Atmos. Meas. Tech. Discussion doi:10.5194/amt-2017-123

General comments from Reviewer #3:
These comments made by this reviewer have helped to make significant improvements in the revised manuscript. In particular, I was unaware of the review of despiking methods by Starkenburg et al. (2016), and this citation has significantly improved the context of this research and has helped narrow the discussion of the intent of my manuscript, and clarify what the novel aspects of the methods described here. Also, the reviewers prompted me to re-read of French et al.'s 2012 publication using the SR method, and the discussion of lag time there has helped improve my discussion of practical aspects of computation. Following the reviewers suggestions, I have re-written the abstract, introduction, and conclusions sections to clarify the intent, context, and relevance of the three computational methods described in the manuscript.

Specific Comments:
Abstract: Logical presentation in the abstract needs improvement... What is your thesis?
I acknowledge the lack of clarity and have re-written the abstract to clarify that the intent of the paper is to document and quantify the efficiency of three algorithms, which rely on convolution and algebraic simplifications, and consequently facilitate implementation of the surface renewal method. A secondary finding of the manuscript relates the flux averaging period and computational efficiency. Mention of potential uses for this findings (open source methods, implementing SR on mobile platforms, integration into hardware solutions, etc.) and similar have been moved to the discussion in the conclusions section, rather than being misleadingly referenced in the abstract.

Not mentioned, but should be, are the SR limitations relative to EC... quantify the benefits: how much less does SR cost?
I have added discussion relating more context and citations regarding practical implementation of SR to measure flux.

What fetch benefit does one gain with SR?
Because it is relevant to the context and motivation for the SR method generally, I have added language to better cite relevant references (Castellví 2012, Göckede et al. 2004; Paw U 2005), and brief discussion regarding the measurement fetch. I have kept this limited as it is not directly relevant to the computational method. In one sense, the method's reduction of measurement fetch is not clearly established in the literature, and following Castellví (2012), it is probably comparable to eddy covariance. However, it is clearly established that SR can give reliable measurements of flux within the roughness sub-layer (Paw U et al. 1995; Katul et al. 1996; Chen et al. 1997; among others more recently). Due to this difference from eddy covariance and gradient methods which require measurements at two heights, the practical source-sink area associated with a measured flux is smaller, and spatial footprints can therefore be resolved at finer scales.

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.
I have expanded the description of the field experiments, and included results that quantify the improved calculation efficiency.

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Regarding de-spiking: authors should read and consider findings in Starkenburg et al. 2016, with attention to their Table 1.
I am grateful for the reviewer for bringing this paper to my attention as it was published after this manuscript was originally prepared, and significantly adds to the context of the work shown here. While de-spiking is a required QAQC process with micromet data, the convolution method shown here specifically addresses and improves computational efficiency, and shows significantly improvement over the methods shown in Starkenburg's review of published methods. In addition, the convolution approach facilitates a more sophisticated application of the phase space approach, and overcomes a major limitation of that approach through efficient calculation. I have added a brief discussion of my method to the manuscript to demonstrate the benefit of signal processing techniques like convolution.

Discussion of convolution should mention that the time-series operation includes multiplication of the time-reversed kernel.
I have added more technical description of convolution.

Regarding structure function lag estimation, consider findings reported in French et al. discussing lag vs. SR accuracy.
This citation was also a good suggestion, and I have added a brief discussion of the relevance of lag time to the methods' accuracy, and how this pertains to computational efficiency.

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.
Although I grant that this would be an interesting comparison, I think that it suffices to state that algebraic solutions are always less computational intensive than any iterative root finding algorithm. Cardano's algebraic solution requires fewer operations than any numerical root findinig solution of which I am aware- it is a happy coincidence that he so-called "depressed" cubic polynomial is the one needed to solve the structure function arrangement posed by Van Atta.

If your aim is open-source you should provide readers with evidence that m script successfully executes on a non-proprietary software platform.
I agree! In the interest of time, I have not included my partial results of executing these methods in Python, which are ongoing. I rephrased this mention of potential open source implementations to my discussion as a needed action.

Line 166: here is a critical finding about computation time vs. averaging period; you should find a way to highlight this and not bury it in the text.
I agree that this is one of the coherent points in the results, and I have reworded to emphasize it.