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Atmospheric Measurement Techniques Discussions

Interactive comment on "Eddy-covariance data with low signal-to-noise ratio: time-lag determination, uncertainties and limit of detection" *by* B. Langford et al.

Anonymous Referee #3

Received and published: 26 March 2015

I found the topic - evaluation of limit of detection in flux data - very important and the approach taken, highly innovative and promising. However, I was struggling throughout the paper, mostly because there are long and worded description of what was done, but a critical lack of concise mathematical formulation that will help describe clearly what was done and how. Specifically, there is no formulation of LoD. the average LoD is listed as a function of LoD in eq. 6, but how do one calculate LoD? You mention 2 methods to do so (RMS and sigma). Please provide the exact formulation for each. You provide formulation for RE but not for sigma. What exactly is Sigmaˆ2_fc.sub? is it the variance within, between or among the n different time series? Can you provide a for-

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mulation to the MAX, AVG and PRES lag approaches? Can you make all formulations use the same averaging time and lag definitions (should be parametric, not a actual fixed time).? Can you provide an objective numerical criterion for the determining that mirroring is occurring, and can that criterion be formulated and not only described in words?

Other points I am confused about:

What is the difference between cross-covariance and just covariance?

What is the difference between the auto-covariance and auto-correlation functions? Can you formulate the autocorrelation function to make that clear? Lines 220-222 make no sense to me.

L230-232: What do you mean by "visually, the area becomes proportional to the noise variance"?

Other comments: L44-46 you claim this to be an "active area of research" yet the most recent paper you cite is from 2002. Doesn't seem too active to me.

L254-265: you claim that: "Any correlation between c' and w' within these bounds is either purely accidental and reflects the random noise in the time-series or it is due to organised structures that persist over much longer time intervals suggesting that turbulence is not stationary or statistically not well covered in the measurement" - what about the middle range - that the correlation is a result of small (turbulence) organized structures at a time scale much smaller than the averaging time that provide the mixing with the land surface. Effectively - the turbulence flux. Why is that not possible?

Section 2.4.2 - you peak width simulation uses a signal with decaying frequency over time. This is not a fair representation of the real-world turbulence flux signal, as we assume that the turbulence signal is ergodic within the averaging period (typically 30 min) and thus, by definition, has a constant frequency profile over time. L378-383 - I totally lost you here. Can you provide the formulation for this, so I could trace what you

AMTD
8, C442–C444, 2015

did?

Minor comments: L244 1995 - Author name missing

L250-252 the + or - sign at the second of each pair of numbers is missing. I am not sure if you mean -150 to -180 or -150 to +180. And, I am also confused about this time range, are these the limits of the lag-shift, the potential ranges of the averaging time,...? Having well defined formulation that is explicit about all these things throughout the manuscript will help.

L260 - you open more parentheses than you close.

L390 what Gill model did you use?

L532 What are "red time traces"?

Fig 2 and 5 - the legends are barely legible.

Fig 11 - please mark each panel with its own index. there are 4 marked with A and 4 with B. You can use A.1 A.2 ...

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 2913, 2015.