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## Comment on hess-2022-91

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Community comment on "Remote Quantification of the Trophic Status of Chinese Lakes"  
by Sijia Li et al., Hydrol. Earth Syst. Sci. Discuss.,  
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The TSI is a universal paradigm for eutrophic research in scientific literature. It is very important to study how to quickly quantify trophic state index estimation in inland water, instead of traditional methods by deriving chlorophyll-a or clarity. The manuscript entitled "Remote Quantification of the Trophic Status of Chinese Lake" proposed an applicable machine learning algorithm which integrates a broad scale dataset of lake biogeochemical characteristics using Sentinel-2 Multispectral Imager (MSI) imagery. Authors applied the best one to first map 10-m TSI in 555 lakes across five limnetic regions in China, and comparison was conducted with previous investigation in lakes across China.

Overall, this paper is well organized and the logic is relatively clear. Many of the acquired datasets are also valuable. However, sufficient explanation is required for the following points.

### General comment

- The Case 2 Regional Coast Color processor (C2RCC) was used to remove atmospheric effects. And In Figure 2, normalized water leaving reflectance of samples are acquired. How is the normalization done? This measurement is really odd. Then C2RCC-nets were used instead of C2RCC, and it is need to explain. There are some good atmospheric correction methods designing for MSI sensor, such as the Sen2Cor. Why you choose C2RCC for correcting atmospheric correction?

- Several machine learning algorithms were used in the process of calibrating the TSI model. Why were these algorithms tested? Is there any reason? Is linear regression a machine learning approach?

- The water qualities optical absorption contribution and a k-mean clustering were used in

this paper. How can these methods help with the search or the improvement of TSI algorithm? What are the advantages lies in? Please add more explanations.

-The time window of match-up dataset was chosen as 7 day. This time window might be too wide considering the dynamic change of water qualities. Further, it may not show the advantage of relatively high temporal resolution of MSI. And the credibility and accuracy could be undermined by the wide time window.

- Quantitatively, this article referred an effective way to monitor the lake eutrophication on a macro-scale. The machine learning seems to be more excellent than traditional empirical models. However, it may be not a discontinuous mapping within a lake in supplementary material.

#### Special comment

-Line 43 knowledge of the process of eutrophication can provide us with an understanding of the ..... is confused, please clarify it.

-Line 158 some lakes were sampled in the middle can be described again.

-Line 204-205 total phosphorus did not show optical properties, but it still appeared in the modified TSI calculation. Is it possible to explain again□

-Line 218 I am not sure that the selection of images with time window  $\pm 7$  days can affect the reflectance and results because of quick changes of water qualities, such as a storm event.

-Line 234 why the four algorithms used in this study are the representative machine learning algorithms?

-Line 283 this section needs to be improved and one or two sentences are included

-Line 447-451 need to be improved. It seems the blue band is useless in some high turbid or productive waters, but it is included in this study owing to some samples from Tibet.

#### Technical

- Line 102 Sentine-2 instead of Sentinel-2

- Line the same reference in Line 154 and 157 is different

- note that TSI in some sentences are italic, and some are not, such as Line 213 and 214, as well as the N in Figure 8.

- Many scripts (e. g., R2) require superscripts or subscripts for proper rendering, such as Figure 6a

- some typefaces have different colors in Figure 7.
- Line 577 Qin et al., (2020)
- Line 606 it is very confused that there are many numbers and commas.
- Figure 2 CR2CC?