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Atmospheric Measurement Techniques Discussions

Interactive comment on "Computational Efficiency for the Surface Renewal Method" *by* Jason Kelley and Chad Higgins

Anonymous Referee #3

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The authors present three methods to improve computational speed of sensible heat fluxes from surface renewal measurements. The methods aim to improve practicality of the SR approach. The manuscript is original research, technically correct, and appropriate for AMT. However, construction of the manuscript has problems. Lack of innovation is one: none of the proposed methods (de-spiking, FFT solution of lag, and root solving) are, though you could say that your implementation is novel. The abstract does not adequately present the problem being solved and their proposed solutions. The presentation here and in Conclusions mention different points but there needs to be a unified message. There is a lack of quantification supporting assertions in the Introduction and details in their tests in Methods. Current relevant references are not included.

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Discussion paper

Details: Abstract: Logical presentation in the abstract needs improvement. Sentence one is a factual and not very informative statement (don't all flux techniques require programmatic algorithms?). Sentence two addresses a problem never posed, but should be: existing knowledge on required averaging periods is incomplete or poorly understood; or maybe the problem is more specific: SR is computationally expensive and reducing the averaging period would greatly improve feasibility of SR. But then in sentences 4,5, and 6 it appears that discovering the minimum averaging period isn't really what your study is about, instead it is to develop computationally faster processing algorithms. Or maybe the intent is to facilitate mobile flux platforms as mentioned in the Introduction. Looking at your conclusions, a completely different idea emerges: the need to standardize SR methods. Why is this mentioned as an after-thought? What is your thesis?

Introduction: Not mentioned, but should be, are the SR limitations relative to EC: it returns H and not LE, the latter having to be computed by residual (and thus ET estimates contaminated with both SR-derived H and non-SR (G,Rn) errors. What instrument do you propose to deploy for SR? Thermocouples are inexpensive but fragile, 2D sonics not fragile but not inexpensive. So: would help readers to quantify the benefits: how much less does SR cost? What fetch benefit does one gain with SR? I think the jury is still out on SR fetch length, but estimates would still be important to support your claim. L43: a major problem here: you have yet to publish your manuscript assessing efficacy of different averaging periods, but as of now we don't know the result and so do not know how important your algorithm refinement is. L 51-56: here your actual manuscript content is presented: you implement 3 algorithms to speed SR processing: de-spiking, structure function computations, and a root solver. Regarding de-spiking: authors should read and consider findings in Starkenburg et al. 2016, with attention to their Table 1. Discussion of convolution should mention that the time-series operation includes multiplication of the time-reversed kernel.Regarding structure function lag estimation, consider findings reported in French et al. discussing lag vs. SR accuracy. Root solving is not innovative although I will grant innovation in the diagnostic findings of pathological cubic equations by Edwards and Beaver. It would be useful to compare the speed improvement using Cardano's method vs. numerical Newton-Raphson. If your aim is open-source you should provide readers with evidence that m script successfully executes on a non-proprietary software platform. Line 166: here is a critical finding about computation time vs. averaging period; you should find a way to highlight this and not

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