

Interactive comment on “An algorithm for generating soil moisture and snow depth maps from microwave spaceborne radiometers: Hydroalgo” by E. Santi et al.

Anonymous Referee #1

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Review of An algorithm for generating soil moisture and snow depth maps from microwave spaceborne radiometers: Hydroalgo

By Santi et al.

The authors present a new algorithm based on artificial neural networks (ANN) for retrieving soil moisture as well as snow depth from passive microwave observations. Thereby they present an alternative for the currently available global soil moisture products from spaceborne radiometers, which highly desirable since differently algorithms may have different sources of uncertainty. The authors adopt a rigorous approach for

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the development their HydroAlgo based upon an enormous data set and validate it again with another independent. The manuscript is very well written and true pleasure to read. I would, therefore, recommend to publish the manuscript in HESS after consideration of a few comments.

One of these comments is, if the authors truly intend to present an alternative to for example the LPRM for soil moisture and others for snow depth, then I would recommend the authors to include also these products in their validation.

The other major comment is that the authors can improve the quality of the figures, especially the maps. Fig. 13 and Fig 15 have a continuous color scale, while the Fig. 12 and 14 have discrete color scale. It would be nice to see some consistency in this perspective and I would prefer the usage of a continuous scale. Further I note that the authors have made use MS Excel for the scatter plots and time series plots. Perhaps the authors could also see an opportunity to create these plots with more professional software that make it possible to better define the time scale.

Minor general comments/questions:

- A question is on how the would like to name their algorithm? Is Hydroalgo an abbreviation of Hydrology Algorithm or something else? This is not clear to me. Perhaps the authors would like to consider this because ones it is written is it so.
- The authors express soil moisture in $\text{cm}^3 \text{cm}^{-3}$, while I believe that nowadays $\text{m}^3 \text{m}^{-3}$ is preferred.
- Please refer on P3863 L2 to the explanation on why the V polarization is used for retrieving soil moisture.
- P3863: Essentially, HydroAlgo does not only used TbV at C-band. It also use the Pix for masking vegetation and TbV at Q-band for normalized the diurnal and seasonal variations. I think that especially the latter should also be made clear.
- P3865L1: The authors refer Jackson et al. (2004) for the relationship between NDVI

and VWC, but Jackson et al. developed this relationship for corn and soybean vegetation in Iowa (USA). I am not sure whether this relationship is directly transferable to other regions and other vegetation type. Please provide a reference that supports this or just mention it with a justification of this assumption.

- P3867-3871: The vegetation component of the Radiative Transfer simulations is very well described, but it is not clear how the authors treated the surface roughness.

- P3870L11: I think that the units should be $m^3 m^{-3}$ or $cm^3 cm^{-3}$ and not %

- P3873: I find the validation of the soil moisture the weakest part of the manuscript. I see that the authors presented the nine measurements and retrievals in a table, but aren't there nowadays more soil moisture measurements available for validation. For example from the US or from the Soil Moisture Data Bank. It would be nice if the authors could come with more.

- In the conclusions: I would start with 'A new algorithm' instead of 'An innovative algorithm' because one can always argue the innovative part. As is said in the introduction ANNs have been used for both soil moisture and snow depth retrieval many times before.

- Fig 2 caption. Please highlight that the PWC is estimated using the relationship of Jackson et al.

- Fig 7, the units of soil moisture are missing and the scale should be consistent with the units $cm^3 cm^{-3}$ or $m^3 m^{-3}$ used earlier. This comment is also applicable to the other figures.

- Fig 9, some text has fallen off the x-axis

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