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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Modeling regional evaporation through ANFIS incorporated solely with remote sensing data" *by* F.-J. Chang and W. Sun

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1 General Comments

In this manuscript, the authors describe a procedure to estimate evapotranspiration over Taiwan using adaptive network-based fuzzy inference system and remotely sensed products. The authors argued that the proposed method is reliable enough for prediction over large areas where the density of metereological stations is not dense enough. In my opinion publications of relevant research in this subject should be encouraged in HESS. In the present manuscript, however, several major issues should

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Discussion Paper

be clarified before publication.

2 Specific Comments

This manuscript has the following technical shortcomings:

- First of all, authors should clearly indicate what they really mean by evaporation. Do they mean solely evaporation from bare soils or water bodies? Or do they mean evapotranspiration (ET)? Please clarify. It seems that they use this term interchangeably.
- I am missing a research hypothesis in this study. It should be mentioned in the introduction and it should address the shortcomings of the current state of the art. No research hypothesis, then no research paper.
- The literature review on the estimation of evapotranspiration based on remotely sensed products is abundant. The small subset presented by the authors is not complete. The literature review should be relevant to support the research hypothesis.
- The authors clearly identify the importance of estimating ET for water management. Based on this statement, I can not understand why a data-based driven model, as that one proposed by the authors, which do not have any physical conceptualization of the processes involved, should be better that a land surface hydrological model. Please justify.
- ANN (with or without fuzzy rules) are complex and overparameterized data-driven models. If the authors argue that this kind of models are better suited for estimating ET than other kinds of models, then the authors should provide evidence in

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favor of this hypothesis. Simply concluding that the proposed method is “reliable”, without careful model evaluation and inter-comparison is misleading if not wrong.

- ANN based models (with or without fuzzy rules) should be cross-validated against station based estimates, e.g. eddy covariance stations. Analysis of parameter uncertainty and predictive uncertainty is definitely necessary.
- The advantage of land surface hydrological models over ANN stemms from the fact the former close the water and energy balance over the studied river basin or domain. In the case of the ANNs, it is imposible to know whether the model estimates fullfil these conditions. The authors should indicate how this conditions can be fulfilled with data-driven model.
- The authors indicate that ANN are useful to “identifying complex nonlinear relationships between input and output data sets”, in particular for problems that “difficult to describe by physical equations”. I guess this is the wrong argument when one attempts to model ET! In this case the equations are well know, the problem is how to find effective model parameters at the scale of interest. There are already attempts to this at large scale (see Samaniego et al. WRR 2010, and J Hydrometeorology 2013, Kumar et al WRR 2013). Here again, if the hypothesis is the ANN+Fuzzy rules are better than process based models, then the authors should demonstrate that this hypothesis holds across locations and scales not used for model training.

3 Editing Comments

The abstract should be improved. Clear overview of research hypothesis and results should be provided.

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Any figure of this manuscript is publication ready. Some are even screen-shots from a windows based program.

4 Final Remarks

Based on previous comments and bearing in mind the HESS publishing standards for a research article, I recommend to reject the manuscript on its present stage and invite the authors to resubmit when the major issues mentioned above are carefully adressed.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 6153, 2013.