

Review of: "Lake Bonneville and the Wasatch Fault – new theories and new paradigms yield insights into present-day hazards in other regions of the world"

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Potential competing interests: No potential competing interests to declare.

The paper suggests new ideas about the Pleistocene Lake Bonneville level changes. The ideas include earthquake-induced surging and isostatic rebound pop seiche theory. The concepts are interesting in terms of new alternative causes of the lake level changes during the Quaternary, however further clarifications are required to justify the suggestions.

I discuss some of the shortcomings that have to be resolved.

1. The Wasatch fault is considered as a seismic source for the surging of the water in the lake. It is a normal fault, and the small study area is limited to its hanging-wall. A major earthquake on this fault may produce a maximum of ca. 4 m drowning of the lake floor near the fault. This will cause a local apparent lake level increase.
2. The 4 m drop of the hanging-wall on the eastern shore of the lake can produce waves that propagate towards the west, and only on the western shores it can produce high seiche waves where the waves come ashore. On their way back, the waves may not assume heights as much as 50 m as suggested by the paper. Numerical modeling of the tsunami waves can help to understand such issues.
3. Study of the Great Basin Lake levels in the southwestern US suggests an almost uniform increase around the last glacial maximum period. How would such an increase in the lake levels of different settings be interpreted in terms of the theories suggested by the paper?
4. The "isostatic rebound pop seiche theory" has to be further elaborated (quantitatively) by the author since it is brought up for the first time.
5. The isostatic rebound occurs on long time scales (about thousands to ten thousand years); while most of the movements discussed in the paper appear to be related to coseismic and post-seismic time scales.
6. It also occurs on larger spatial scales; the Basin and Range region of the western US is experiencing an extensional tectonic regime, and it is expected to uplift uniformly due to the isostasy, while the movements you are suggesting are locally active in a small lake.
7. To support your idea regarding the tsunami theory, you need to expand your study area into other places around the lake, especially the western shores.

8. The 50 m runup is too much for the waves in a lake; this is about the maximum value for the major oceanic megathrust earthquakes.

9. I would expect the surging transported boulders to be at least partly broken due to the high velocity of the tsunami waves.

10. The writing of the manuscript requires some corrections, especially regarding the location of the “Figures” and “references” in the sentences.

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June 8, 2023