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Hydrology and Earth System Sciences Discussions

Interactive comment on "Modeling moisture fluxes using artificial neural networks: can information extraction overcome data loss?" *by* A. L. Neal et al.

Anonymous Referee #1

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The paper present a sampling method to extract a training dataset to be used in Artificial Neural Network parameterization applied to simulate latent heat fluxes measured with eddy covariance technique. The method try to better sample the extreme values in the timeseries but the results don't show improvements in the performances of the ANN (that are even slightly worst respect to a standard method). We know that this can happen in science but I'm not sure that a paper like this is of interest for the readers. I leave to the Editor the decision on this aspect. However, there are also a number of points that should be analyzed and corrected before the paper can be considered for publication. The main aspects are:

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Discussion Paper

General: The result of the different sampling strategy is to have relatively more data points in the extremes of the dataset range. Is this really useful in a gapfilling application considering that these data points will represent (by definition) conditions not or less common? The cost would be to have less data points extracted in the rest of the range where the probability to have gaps are higher (because more common situations). In addition one should consider that the extreme values could be spikes so a good despiking method must be applied before. . .

Par 2.2.2: The idea to use the Shannon index to evaluate the amount of information in the training dataset is interesting but the results shown that it is not related to the usefulness of this additional information to improve the ANN performances. Why the authors didn't use artificial gaps (simpler to evaluate and compare with others studies and more related to the real results obtained in the LE simulations) to compare the performances of the different approaches? Or at least both Shannon index and artificial gaps.

Model Performances: in general, it is not clear which data have been used in the model performances analysis. Only a validation set? Are really independent data? Also here artificial gaps would have been useful.

Others comments:

P6528 - L15-17: This would be true only if the turbulence is directly related to the fluxes (explaining variable) but it is in contrast with the definition of the u* threshold that is based on the opposite assumption (ecosystem respiration independent of u* at given temperature).

P6529 - L23-26: it seems that the meteorological data used are not registered at the site (1 km for net radiation and precipitation could be a lot) but in particular these are gapfilled using the mean diurnal variation method and this could affect strongly the performances due to the limits of the method.

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P6531 – EQ2: where are the two equations different?

P6532 – L11-18: it is not simple to relate the text to table 1, I would suggest to reorganize the text and better explain the table.

Par 2.2: it is not specified how may data points have been used in training, test and validation and how these have been extracted. In fact, a stratified sampling without changing the data distribution could be a good compromise.

P6538 – L6-9: I don't agree. Mismatch between model and data can easily indicate problems in the model that doesn't work properly... However the problem of the eddy covariance technique when turbulence conditions are low is well known. For this reason it would be important to better explain how the data have been processed (how the authors estimated the u* threshold? How the storage correction has been applied?)

P6538 – L23-25: Based on the results in Moffat et al. 2007 where the authors shown errors in the gapfilling very close to the random component of the measurements, I'm not sure that new model structures may have large impact on gapfilling results...

Table 1: in the caption explain the difference between Hrsc and Hstd

Fig. 3: Y-right Axes label missing

Fig. 5: legend missing

Fig. 6: X axes label missing

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 6525, 2010.