

## ***Interactive comment on “A robust data cleaning procedure for eddy covariance flux measurements” by Domenico Vitale et al.***

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The authors present a procedure for the "cleaning" of raw data from eddy covariance flux towers. If effective, such a procedure will be of great value. The procedure described is founded partially in previous studies of quality control for flux tower data, and partially based on statistical analyses that can be considered novel in this context. I am no expert in statistical analyses, but the approach put forth seems to be valid and defensible. The paper is well written, although I offer some minor suggestions intended for its improvement. My main problem with the paper is that the evaluation of the proposed scheme is based on synthetic time series, and I am left wondering whether such "data" are representative in terms of the types of problems that can be encountered in real, field data. If there were a means of assessing this key question,

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then I would suggest this as a "major" revision issue. In any event, however, I believe that the manuscript merits publication.

Specific comments (by line number)

38 "An intergral part of the EC..."

82 This statement strikes is as excessively bold and over-simplified. For example, a random error that were to consistently reduce the covariance at a frequency of 0.01Hz (by introducing random noise at that frequency) would cause flux underestimation for the corresponding eddies. It could well be that these frequencies matter greatly for (convective) eddy transport during daytime, and far less so at night. The result would be an overestimation of NEE over the long term.

83 "classified into partially versus completely data-driven"

87 "Such a call"

93 sacrifice

98 "because it is extremely"

100 "false-positive rates"

105 "selected, the results of these tests"

135 "proposed set, and iv) results in"

142 "a set of tests"

200 "with some instruments, especially older models or often"

200 Table 1: if the terms "fraction of missing records (FMR)" and "longest gap duration (LGD)" are defined with the acronyms in parentheses as in this sentence, then it makes it easier for the reader to find them when they encounter them for the first time in the text.

248 Again, I find greatly exaggerated the claim the random errors due not affect co-variances. This depends on the magnitudes of the signal/noise variances, and also on their durations during the averaging period.

271 "concists of". I suggest checking the entire manuscript and systematically replacing "consists in" with "consists of".

372 This seems particularly risky for high towers in situations with strong convection. Maybe this could be stated explicitly rather than left vague as "further considerations".

374 "With respect to"

385 The post-dawn transition from a stable to a growing/convective boundary layer seems to be a moment that is particularly relevant here. Perhaps you could elaborate on this or at least prepare the user for its importance.

404 LOESS

414 loess

465 A key point: can you either justify this or evaluate its importance?

470 You are careful to describe the methods for the eddy covariance calculations. However, whereas the determination of the storage terms is not trivial, you provide no methods.

484 The meaning of the subscript ( $i=1,\dots,6$ ) is not at all clear to me. What are the differences between the six cases?

485 "was run"

497 Figure 2 has no units on either axis. Also, whereas this figure has labels for every panel, many of the following figures do not (but should).

516 This is hardly a stand-alone figure (i.e., a reader would need to search broadly through the text in order to understand it). One might easily suppose that LSR means

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"least-squares regression", and not a "low signal resolution" text. Again, the subscripts are not clear. What is the difference between  $i=1$  and  $i=4$  (both of which give  $\phi$  values of 0.9). Do "A-R" and "Amp Res" refer to the same thing? Generally speaking, I think that the average reader would initially obtain no information from this figure, and would become bewildered after studying it for ten minutes.

519 "n0 indicates the percentage"

529 Does size 6000 mean 10 minutes of data?

531 Which 15% were replaced? I don't see a change in variance in Figure 5 (whose panels are not labelled, but I refer to Figure 5f

536 "was run"

549 the proposed tests were more selective

553 identify the same issue, which is why the ModEr statements

572 what are the units of the values 0.0004 and 0.004?

573 what are the units of the values 0.025 and 0.25?

573 change "Exemplary" to "Representative".

603 Figure 9 has no units. Also, understanding the meaning of FW96 and M98 would require the reader to have access to older papers that may not be readily available. When a measure is used to compare against a threshold, that variable should be explicitly defined (so as to make the figure stand alone).

634 The appearance of references (to the works of Cleveland, Lomb, and Scargle) in the Results section indicates poor structure. All of these tests should have been previously defined in the methods section.

639 The y-axis labels of Figure 13 are particularly weak. What is "c" to which NEE has been added prior to computing a logarithm? What is "D"? The term "Irreg-

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ular" is nowhere precisely defined (although it appears to derive from the work of Lomb/Scargle). What are its units? Also, the choice of max/min for the y-axes of the LRT and SRT variables (likewise not clear from the figure) are poor and give no idea regarding the ranges of these variables.

643 "Previous research (refs) has highlighted"

648 Figure 14: Maybe change "DoY" to "Day of Year". To what year does it refer? Also, change "Density" to "Probability density".

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