

General comments: This article describes the state of the development of pedotransfer functions (PTF) development, including traditional methods of creating such models, limitations, and proposed improvements in their development. The article is well-organized, well-written, and relevant to the journal. I found the paper, especially the first half, to be thought-provoking and an easy read. The ease in readability decreased after section 3, but the remainder of the paper is still accessible to those who wish to learn more about this topic. I have only some moderate suggestions (listed below), and believe the article should be acceptable for publication once these are addressed.

Specific comments:

- Line 34: revise to “spatial **scales**”
- Line 42: Add period after Gilding et al. reference.
- Line 51: Change period after Gerke et al (2002) to a comma
- Line 52 and 212: “Land” should not be capitalized
- Line 137: Revise to read: “...or by coupling **RRE** variations of the RRE...”
- Line 145: change to “...as the point **at which** water loses...”
- Line 164: Change to “... the significance **of**...”
- Line 166 and many places from this point forward: There are often extra parentheses when in-text citations are given. Double-check that there are the proper number of parentheses throughout.
- Line 210: Add period at end of sentence
- Lines 253-264: The authors address the issue of varying taxonomic systems later in the paper, but this may be a good place to at least mention it.
- Line 266: Change to “...models applied **in** spatially explicit modeling...”
- Line 303: Change to “...hydraulic properties **in** many tropical soils...”
- Lines 344-346: If most models do not consider the litter/humus layer (as stated in the first sentence of this section), does it need to be modeled using the RRE, or would another method be more suitable? It seems the authors have limited themselves to a discussion of the RRE, which they admit themselves is likely not suitable for litter layers.
- Line 449: Something weird happening with Paschalis citation; also, change to “...PTF **found that** uncertainties...”
- Line 451: “artifact” is misspelled
- Line 509: While I applaud the authors for attempting to show some analysis of their own in this study, the provided figures do not necessarily support their statements made in this section. No explanation is given as to how the residual distributions explicitly show dependency on soil texture or sample size. There is variability shown across these categories, but that does not empirically prove dependence in the way the authors are implying. I recommend that the authors re-think their arguments here.
- Line 540: Remove “allowing”
- Line 541: Change to “...sequence, **allowing**...”

- Line 548: Change to “...obtained data **from these methods** are not directly compatible **with one another,**...”
- Line 549: This is the first use of “quasi-continuous data” and it would be helpful if a definition or example was given.
- Line 552: End sentence after “...quasi-continuous data.” And begin the next sentence with “While it is based on...”
- Line 566: Change to “Furthermore, **while** x-ray tomography...”
- Line 569-570: remove “who illustrated the huge sensitivity in image thresholding”- this was already stated.
- Line 580: Some random non-English text here.
- Line 584: Change “effect” to “affect”
- Line 585: I recommend that the authors change all instances of “height” to “length,” because not all samples are collected vertically. Often, samples are collected horizontally by driving a sampling core into the wall of a soil pit. This assumption of vertical sampling also affects the authors’ interpretation of pore characteristics, so the authors should take care here.
- Line 610: What did Vanclooster find, exactly?
- Line 633-645: I applaud the authors for their ambitious goals, but these standards are unrealistic in practice. It would be good for the authors to better discuss the reality of the costs, including money and time, needed to meet their recommended strategy, especially given that in many cases funding for such projects is very difficult to get.
- Section 4.4: There seems to be a shift in the writing here, and “field soil surveys” are mentioned several times in this section, where previously the discussion was centered on samples collected. The authors of this section seem to be assuming that soil samples are collected primarily during these types of pedogenic surveys, which is often not the case. Many times samples are collected without any pedogenic data or profile descriptions.
- Line 690: bimodal model of what? A specific parameter or something else? Please clarify.
- Lines 693-699: This was already addressed in Section 3.3
- Line 702: change to “...soil pore **structure**...”
- Section 4.5: This section is lacking a description of several key methods of larger-scale in situ sensing that may provide very useful data for inclusion in PTFs. A few that come to mind are the use of electromagnetic induction (EMI) surveys for determination of clay content (e.g., Hedley et al., 2004), gamma ray spectroscopy for determination of field-scale bulk density (e.g., Reinhardt and Herrmann, 2019), and the novel use of cosmic ray neutron detectors for estimating field-scale hydraulic properties using inverse modeling within the HYDRUS COSMIC module (e.g., Brunetti et al., 2019).
 - Hedley paper: <https://www.publish.csiro.au/SR/SR03149>
 - Reinhardt: <https://onlinelibrary.wiley.com/doi/full/10.1002/jpln.201700447>
 - Brunetti: <https://access.onlinelibrary.wiley.com/doi/full/10.2136/vzj2018.06.0123>
 - Note: None of these are my papers
- Line 785: First mention of “parametric PTF.” Use consistent terminology.
- Line 803: “We explicitly introduce it here...” What is “it” referring to? Be specific.
- Line 814: What is meant by “This is mostly done...”? Do you mean that this is the most common method, or that the work is nearly completed?

- Line 833: Could the authors provide an example of the “clear empirical evidence” that they refer to here?
- Section 5.2/Line 803: Both sections describe physical constraints. Consider reorganizing to be more clear.
- Line 888: Change to “...loamy soils must have a higher length of evaporation L_c **than sandier soils...**”
- Figure 9: I really like this figure and think it provides a clear understanding of what the authors are describing.
- Section 6.4: I found the vague description given of a standardized measurement method to be disappointing. I was expecting a detailed explanation that would allow for replication of the described methodology, but that description given here is very ethereal and non-specific.
- Line 1038: How do the authors propose to actually carry out point #7? “Tackle the discrepancy” is very vague.
- Line 1040: Change to “...evaluate **PTFs** functionally...”
- Lines 1041-1042: Point #10 contains a typographical error and does not currently make sense.