Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
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Comment on hess-2022-77

Anonymous Referee #1

Referee comment on "Using LSTM to monitor stormflow discharge indirectly with electrical conductivity observations" by Yong Chang et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-77-RC1, 2022

Chang bet al. present the application of a statistical approach (LSTM) to determine discharge of rainfall event runoff from instream EC measurements.

MAJOR

Title/Premise: The authors present the application of a statistical approach (LSTM) to calculate discharge during rainfall events from EC observations. The title (Using LSTM to monitor continuous discharge indirectly with electrical conductivity observations) might perhaps mislead the reader, as certain time periods (low flow, initial runoff) are clearly excluded from the analysis. A more fitting title would be: Using LSTM to monitor STORMFLOW DISCHARGE indirectly with EC observations.

The performance of a model using EC only is compared to models using both EC and P and only P. It might be interesting to compare the selected model to a more simple approach, to really highlight the added value of a more complex model.

20: In your abstract in line 20 you write that in your spring EC always has a negative correlation with spring discharge. However, in line 126-130 you mention that there is occasionally a positive correlation (EC peak at the initial runoff).

23-25: "LSTM results indicate that the spring discharge can be predicted well with EC, particularly in storms when the dilution dominates the EC dynamic; however, the

prediction may have relatively large uncertainties in the small or middle recharge events." It seems the findings of your study do not support this conclusion at all. As I understood, spring discharge could ONLY be predicted well for large storm events; there are large uncertainties when it comes to intermediate and small events and it was not possible at all to use EC for the estimation of baseflow/low flow. So, one might conclude that overall spring discharge can actually not be predicted well.

130: It is unclear why a there is a need to correct the maximum EC values in 2017 to match them with 2018 and 2019. Please elaborate why the maximum EC should be the same in all years.

130: You corrected for drift of the sensor by subtracting 23µS/cm. Please elaborate why you choose this specific value. Also: A simple subtraction of measured EC does not adequately account for gradual drift.

424: You elaborate that the EC dynamics of the investigated spring are relatively simple without temporal EC peaks at the beginning of storms. However, in line 126-130 you describe that you found indeed initial EC peaks at the beginning of storm events in your 2018 and 2019 data and you state that you excluded these observations from your analysis.

426: To my knowledge, the cited paper of Hess and White (1993) does not give any reference to "piston flow", it doesn't mention the words 'piston flow'

MINOR

83 –geographical coordinates of the spring might be useful

83-91 citation might be useful

Figure 1a: labels in map are too small to read

120 -121: "the spring`s EC dynamic is MAINLY controlled by the rock dissolution and the dilution from the low-EC event water during storms." – what other minor influencing factors are there?

133: wrong unit: 23us/cm -> 23μs/cm

170: “LSTM belongs to a special kind of recurrent neural network” – I suggest different wording

253: “The performances of MP and MECP deteriorate obviously probably due to …” – obviously or probably, which one is it?

Figure 3e: red line in legend is missing

285: wording: middle -> intermediate