

Reviewer comments on manuscript EGU sphere-2026-808 “**Rising Lake Levels Across High Mountain Asia**” by *Hassan et al.*

General comments:

This manuscript analyzes lake-level changes across 232 lakes in High Mountain Asia from 2010 to 2024 using CryoSat-2 and ICESat-2 data. The results show heterogeneous lake-level changes across HMA, with overall increases in the Tibetan Plateau lakes and declining tendencies in the Himalaya. The authors further examine correlations between lake-level changes and ERA5-Land precipitation, temperature, and evaporation to interpret possible hydroclimatic controls. While the dataset and regional synthesis are useful, the manuscript’s current scientific contribution is somewhat limited by a largely descriptive analytical framework. The conclusions regarding climatic drivers, cryospheric buffering, and regional mechanisms are not fully supported by the current analyses. The study would benefit from more robust attribution framework, and a more explicit statement of its novelty relative to previous HMA lake-level studies.

Specific comments:

1. **About innovation.** The broader finding on the rising lake-level in the central Tibetan Plateau and declining tendency in the southern Tibetan Plateau/Himalayan region is already well established in the literature. The authors state that the majority of previous studies are confined to the Tibetan Plateau. While, existing studies have either extended the analysis to high-elevation lakes above 2500 m a.s.l. (e.g., Zhang et al., 2020) or to glacial lakes across the entire HMA (e.g., Wang et al., 2025). It is useful that the manuscript extends the lake-level record to 2010–2024, however a 15-year period does not necessarily provide a clear advantage for assessing long-term trends. The manuscript should more explicitly state the knowledge gap, not only in terms of “more lakes and longer time series,” but new process understanding. For example, does the study reveal post-2018 acceleration or deceleration in lake-level changes? Or does it identify regional differences that were not captured by previous TP- or HMA-wide studies?

Wang Y, Zheng D, Zhang G, Carrivick JL, Bolch T, *et al.* (2025). Patterns and change rates of glacial lake water levels across High Mountain Asia. *National Science Review*, 12(3): nwaf041.

Zhang, G., Yao, T., Xie, H., Yang, K., Zhu, et al. (2020). Response of Tibetan Plateau lakes to climate change - Trends, patterns, and mechanisms. *Earth Science Reviews*, 208

2. **About mechanistic interpretation.** The manuscript relates lake-level trends to ERA5-Land temperature, precipitation, and evaporation trends. This provides a reasonable first-order analysis, but the Discussion often moves from correlation to mechanistic interpretation. For example, the authors suggest that lake expansion

on the Tibetan Plateau is mainly associated with increased precipitation, that glacierized catchments reflect cryospheric buffering, and that declining Himalayan lakes indicate precipitation sensitivity and reduced meltwater buffering. These interpretations are plausible, but correlation analyses alone are not sufficient to infer dominant mechanisms. Lake-level change integrates catchment runoff, direct precipitation over the lake, evaporation, groundwater exchange, glacier and snow melt, and possible outlet dynamics. The authors should therefore either moderate the mechanistic language or strengthen the analysis, for example by introducing a simple lake water-balance framework to guide interpretation.

3. **About uncertainty.** The climate-driver analysis is based on ERA5-Land temperature, precipitation, and evaporation. Reanalysis data especially precipitation are highly uncertain in high-mountain regions, and this uncertainty directly affects the interpretation of correlations between climate variables and lake-level changes. The authors should discuss this limitation more explicitly. If possible, comparison with another precipitation product would strengthen the analysis.
4. **About Discussion.** The discussion of glacier melt and permafrost contribution mainly relies on previous studies. Some statements on glacier-melt buffering and permafrost-related contributions cannot be directly supported by the lake-level and climate-correlation analyses. The manuscript should make clearer which process interpretations are directly supported by this study and which are inferred from prior literature.
5. **About regional classification.** The manuscript groups lakes into Tibetan Plateau, Himalaya, western HMA, and glacierized catchments, however, the criteria are not described explicitly. In particular, “glacierized catchments” overlap spatially with the other regions. It is not clear whether these are treated as an independent category or a cross-cutting classification.

Given the above, I would recommend a major revision.