

Itemized response to Editor's comments

In this new round of revisions of the manuscript, I have accepted virtually all of the suggestions you made, as you can easily see from the file with Tracked changes. There are a few cases where I have decided not to follow the suggestions. They are discussed in the following.

On lines 59-63 of the previous version, you suggested changing the text to “To that end, given the sizeable task at hand, measurement methods were needed that at the same time were rapid, could be implemented directly in soil pits or in a rudimentary field laboratory without requiring sophisticated equipment, and *assumed that soil properties were static*, i.e., did not change appreciably over time.”

Author's response: I agree but I have tried to make the wording more accurate. Field pedologists did not assume soil properties to be static, but they zeroed in on a number of soil properties that, they thought, could be reasonable assumed to stay constant over extended periods of time. The text now reads (on lines 51-54 of the new version): “To that end, given the sizeable task at hand, measurement methods were needed that at the same time were rapid, could be implemented directly in soil pits or in a rudimentary field laboratory without requiring sophisticated equipment, and focused on soil properties that, one could reasonably assume, did not change appreciably over time.”

On lines 110-113 of the latest version with your comments, you suggested that I write “Fortunately, the move towards “physics-informed machine learning (PIML), e.g. physics-informed neural networks” (Norouzi et al., 2025), which combines key soil water theory with machine learning approaches, signals a trend to move away from pure data-driven statistical approaches for generation of soil parameters.”

Author's response: I agree with the general idea behind this suggestion, but since I am not as enthused by these “physics-informed” proposals as you are, I have written that sentence slightly differently, as follows: “Also, some researchers have advocated for the use of “physics-informed” machine learning (PIML), and in particular of “physics-informed neural networks” (Wang et al., 2023; Norouzi et al., 2025), which perhaps signals a trend in the estimation of soil parameters to move away from pure data-driven statistical approaches toward attempting to combine some theory (in this case about soil water retention) with machine learning methods.”

Similarly, on lines 145-149 of the latest version with your comments, you suggested that I include a sentence like: “. In fact, the soil science community has got to be given credit for developing these hydro-thermal parameter maps (e.g. Montzka et al., 2017; Dai et al., 2019) as without them land surface modellers might still be using look-up tables of hydraulic and thermal parameters, with only a handful of soil types in them (Weihermueller et al., 2021). Also, these soil physical parameters feed into physical theories of water- and heat transfer in land surface and hydrological models.”

Author's response: The sentence I included in the text, on lines 104-107, reads: “One might argue in this respect that if hydro-thermal parameter maps (e.g. Montzka et al., 2017; Dai et al., 2019) had not been developed, land surface modellers might still be using look-up tables of hydraulic and thermal parameters, encompassing only a handful of soil types (Weihermueller et al., 2021).”

On line 190 of the latest version with your comments, you suggested that I add the sentence: “Fortunately, with physics-informed machine learning we can avoid these pitfalls (Wang, 2023).

Author’s response: The sentence I included in the text, on lines 142-144, reads: “Physics-informed machine learning (e.g., Wang et al., 2023; Norouzi, 2025), taking advantage of the fact that a theory exists to describe the retention of water by soils, may help alleviate some of these pitfalls. However, the problem persists for other dynamical aspects of soils for which no fundamental theory is as yet available.”

On line 202 of the latest version with your comments, you questioned the expression “emphasis added”.

Author’s response: This is a standard procedure when someone quoting a piece of text verbatim from another author, wants to add emphasis (in this case italics) to the text to underscore a part of it, when this emphasis was not present in the original text.