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Interactive comment on "Calculating the turbulent fluxes in the atmospheric surface layer with neural networks" *by* Lukas Hubert Leufen and Gerd Schädler

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Response to referee #1 23.1 2019

We thank the anonymous referee #1 for the comprehensive and sound comments which certainly helped to improve and clarify the paper. Our responses follow the order of the comments.

A revised version of the paper can be found in the supplement.

p1,3-7: we agree that data availability is a problem for the standard regression as well as the ANN method; however, the data sets we used were considerably larger than the

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ones used

previously and were checked for consistency with MOST. The ANN method seems more flexible than standard multivariate regression because no assumptions about the functional form of the

relationship are made. Having explicit formulas instead of ANNs would only be an advantage if there were some physics behind the formulas, which is not (yet) the case.

p2, 1: we agree

p2, 7: rephrased more explicitely

p2, 10: corrected

p2, 11-12: text changed

p2, 14-15: text adapted. We do not suggest anything, we just quote the paper. Overall best model is not mentioned in the paper.

p2, 16-17: text changed

p2, 22.25: text changed

p2, 8-25: text extended

p3,8: we do not agree here: the quantities mentioned are not stability parameters. We used potential temperature, therefore no index v.

p3, 15: done

p4, 1-7: moved to introduction and rephrased

p4, 12-13: rephrased

p4, 14: done

p4, 15: done

p4, 20: yes; rephrased

p4, 25: we used the superscript Omega to make clear that N refers to the output ("Omega") layer

p5, 1-9: done

Table 1: we rephrased and extended the text

p5, 18-20: we rephrased the description. DE-Keh was left out in training and validation in the second experiment

Table 2: done

Table 2 and A1: done

Figure 1: replaced

p5, 21: done

p5, 27-28: done

Sec 2.3&2.5: Moved "Cross-validation" after "Data"

Ch 2: batch is the whole training set

p7, 16: rephrased in sec 2.5.

Fig 3: done

Fig 4b: done

p7, 27: done

p7, 28: which statement do you mean?

p8, 1: rephrased

p8, 3: done

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p8, 7: done

p8, 8: done

Table 3: table rearranged

p8, 9-23: this is not genarally true. We added a sentence "Networks with seven inputs have in our case no substantial advantage over networks with six inputs."

p8, 25-26: we don't get what you mean here

Table 4/5: done

p8, 28-29: done

p9, 2-3: rephrased

p9, 7: we do not agree here because: a) the training data set we used was quite large, and b) using even more and even better training data would probably also improve the results of the

simpler nets, so cost/benefit might not change.

Sec 3.2: brief summary added

p9, 13-15: rephrased

p9, 19: input was every 30 min, corrected

p9, 23: data were new in the sense that time periods were used which had not been used for training and validation; the DE-Tha site had not been used at all before, because a) the sites

selected in sec 2.4 were more consistent with MO than DE-Tha and b) the DE-Tha time series covered only one year. For running the LSM for the DE-Tha site, a more comprehensive input data

set (including e.g. radiation, precipitation) was required, which was only available for

the year 1998. The years for the two sites were mixed up in the paper: it should be 2011 for the

DE-Fal site and 1998 for the DE-Tha site. (not 2011, as the paper says erroneously).

Fig 7: done

p10, 10: replaced "training method" with "data sampling method"

p10, 14-15: done

p10, 26-29:

grammar/typos:

overall: we use nonlinear

p1, 3: done

p1, 18: done

p1, 19 : done

p2, 2: done

p2, 5-25: changed to present tense consistently

p2, 20: sentence rephrased

p2, 28: we prefer to leave it as it is

p4, 16: done

p4, eqn#: done

p5, 17: done

p6, 2: done

p6, 9: done

Figs 3 and 4: done

Fig 4, caption: done

p7, 21: done

p7, 23: done

p7, 25: done

p8, 4: done

Table 3: done

Sec 3.2: changed to active form

p8, 30: done

p9, 16-18: done

Sec 4: changed to active form

Please also note the supplement to this comment:
https://www.geosci-model-dev-discuss.net/gmd-2018-263/gmd-2018-263-AC1-supplement.pdf

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