Answer to Reviewer 2

We thanks Reviewer 2 for his positive comments

The ms is well-written and presented , reinforcing the expectation that satellite data providing additional data coverage improve the data assimilation results assimilated along with in-situ observations of 3D lake models. The DA method used was EnKF .

The authors should briefly address data assimilation using variational method i.e.4DVAR method, along with displaying relative sensitivity of model to the type of observations being assimilated.

Model error should also be briefly discussed. See for instance:

Santha Akella and I.M. Navon:Different approaches to model error formulation in 4DVar: a study with high resolution advection schemes . , Tellus A . , Vol 61A, 112–128 (2009)

Daescu D.N. and Navon I.M.:Sensitivity Analysis in Nonlinear Variational Data Assimilation: Theoretical Aspects and Applications. Chapter in book : Advanced Numerical Methods for Complex Environmental Models: Needs and Availability. Istvan Farago and Zahari Zlatev (Editors), Bentham Science Publishers, Published December 2013,ISBN: 978-1-60805-777-1 (2013)

We agree that 4DVAR is an efficient data assimilation approach. Yet, we used EnKF and as it we do not see the benefit for this article to describe 4DVar further. Other DA methods were adequately described in the Assimilation approaches in Appendix B. We propose to move parts of this section up to section 3, the Data assimilation section, to explain our approach more clearly. The reason for choosing a suitable DA method for this application is based on 1) computational efficiency, 2) operational consideration, 3) model independence and 4) code availability (openDA). For those reasons, EnKF was selected for this particular observation-model-DA system application. Developing or evaluating different DA techniques was not the goal of this paper and out of the scope of this project and publication.

We believe that model error was adequately described in multiple figures and plots in the manuscript (Tables 2 and 3; Figures 2, 4, 5 , 6, 7, 8) with various statistics and diagrams. Those statistics and figures showed the error between observational data, model free runs and DA runs, and demonstrated the value and improvement of DA. Again, it is not the goal of the paper to evaluate different DA methods and we prefer not to deviate too much from our main message: describe and implement an integrated observation-model-DA forecasting system for physical processes in lakes.

Another issue to address is the question of existence of an upper limit to the amount of information that can be assimilated and the improvement in model error.

Our approach aimed at being operational and the upper limit is so far constrained by operational computational resources with the goal to provide output in < 6h. Hence, we arbitrarily limited the amount of information being assimilated and simply tested the absence of assimilation shocks but did not investigate the existence of an upper limit to the amount of information that can be assimilated. This question is very relevant but we believe that this is not needed for this study aiming at developing an operational assimilation framework for lakes. We have however added the following text in the manuscript (P20L23): The existence of an upper limit to the amount of information assimilated was not investigated here, as the aim of this work is to provide an operational system with data assimilation in lakes.

We believe the true issue is to find the optimal amount of information that could yield the best simulation results under the operational consideration, and not seeking the upper limit. Finding out the upper limit is useless if there is no practical application, which can not be applied in an operational environment.  This is why the authors ran multiple configuration and numerical experiment to test and evaluate the best configuration (number of AVHRR images, data assimilation insertion frequency and number of ensemble members).