Thank the authors a lot for their dedicated revisions, elaborating the potential measurement uncertainties and adding more explanations about the experiment, used models, and results, which addressed most of my concerns. I only have some minor comments for consideration.

Line 246: Please check the appropriate use of "experiment"?

Line 249: "Permittivity measurements were taken only when the soil temperature equilibrated with the cold chamber air temperature ($\pm$ 0.1°C)."

Please explain more about the cold chamber air temperature. The cold chamber air temperature is measured by sensors or the temperature settings of the cold chamber. If for the later option, what is the range of the temperature fluctuations when you set the cold chamber to a specific temperature value?

Section 2.2.1, and Line 357-359, Line 380:

The treatment of ice fraction in Zhang's model is still not mathematically clear to me.

In its original form (Equations 1 &2), the liquid water fraction is calculated as the exponential function of soil temperature. Then how is the ice fraction calculated?

In the updated Zhang's model with consideration of the hysteresis effect, the ice fraction is added as an exponential function ($\frac{e^x}{e^x+1}$). What is "x" represented for? How the ice fraction is differed for the freezing and thawing cycles?

The definition of ice fraction as "this ice fraction should not be interpreted as actual ice at temperature below freezing point but rather as an aggregate of the heterogeneous soil temperature" is only for the thawing cycle or for both the freezing and thawing cycles? The cases where "this definition of ice fraction" is used should be clearly indicated.

The concept "freezing/thawing temperature offset" needs more explanation (Line 380).

Section 2.2.1, Equations 1 &2, Table 1:

Although the symbols are well defined, I think it is better to keep the symbols ($\theta_V, \theta_G, \rho_d$) in Table 1 consistent with Equations 1&2.