

Interactive comment on “Combined impact of local climate and soil properties on soil moisture patterns” by Thushara Gunda et al.

Anonymous Referee #2

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The study by Gunda et al. aimed to evaluate the impacts of climate and soil properties on long-term soil moisture patterns in Sri Lanka. The authors adopted a simple water balance model to compute monthly deficits of soil moisture under different climatic conditions. Overall, the manuscript was well written and reasonably structured. Although this study presents some interesting model results, in my opinion, it suffers from some major problems and the significance of this research is not clear to me.

(1) The authors divided the study region into three climate zones (e.g., wet, intermediate, and dry). However, all those zones belong to humid tropic climates. Therefore, the authors need to stress those are relative terms.

(2) To be a standalone paper, the authors need to provide the description of the water balance model used by them as well as all model parameters. My major concern is

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the use of the simple water balance model, which does not seem appropriate for the aim of this study. Except for the use of SMAP data, it lacks rigorous model validations. In addition, the use of a 1-D model is not justified by the significant slope across the study region. It would be very important to provide information relevant to the current study, such as soil properties, observed soil moisture, groundwater level, and climate (e.g., precipitation, potential evapotranspiration, and their seasonality), which is critical for the interpretation of the data and to ensure the validity of the model results.

(3) The use of the SMAP data is not appropriate for several obvious reasons (e.g., mismatch in spatial scales and soil depth, and a very limited time period). More importantly, from Figure 4, we can see that when the deficit fraction reached above 0.75, SMAP data still showed very high soil moisture contents (deeper soil moisture tended to be even higher). Physically, this does not make any sense.

(4) The authors argued that soil had a buffering effect in the wet zone, and temperature had a larger effect than precipitation on the shifts in soil moisture patterns. On the other hand, in energy limited environments as in the study region, available energy is of course more important. It simply might be that there is not enough energy to evaporate soil moisture in those areas, despite increases in temperature.

Overall, I think the authors need to provide more information and data to justify the use of the water balance model and the validity of the model results.

Minor comments:

- (1) P3L5: it should be degree Celsius not C.
- (2) P3L21: either use 'correlations' or change 'have' to 'has'.
- (3) P3L22: 'As a common measure...'
- (4) P4L1: 'ranged...'
- (5) P4L8: '... standard deviation of ...'

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(6) P5L29: 'in Jan-Mar...' (and in other places as well)

(7) P7L1: '... conditioned both on ...'

(8) P10L4: Is that possible the lag time is the artifact of the model structure?

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