

## ***Interactive comment on “Laser vision: lidar as a transformative tool to advance critical zone science” by A. A. Harpold et al.***

### **Anonymous Referee #1**

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I was excited to read this paper, which covered an interesting topic—the use of lidar to transform our understanding of CZ systems—by a long list of capable authors. However, I was fairly disappointed by what I read. While the authors note in the abstract that lidar has led to “fundamental discoveries” in a variety of CZ fields, much of the paper merely reads like a laundry list of applications. It’s a blur of citations and I’m left without an answer: what was truly gained here beyond what we’d have in the state of the practice without lidar? The authors use words like “new insights” or “substantial advances” without really saying what any of those are. It feels like a paper written for lidar experts, yet probably says little new to that audience. This paper could be of value to a general CZ audience—but not as written. The paper is well-written—that isn’t the issue. I have no minor editorial comments, but rather a greater challenge to these authors: to analyze

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what lidar has been used for, how this is transforming CZ science beyond the state of the science, and what opportunities lay ahead. This has not been done here, despite the promise.

The analysis of literature is interesting, and there's clearly a good compendium of papers here. What I'd prefer to have seen here is some analysis of the application of lidar—not just a count of what fields the method has been used in. The ecology section early on does a pretty good job of this, but it's lacking throughout the rest of the paper. Even the “three areas in which lidar can make a contribution” still feels like a laundry list of things done. There's a lot of talk about scale of measurement—perhaps the authors could provide insight on nesting lidar measurement scales? What about a few example datasets in figures, showing what could be done with a well-integrated field study using lidar? I find figure 2 strange—it implies there are only 3 good interdisciplinary papers out there (I'm still not sure the word ‘transdisciplinary’ really holds for what is being described here)—but maybe those three have examples worth highlighting in figure form. Lastly, if this manuscript is to reach to a broad CZ audience, simply explaining the methodology of the lidar methods out there (TLS, ALS, SLS, etc.) in detail would be really useful. Many of the potential readers of this manuscript won't be experts in the method.

The last bit of the paper—the vision piece—could be particularly useful, and is thoughtful but feels too short and not expanded on fully. That might be the real contribution of this paper, but as it feels like a last-minute add-on.

As a last aside, the abstract is fairly weak, and reads more like an introduction than a true abstract. I realize this is a review paper, but there should be more content here. Maybe the issue is that the paper itself is a bit light on its content and conclusions, but perhaps the abstract is an opportunity to ask: “what specifically has been gained here?” It's the piece that would make this publishable. It's a capable group of authors; I am sure they can rise to the challenge.

## HESSD

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