Hydrology and
Earth System
Sciences
Discussions

# Interactive comment on "Development of a Spatial Hydrologic Soil Map Using Spectral Reflectance Band Recognition and a Multiple-Output Artificial Neural Network Model" *by* Khamis Naba Sayl et al.

## Anonymous Referee #2

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The general approach of utilizing remote sensing for soil texture mapping in desert regions is quite valuable and has been demonstrated in the literature. I think the authors were right to look at ways to use these methods to try and more efficiently maps soils in Iraq. However, I have quite a few concerns about the manuscript submitted by Sayl and coauthors. I'm attaching the original pdf with specific comments which provide all specifics related to the general comments below.

1) Clarity of methods section As written, the methods section is not repeatable. Much effort is needed to be more specific in describing steps taken and cite all the algorithms used. Couple examples: 1) soil sampling technique (e.g. auger, open pit) and sampling depths were never specified, 2) radial basis neural network has no citations, and 3) the

unsupervised classification method is not specified or cited, and the software used is also not specified. There are quite a few other major methodological details where I got lost and couldn't figure out what was done (please see the commented pdf for full details).

2) Sampling design, size and inference The sample size (n=25; 15 training, 6 validation) was quite small for such a large area. The chosen smaller area for sampling also did not appear to represent the greater study area (flat accessible area versus a plateau with a dense network of valleys and canyons). The validation set represented a very small range of both soil texture separates (sand, silt, clay) and only fell within one of the USGS hydrologic groups. This limits the inference space to just that group and makes any claims about predicting the other groups correctly unsupported by the data and result. This makes extrapolation from the smaller sample area to the greater study area unsubstantiated.

3) Overall grasp of literature The literature review and breadth of topics covered and utilized suggest that the authors should consider expanding the tools and data they use for making these predictions (beyond having a better sample). For example, in the broad body of digital soil mapping studies, topographical layers from DEM, climate surfaces, and other spectral data (e.g. gamma radiometrics) are often the most effective predictors. I think including DEM variables could prove very effective at this scale, yet this was not done. I'm also not sure why this form of neural networks (NNs) was utilized. Generally random forests have been outperforming NNs, why not try other algorithms. Also, if hydro group is the desired target variable, why not predict that parameter? Machine learning seems to do better at classification (particularly random forests).

Based on these issues, I do not think this manuscript is appropriate for publication in HESS.

Please also note the supplement to this comment:

http://www.hydrol-earth-syst-sci-discuss.net/hess-2017-13/hess-2017-13-RC2-supplement.pdf

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