Final Response to Associate Editor Decision

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Cloud motion on the edge with phase correlation and optical flow by Bhupendra A. Raut et al.

Reviewer #2

> One promising aspect of this paper is that wind-profiling radar and ceilometer measurements were taken "to validate the estimates of the CMV" (cf. Sec. 2.1.3. of the current version). However, the authors have now indicated in their answer to my requests for a more qualitative validation that retrieving the wind is actually not an objective of the paper/algorithm. As a result, the connection between these wind-profiler-radar and ceilometer atmospheric measurements and the optimisation of their CMV algorithm now becomes quite unclear. Some things have certainly been much improved in the paper as it stands now, such as welcome added details about the methods, and the use of synthetic data, which now give something to compare against (in terms of shifts in pixels). But it might be more of an image-motion detection technique paper, than an atmospheric-measurement-technique one. It is not clear what reference empirical atmospheric measurements are actually used to compare against and therefore how meaningful the assessment of how good the retrievals and the optimisation of the algorithm are. This, especially given what follows.

> One point is that there are already many papers that are using more sophisticated algorithms with careful preprocessing to avoid well-known issues/pitfalls leading to unsatisfactory results (this was also an essential part of the original report). When asked why those known approaches to obtain better results were not implemented here (pointing out that the Sage nodes are able to run ML and OpenCV), the answer has been "the Sage nodes run many applications using OpenCV and deep learning models, some of them are critical, for example, traffic estimators in the city and wildfire detection in the forests. These applications take the bulk of the processing powers due to the deep learning models. Therefore, it is important to try for low processing for most applications. In the future, we may use more complicated algorithms by adapting an advanced machine learning approach to estimate the cloud motion after accessing their value addition to the final product such as solar irradiance estimators." Because of this conscious choice, what this paper actually brings to the literature is then limited; this might be an acceptable justification for a proceedings, but probably less so for an article in a journal. At the very least, the limited impact of not addressing these issues should be demonstrated.

We appreciate the reviewer's efforts to evaluate the paper again. We understand their concerns regarding the wind retrieval from the CMV and, as mentioned in the earlier response, wind retrieval needs the height estimations. For this, we are considering using thermal sensors in the future to derive the height of the cloud bases. However, the discussion of that is outside the scope of the current paper. The focus of the current paper is *to test the sensitivity of the phase correlation (PC) algorithm and compare it to the optical flow (OF) method*. The paper's contribution is in providing

insights into the sensitivity of the block-wise PC method, which is not available in the peer-reviewed literature to our knowledge.
The wind and ceilometer measurements served as additional validation, showing consistency with independent atmospheric measurements over two years period. Such comparison with *a long-term dataset* is also not found in the literature and it was made possible thanks to the ARM SGP user facility. The application of CMV (alone) for targeted miniMPL scanning is valuable for cloud and aerosol research (Mentioned in Section 5).
Moreover, despite the recent advent of sophisticated methods, especially in the AI/ML domain, traditional computer vision methods (e.g. PC, OF, Kalman filtering) will remain in use due to their flexibility, efficiency, and more so their explainability. Therefore, the results of this paper will be of interest to researchers who are using PC/OF methods.
We have now clarified our objectives (in the Introduction section and modified the title) in the final version of the paper. We are very grateful for the reviewer's earlier suggestions that substantially improved the contents of the manuscript.

Associate Editor decision:

> **Publish subject to minor revisions (review by editor) by Ad Stoffelen**
> The 2 reviews are rather different, but both of interest. The technical aspects of atmospheric cloud motion measurement are now much improved and it is clear that the manuscript focuses on these aspects, which satisfies the first reviewer. The abstract and title also focus on these aspects. Nevertheless, the second reviewer is looking for the practical usefulness of the measurements, which is less clear indeed and of course very relevant. I recommend to sincerely consider the reviewer's comments with the aim to further clarify the manuscript in terms of these latter aspects in a minor revision.

We thank Associate Editor Ad Stoffelen for the opportunity to revise our manuscript and appreciate Prof. Robert Höller and anonymous reviewer #2 for their efforts in providing their perspectives.
We understand that the two reviews present differing views on the different aspects of the paper. While both the reviewers recognize the technical integrity of the paper and the clarity of the presentation, the second reviewer's concerns regarding the exclusion of wind retrievals from our measurements and not adapting newer and more sophisticated methods are recognized and responded above. The applications of CMV estimations for guiding the MiniMPL scans and solar irradiance forecasting are also mentioned in the final section. We have revised the Introduction and the Discussion section to clarify these concerns (See annotated file). The title is now modified for more clarity to read "Optimizing cloud motion estimation on the edge with phase correlation and optical flow". The author order has been changed as per their contributions in the current version of the paper.
Revisions to the paper have significantly improved its clarity and quality of contents, and we hope it meets the criteria for publication in AMT.