The paper provides a detailed analysis of past & present altimetry mission data for lake water level retrieval. The paper is well written & organised and results are correctly presented and discussed. Official retrackers are discussed in detail underlining pros & cons. A strategy for constructing for a consistent long-term lake water level is presented. If implemented, it would have added a significant contribution to the paper. Hopefully this is something that authors will present in a future paper. I recommend to accept the paper implementing the minor changes reported below. Some points could be discussed with more detail but this is essentially a very good paper deserving to be published.

General comments:

- SAMOSA3 is cited everywhere as the official S3 ocean retracker. This is not correct as it has been updated a long time ago to SAMOSA2 (https://sentinel.esa.int/documents/247904/2802412/Sentinel-3-Mission-Status-Report-06-December-2017.pdf). In table 3, authors indicated Baseline 2.45, this confirms that the SAMOSA 2.5 model (SAMOSA2) has been used as it was introduced in Processing Baseline 2.24 according to the Labroue et al. talk at the 2018 S3VT meeting in Darmstadt. Please correct from "SAMOSA3" to SAMOSA2" everywhere in the manuscript.

- Please correct from ENVIsat to ENVISAT everywhere.

- In this work official retrackers have been considered, however, many non-official efficient retrackers have been developed for the inland water domain (SAMOSA+, DTU MWaPP, please see and cite the following as well: https://doi.org/10.1016/j.rse.2019.111546) performing better than OCOG. Therefore, for a possible future paper, we suggest the authors to test these alternative retrackers against the OCOG for S3 and also report the results at the Sentinel-3 Validation Team Meeting in order to eventually stimulate the adoption of retrackers alternative to OCOG. The same should be done by citing GPD+ Tropo corrections which many papers indicate as a valid alternative for the inland water domain.

- The discussion on input datasets is very good whereas the complexity of the scenario is not discussed with the same level of detail in relation to the surrounding topography (with respect to lake size), tracking modes (open loop/closed loop) & size of the receiving window. This is an important point considered in the majority of papers investigating the performance of altimetry systems in the inland water domain.

- In the conclusions, the FF-SAR could be cited for future investigations (see https://doi.org/10.1016/j.rse.2019.111589) as services will be providing FF-SAR Sentinel-3 and Cryosat-2 data shortly (Scagliola et al. 2020 in OSTST2020, Moreau et al. in the 2020 Coastal Altimetry Workshop final report available at http://doi.org/10.5270/esa.caw12_2020.final_report.). Sentinel-6 data can also be processed in Fully Focused mode when available.

Specific comments

Abstract section:

For Sentinel-3, Tables 9 and 8 indicate that the mean results are equivalent for the OCOG and SAMOSA, this should be underlined in the discussion. The bias (Table 7) is way lower for Sentinel-3. Therefore, the statement in the abstract (*"The results show that the model-free retrackers (e.g. OCOG/Ice-1/Ice) outperform the model-based retrackers for all missions, particularly over small lakes."*) shall be revised.

Introduction:

- In citing each mission, a reference paper should be added.

- Please indicate that Cryosat-2 is able operating the SARin mode in: *"Most of the radar altimeters operate in a conventional low-resolution mode (LRM), whereas Sentinel-3 and Cryosat-2 operate in Synthetic Aperture Radar (SAR) mode."*

- Please support the following with a reference: *"the River and Lake database (http://www.cse.dmu.ac.uk/EAPRS/products_riverlake.html) built by the ESA and De Montfort University (ESA-DMU)," as made for the other databases.*

- The position of this reference: "Jarihani *et al.* (2013) compared five different satellite […]" shall be revised in the references list as the name is reported before the surname:

  Asadzadeh Jarihani, A., Callow, J. N., Johansen, K., and Gouweleeuw, B.: Evaluation of multiple satellite altimetry data for studying inland water bodies and river floods, Journal of Hydrology, 505, 78-90, 10.1016/j.jhydrol.2013.09.010, 2013.

- Please evaluate revising from "self-developed retrackers" to "non-official retrackers" when citing Villadsen et al. (2016). Please cite also this paper in the sentence: https://doi.org/10.1016/j.rse.2019.111546.

- The following could be a bit more detailed: "*HY-2A was excluded from this study because of the difficulty in obtaining its data product.*"

Section 2.1

- The overall discussion on ice cover and presence of small islands is fine. Can something more be said about the complexity of the topography surrounding each of the investigated lake? This should be related to the tracking modes (open loop/closed loop) & size of the receiving window of the specific altimetry system to enhance the discussion. This is a very important point which is not discussed in detail in the paper (e.g. ENVISAT operated with 3 possible bandwidths/receiving window sizes allowing the instrument to correctly operate on various surfaces). This could be related to the data loss rate discussed in Table 6.

Section 3

- Table 2 is introduced with the following sentence: *"We used the most up-to-date version of data product of each mission for the evaluation. The geographical coverage, operational time period, repeat cycle, footprint size and retrackers of these radar altimetry missions are summarized in Table 2.'. Please correct from "footprint size" to posting rate:*

Mission	Operational Time		Organization	Geographic Coverage	Repeat Cycle	Data Product			MWR Bands (GHz)
	Begin	End				Source	Rate	Retrackers	
GeoSat	03/12/1985	01/01/1990	U.S. Navy	72°N–72°S	17 days	RADS	1 Hz	Ocean	—
ERS-1	07/17/1991	03/10/2000	ESA	81.5°N–81.5°S	35 days	ESA	20 Hz	Ice1, Ice2, Ocean, Sea-Ice	23.8, 36.5
T/P	08/10/1992	10/09/2005	NASA, CNES	66°N–66°S	10 days	RADS	1 Hz	Ocean	18, 21, 37
ERS-2	04/21/1995	09/05/2011	ESA	81.5°N–81.5°S	35 days	CTOH	20 Hz	Ice1, Ice2	23.8, 36.5
GFO	02/10/1998	10/22/2008	U.S. Navy	72°N–72°S	17 days	NOAA	10 Hz	Ocean	22, 37
Jason-1	12/07/2001	07/01/2013	NASA, CNES	66°N–66°S	10 days	AVISO+	20 Hz	MLE4, Ice	18.7, 23.8, 34
ENVISat	02/28/2002	04/08/2012	ESA	81.5°N–81.5°S	35 days	ESA	18 Hz	Ice1, Ice2, Ocean, Sea-Ice	23.8, 36.5
Jason-2	06/20/2008	10/01/2019	NASA, CNES, NOAA, EUMETSAT	66°N–66°S	10 days	AVISO+	20 Hz	MLE4, Ice	18.7, 23.8, 34
SARAL	02/25/2013	—	CNES, ISRO	81.5°N–81.5°S	35 days	AVISO+	40 Hz	Ice1, Ice2, Ocean, Sea-Ice	23.8, 37
Jason-3	01/17/2016	—	NASA, CNES, NOAA, EUMETSAT	66°N–66°S	10 days	AVISO+	20 Hz	MLE4, Ice	18.7, 23.8, 34
Sentinel-3	02/16/2016	—	ESA	81.35°N–81.35°S	27 days	ESA	20 Hz	OCOG, Ice-Sheet, Sea-Ice, SAMOSA-3	23.8, 36.5

- *Please improve including 'empirical' & 'physical' in the following sentence: "These retrackers can be divided into two general categories: the **empirical/**model-free retrackers and the **physical/**model-based retrackers."*

- *Typo, plural in "retrackers": "and the Sentinel-3 Ice-Sheet retracker~~s~~ is based on a 5-part piecewise analytical function (MSSL/UCL/CLS, 2019)."*

- *Regarding "Jason-3 now operates on the nominal orbit and will continue until the planned launch of Jason-CS/Sentinel-6 in 2020." Please replace "Jason-CS/Sentinel-6" with "Sentinel-6 Michael Freilich"*

Section 4

- Typo "e" in : "and the most recent release e of the altimetry"

- Regarding *"Third, the ice-cover condition is examined using the simultaneous TB measurements from the MWR instruments, and those lake water level estimates during the ice-covered period are excluded in the subsequent accuracy evaluations." Did author consider the possibility of comparing TB measurements results to ice charts?*

Section 4.1

- Please indicate "orthometric height" in "Geoid converts the reference surface from 330 ellipsoid to geoid**(orthometric height)**".

Section 6

- Regarding *"Our evaluation result is contrary to Sulistioadi (2015), who found comparable performances between Sea Ice and OCOG retrackers over a couple of small lakes using ENVISat data." Please do not be generic and clearly name the lakes studied in Sulistioadi **et. al** (2015). As previously indicated, one cannot exclude that other factors*

*(e.g. topography) & filtering criteria played a role in justifying the results obtained by Sulistioadi **et. al** (2015). To confirm that the OCOG is better, your analysis should be done over the same lakes and the methodologies adopted compared in discussing the results.*

- A possible strategy to create a multi mission time series is discussed. If implemented, it would have added a significant contribution to the paper.

- *Regarding: "When a lake was visited by more than one satellite missions on the same day, the best water level estimate among the overlapping missions should be selected to form a long-term series of records, in terms of the performance (r and RMSE) of the missions", which criteria would authors suggest to select the "the best water level estimate among the overlapping missions"?*

- *Typo (double full stop)in:* "[…] in terms of the performance (*r* and *RMSE*) of the missions.."

- *Please modify, according to table 9, from "6.47" to "6.08" in "The mean RMSE decreases from 35.17 cm of the early ERS-1 mission to 6.47 cm of the current Sentinel-3 mission."*

On Tables & Figures

Table 2

- Sentinel-3 is indicated with a single launch date. Please consider including 2 entries for both Sentinel-3A & Sentinel-3B.

Table 4

- Please explain how (see Sentinel-3 for example) for 18 Cycles you have 272 ground tracks selected for the first lake in the table.