

Comments reviewer 1 (Jan Hofste) on revised manuscript: "Soil dielectric characterization during freeze-thaw transitions using L-band coaxial probe and soil moisture probes", Alex Mavrovic, Renota Pardo Lara, Aaron Berg, François Demontoux, Alain Royer, and Alexandre Roy, HESS, 2020

Date: 2020 12 16

[1] Accept author reply and corresponding manuscript revisions.

[2] Author reply clear, but revision in manuscript not yet sufficient. Mention in text that OECF measurements were only performed at one position of OBS sample because only one OECF was available (applies to OBS sample). Mention also that the other three samples were too small to allow for measuring at multiple positions (at same depth of course), doing so would disturb the samples because they would then have holes in them. (As author explains in response to comment [4].) The low number of OECF sampling positions is, unfortunately, a shortcoming of the experiment. The authors should be honest about this.

Finally, I disagree with the sentence "The repeatability of the measurements gives us confidence that the experimental protocol is robust." Measurements at same positions are indeed alike, and thus are repeatable (albeit there is still some variation..) but this does not have to mean that the retrieved epsilon values are accurate.

[3] Author reply clear, but revision in manuscript not yet sufficient.

I mis the sentence found in the original manuscript (line 244) explaining the hysteresis: "hysteresis should be expected because of the latent heat of fusion of water". Line 287 of new manuscript not necessary: you don't need to give the definition of hysteresis. The hysteresis-amplification is explained better now.

[4] Accept author reply and corresponding manuscript revisions.

[5] Accept author reply and corresponding manuscript revisions.

[6] Author reply and corresponding manuscript revision not yet sufficient. You mention in the explanation and in the manuscript (line 335) the (hysteresis) trends are similar between the permittivity measurements. This statement should be more specific and quantified. Are measurements similar between thaw/freeze cycles?, or between HP positions?, or between different soil samples? Based on the theoretical curve in figure 10 you can define quantities such as ΔT , $\Delta \epsilon'$, maximum steepness of the slope, and the positions where the slopes are steepest. These quantities you then apply to the various measurements. Based on that you can then also make statements on for example the repeatability (see also comment [27]).

[7] Accept author reply and corresponding manuscript revisions.

[8] Author reply and corresponding manuscript revision not yet sufficient. Don't you mean hysteresis amplification -effect? Because the hysteresis itself is known to be present regardless of any probing volume.

[9] Accept author reply and corresponding manuscript revisions.

[10] Accept author reply and corresponding manuscript revisions.

[11] Accept author reply and corresponding manuscript revisions.

[12] Accept author reply and corresponding manuscript revisions.

[13] Accept author reply and corresponding manuscript revisions.

[14] Accept author reply and corresponding manuscript revisions.

[15] Accept author reply and corresponding manuscript revisions.

[16] Accept author reply and corresponding manuscript revisions.

[17] Accept author reply and corresponding manuscript revisions.

[18] Author reply and corresponding manuscript revision not yet sufficient. Line 122 should be: "The sensing depth is inversely proportional to the medium's permittivity and proportional to the magnitude of the electric field generated by the reflectometer, which provides a constant power output of 10 dBm (Fig. 1b). ". This is also what is shown in Figure 2.

[19] See comment [18].

[20] Accept author reply and corresponding manuscript revisions.

[21] Accept author reply and corresponding manuscript revisions.

[22] Accept author reply and corresponding manuscript revisions.

[23] Accept author reply and corresponding manuscript revisions.

[24] Accept author reply and corresponding manuscript revisions.

[25] See comment [6]

[26] Accept author reply and corresponding manuscript revisions.

[27] Author reply and corresponding manuscript revision not yet sufficient. I disagree with added lines " The repeatability of the OECP measurements can also be seen as an indicator of the reliability of the measurements" (281-283) in revised manuscript. Measurements can have a high repeatability, yet be inaccurate at the same time. You can make quantitative statements on the repeatability, but you assume the epsilon values you measure are accurate based on the calibration of your probe and on whether the sample containers or sample edges don't influence the measurement.

[28] Accept author reply and corresponding manuscript revisions.

[29] Accept author reply and corresponding manuscript revisions.