

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
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Comment on hess-2021-560

Anonymous Referee #1

Referee comment on "Predicting soil moisture conditions across a heterogeneous boreal catchment using terrain indices" by Johannes Larson et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-560-RC1>, 2022

The paper by Larson and colleagues deals with the important aspect of predicting soil moisture classes in a study catchment in Sweden. In general, the paper is well written and properly structured and the methods that the authors used to derive various terrain indices are sound. Also worth commending is the large number of field observations $n = 398$ which were used in the statistical analysis.

A concern for me, however, is the use of the term 'soil moisture' throughout the manuscript. Soil moisture and soil moisture classes are not the same thing, in my opinion. Soil moisture is a soil property with both a spatial (lateral and vertical) and a temporal dimension. The soil moisture classes that the authors used (described in line 105 – 133) have only a spatial (and only lateral) dimension. It is therefore rather a mapping unit or a soil association than a soil property. The qualitative description of the soil classes also appears to be biased e.g., possible to walk over and keep dry feet...shortly after snowmelt. Surely this will depend on the size of the person and how long 'shortly' is. Also, the topographic descriptions of the soil moisture classes are raising questions about potential *circular reasoning*. How important are these topographic attributes in determining the soil moisture class? If they are a key determining factor, then surely you are not assessing whether the terrain indices are predicting soil moisture, but rather are the terrain indices able to predict *terrain indices*. So, in my opinion, the authors did not predict soil moisture, making the title and a lot of the discussion misleading.

With this being said, the prediction of soil moisture classes (soil associations) is still novel, and the paper makes a contribution to international literature. An important outcome is that a finer detailed DEM does not necessarily imply better predictions of soil moisture classes.

The article would benefit by adding an improved description of the climate under section 2.1