

Interactive comment on “Signal Processing for In-Situ Detection of Effective Heat Pulse Probe Spacing Radius as the Basis of a Self-Calibrating Heat Pulse Probe” by Nicholas J. Kinar et al.

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Received and published: 16 May 2020

General Comments: The authors describe the design and implementation of a Self-Calibrating Heat Pulse Probe (SCHEPP) that measures soil properties such as thermal conductivity, volumetric water content and bulk density. There are two novel aspects of this manuscript: 1) a signal processing algorithm applied to the single probe configuration that enables near real-time data analysis, obviating the need for post-acquisition curve fitting; 2) an algorithm applied to the dual-probe configuration to estimate an effective probe radius that compensates for post-deployment needle deflection. An apparent probe spacing has been addressed previously, for example, in Ham & Benson,

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2004. The algorithm described in this paper is new, however. Both signal processing algorithms are tested for saturated sand and nearly saturated peat having independently measured soil characteristics. The authors validate improved estimates of soil water content and bulk density relative to traditional curve fitting methods.

The manuscript provides generous descriptions of algorithm derivations with less emphasis on the inspiration that guided their particular solutions. The prototype heat pulse probe has promise for more accurately characterizing soil properties in long term deployments.

Specific Comments: No fundamental defects were identified in the manuscript. Minor revisions include:

1) Comment on calibration for drier soils. 2) Punctuation within mathematical derivations needs cleaning up in the main text and Appendix A. 3) Scaling in Figures 3b, 3d, 4c, 4f, 4i, 7c, 7d need emphasis 4) It is anticipated that the resolution and font quality will be improved in final version of the figures.

Editorial Comments: Editorial comments and suggestions are provided in the attached PDF.

Please also note the supplement to this comment:

<https://www.geosci-instrum-method-data-syst-discuss.net/gi-2019-43/gi-2019-43-RC2-supplement.pdf>

Interactive comment on Geosci. Instrum. Method. Data Syst. Discuss.,
<https://doi.org/10.5194/gi-2019-43>, 2020.

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