

## ***Interactive comment on “Influence of cracking clays on satellite observed and model simulated soil moisture” by Y. Y. Liu et al.***

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The paper is attempting to do something rather difficult – attribute large-scale patterns in a satellite-based soil moisture product to a highly localized soil process (surface cracking in vertisol soils). Despite this challenge, it presents a strong circumstantial case and makes a clear contribution to our interpretation of surface soil moisture retrievals over vertisol regions.

I have only some minor suggestions to consider before final publication:

1) One other potential explanation for Figure 1 might be land cover/land use issues - particularly as they relate to seasonal management of agricultural areas. That is, could the overly dry vertisol areas in Figure 1c be related to some type of large-scale land

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management practices (tillage?) which impacts surface roughness and/or vegetation coverage? Seems unlikely, but some brief discussion of land use in this regions (and its potential role in the seasonal contrasts seen in Figure 1) would strengthen the paper.

2) Also – the topography of the vertisol areas should be described (in a manner analogous to the treatment of vegetation in Figure 3). Even under low-biomass, topography presents soil moisture retrieval problems. Could those problems be playing a role here?

3) First two paragraph of Section 5. The connection between surface roughness and cracking made here raises the question of whether vertisol surface correction is just another manifestation of “surface roughness” and can be accommodated using a slightly larger roughness parameter in existing surface soil moisture retrievals (or whether the physical of the retrieval model itself has to be modified). I understand that the current paper is trying to avoid describing potential retrieval solutions to this problem – but the discussion of roughness presented here almost begs the question. How does this discussion of roughness tie into the cracking problem and does it point to a possible solution?

4) Third paragraph of Section 5. Here the discussion switches quickly between the non-captured efforts of cracking on microwave retrieval to the non-captured effects of cracking on land surface modeling (without warning the reader). I would think about making this transition clear and – in general - being careful with the discussion surrounding surface cracking effects on land model soil evaporation calculations – since it seem to partially undermine the key argument made in Figures 1 and 2 (i.e., if the land model is not physical is these cases, how can it be used to make the case that the retrievals are non-physical?).

5) Figure 6 is interesting but seems misplaced towards the end of the paper. It seems more like a motivator for the analysis that should be presented at the front of the paper (it describes the potential importance of accurately capturing soil evaporation in vertisol regions but uses a completely different approach than the rest of the paper). Consider

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moving to earlier in the analysis.

6) Section 6 – “This study illustrates that the effect of soil cracking is one reason why it is unlikely that we can derive estimates of soil moisture content of the top few cm of soil with good absolute accuracy. . . . .This need not be a major obstacle for successful uses of satellite passive microwave soil moisture for many purposes however.” For clarity, the authors should give a brief explanation of why they believe good absolute accuracy is not necessary for retrievals to be of value (for “many purpose”). I agree with the point - but one more sentence of clarification is need to support this statement.

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