

The manuscript reviews and synthesizes a wealth of existing related research, proposing a physically consistent framework to represent soil organic matter's influence on key physical properties for land surface models. This framework, grounded in rigorous soil mixture theory, explicitly considers the soil's volumetric composition as a mixture of organic and mineral components. The resulting parameterization addresses a previously overlooked inconsistency in many land surface models and is supported by experimental data. The paper is clear and well-written. However, I noticed several minor issues in the manuscript. As the equations are likely to be directly used by many land surface models, I suggest the author examine them further.

Minor comments:

Line 141: In Equation (3), ρ_{ms} has not been defined.

Line 251: Deriving Equation (15) involves substituting the definitions of $f_{m_{om}}$ and $f_{m_{ms}}$ from Equation (13a) into Equation (14).

Line 260: Please correct this sentence. The ratio of bulk density and particle density is equal to 1 minus the soil porosity.

Supplement, Lines 8-9: Please correct the referenced equations, Equation (14) -> Equation (16)?