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Atmospheric Measurement Techniques Discussions

# *Interactive comment on* "A simple insect removal algorithm for 35-GHz cloud radar measurements" *by* Madhu Chandra R. Kalapureddy et al.

**Anonymous Referee #1**

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Reviewer comments on the manuscript titled "simple insect removal algorithm for 35-GHz cloud radar measurements", by Madhu Chandra R. Kalapureddy et al.

The study presented a technique which uses high temporal and spatially resolved reflectivity profiles to extract the cloud echoes from the clutter (mainly from the biota). The proposed technique suggested as a simple and efficient solution for clutter removal, compared to earlier sophisticated techniques based on dual polarization and spectral techniques. I think manuscript has several shortcomings, related to technique and assumptions, poor job of literature review, references and lack of solid conclusions. In its entirety, I would recommend rejection of this paper in its present form.

Major comments:



The screening technique authors have implemented using simple measures of reflectivity (or SNR) thresholds and its variability to filter out the clutter has been a usual practice in the cloud radar community as a part of post-processing exercise. The challenge of separating insects from the cloud clutter is difficult due to the lack of clear demarcation between their properties as seen by cloud radar. More often than otherwise, the screening process requires more than one variable, which captures the texture, distribution width, and physical properties of these echoes. With this motivation, some of the earlier studies have devoted their efforts to address this problem using different techniques (fuzzy-logic, spectral technique or polarization properties).

The authors haven't clearly appreciated and addressed the insect removal to the detail that it was needed. They have demonstrated the algorithm with several minutes of data, which doesn't warrant the techniques robustness to apply for other conditions. Authors have made several assumptions about the insect layer depth, their decorrelation timescale without presenting any evidence about the location of the shallow boundary layer clouds, where the insect clutter is very critical. Previous studies (e.g., Geerts and Miao 2005; Chandra et al., 2010) have utilized the long-term observations of insect echoes to study the convective boundary layer, where they have shown that the insect decorrelation times may vary from few seconds to few minutes depends on boundary layer organization. The authors would have shown the distribution of the cloud base locations (from the closest ceilometer data) to justify their presumed insect layers below $\sim$2km. I suggest authors to utilize the supplemental observations (such as ceilometer, microwave radiometer) to present the cloud properties and refine their insect-cloud algorithm based on the locations of cloud layer depth.

As an alternative solution to the computationally intensive spectral techniques for the insect clean-up (e.g., Luke et al., 2008), a computationally efficient technique to minimize insect clutter have been implemented based on fuzzy-logic algorithm (e.g., Chandra et al., 2013), which takes into account both the physical properties of clouds and different radar moments. This technique can be applied with different levels of com-

plexity based on the supplemental observations (Microwave Radiometer/Ceilometer) you have in addition to radar moments. I suggest authors go through this technique for more details.

The basis of the present technique is that the reflectivity distribution could be effective in separating insects from clouds, which may not be the case always. There could be instances when the range of reflectivities from the shallow passive clouds could be similar to the insects (refer to panels, a1 and a2 from the Fig. 13 as in Chandra et al., 2013). This study has taken into account not only the physical properties of cloud (e.g., liquid water path) but also texture signatures in the reflectivity field, the variability of the scatterers inside the radar range resolution from the spectrum width variable-one of the main predictors in insect-cloud separation.

The authors would have shown the technique demonstration effectively with few figures. I feel that there are some figures (Figure 8a and 8b, Figure 11) which don't serve any purpose. Some of the references (cited in the lines 64-98) related to the clutter removing techniques implemented at other frequencies (C- S-Band) were not necessary.

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