audience. It is indeed a welcomed addition to the existing SWOT precursor studies that are mostly focusing on rivers with regard to the hydrology part of the mission.*

*I only have a few minor comments that should be addressed before publication.*

*- Paragraph L140: please describe briefly how the LiDAR DEM and SRTM DEM were merged/interpolated;*

The DEM was produced and provided by Environment and Climate Change Canada. The way the two DEMs were merged is as follows: the LiDAR DEM was given priority over the SRTM DEM due to its higher horizontal and vertical resolution. However, since the LiDAR DEM covers only parts of the area used, SRTM DEM data was used to patch missing data. The SRTM was downscaled to the LiDAR resolution using bicubic interpolation. This has been clarified in the revised version of the manuscript.

*- L153: please specify which type of classification was used for the S-2 image;*

A supervised classification was made using the maximum likelihood algorithm. This has been clarified in the revised version of the manuscript.

*- L160: Be sure to change the font type here to match the font type used throughout the manuscript;*

The font has been changed to match the rest of the manuscript.

*- L202: Is the assumption of the noise being Gaussian justifiable? Please add some words about that here;*

Water level gauges come in many forms, each with their advantages and disadvantages. The current study assumed the use of pressure transducers, which were used during the measurement campaigns. The specs ensure an accuracy of  $\pm 0.5$  cm,

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with  $\pm 1$  cm considered extremes. This is mostly the result of noise from the sensor itself, including built-in electronics, which should be well approximated by a Gaussian curve. However, it does not consider environmental factors which can create a bias. One such example is a transducer slowly sinking in the loose sediments at the bottom of the river or lake, giving the false impression of an increase in water levels. This implies that a  $\pm 0.5$  cm accuracy is likely an optimistic estimate of the real gauge error. However, while purposely introducing biases in the synthetic measurements potentially adds realism to the study, it was deemed to be a less valuable benchmark against which to compare SWOT-HR estimations than bias-free synthetic measurements.

- L229: 4.3 section heading. Please specify what volume here. I suspect lake water volume?

The section has been renamed “Lake water volume analysis” in the revised version of the manuscript.

- L270: section 5.1. Have you validated the model output in any way? I understand that for this synthetic case study, that may not be needed but it is nonetheless a good idea to indicate whether or not, model validation with independent data was performed and if so, how well did the model do; and if not, why not;

This is a great point and in fact leads to the next planned step in the project.

We agree that more realism in a synthetic study can yield more robust conclusions. This is why the next step in the project is similar in that it also aims to evaluate SWOT’s ability to close the water balance of lakes under windy conditions, but adding dynamic wind conditions over longer periods. This will require additional measurements from other campaigns, as well as the ability to specify changing winds in the SWOT-HR simulator. It is also planned to extend the study site to include a wider variety of lakes. The current manuscript is a first step toward this goal.

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- L328: 5.3 section heading. Again, here, please specify that this is water volume;

The section has been renamed “Lake water volume and net flow analysis” in the revised version of the manuscript.

- The error descriptions are sound and the conclusions reflect the results and analysis well.

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