Anonymous Referee #2
Received and published: 7 February 2017
Interactive comment on acp-2016-1166: "Analyzing cloud base at local and regional scales to understand tropical montane cloud forest vulnerability to climate change"

This paper describes results of an extensive cloud and meteorological monitoring campaign in the Caribbean in order to better understand the distribution of low boundary layer marine clouds in time and space. Monitoring was uniquely carried out in mountain regions to gain insights about cloud immersion of tropical montane cloud forests and establish baseline conditions against which future changes may be measured. There are many results that I believe most readers (including me) will find cumbersome to wade through, but that is the nature of such a paper that reports on an extensive field campaign and important general conclusions were still clear. Low clouds are frequent in the year round, with the highest frequency occurring in the dry seasons. Spatial distributions of cloud frequency and base height were quite spatially heterogeneous, however, likely due to topographic effects. Although it is commonly believed that tropical montane cloud forests would be most sensitive to changes in the frequency and elevation of dry-season clouds, authors interpret their detection of a common presence of wet season clouds to indicate that changes to these clouds could also be ecologically impactful. This paper describes critical ground-work and initial results necessary for long-term monitoring of cloud variations and changes in a unique and ecologically important zone. The complicated nature of the results is just the nature of the beast for exploratory studies such as this one that include multiple sites, multiple metrics for measuring mean cloud height, and multiple monitoring tools test for corroboration. I therefore believe this paper is appropriate for publication in ACP.

Specific comments:

P1 L29: It is not explicitly clear what "higher" is relative to.

We changed "higher rainfall" to "more rainfall".

P2 L2: I would also imagine fog water input varies greatly throughout a forest depending on they types of surfaces available for collection and micro-climatic wind patterns.

We agree and hope to explore this in future work. We added "this value varies greatly from forest to forest and within the forest."

P2 L20-22: It is worth mentioning a couple other relevant studies that have used longterm cloud-base observations to investigate spatiotemporal variations and trends in cloud frequency and cloud-base height. Williams et al. (2015, GRL) used records from 24 airfields in southern California to show that substantial warming-induced increases in cloud base have corresponded to local land-cover change via nighttime urban warming. Richardson et al. (2003, J Climate) analyzed cloud heights at 24 airfields in the Appalachian Mountain region of the eastern US and documented multi-decade (1973-1999) increases (decreases) in cloud-base height north (south) of 37.5_N. Causes of the changes are not rigorously investigated in that study but the ecological implications are stressed as important. Further, Rastogi et al. (2015, Earth Interactions) presented a relevant study that combined cloud-base observations with satellite and radiosonde observations to estimate how marine-layer stratus clouds intersect with topography.

Rastogi, B., A. P. Williams, D. T. Fischer, S. Iacobellis, K. McEachern, L. M. V. Carvalho, C. Jones, S. A. Baguskas, C. J. Still (2015), Spatial and temporal patterns of cloud cover and fog inundation in coastal California: ecological implications, Earth Interactions, In Review.

Richardson, A. D., E. G. Denny, T. G. Siccama, X. Lee (2003), Evidence for a rising cloud ceiling in eastern North America, Journal of Climate, 16(12), 2093-2098, doi:10.1175/1520-0442(2003)016<2093:EFARCC>2.0.CO;2.

Williams, A. P., R. E. Schwartz, S. Iacobellis, R. Seager, B. I. Cook, C. J. Still, G. Husak, J. Michaelsen (2015), Urbanization causes increased cloud-base height and decreased fog in coastal southern California, Geophysical Research Letters, 42(5),1527-1536, doi:10.1002/2015GL063266.

We had cited Rastogi et al. 2015 (see page 6, line 30), in the Methods, because some of the ways they used data sets were similar to ours. We added another citation of Rastogi et al. to the Discussion where we hypothesized the trade wind inversion is limiting the clouds; Rastogi noted that too; thank you for pointing that out. We added a citation of Richardson in the Discussion (pg 10 line 16) discussing possible ecological implications. We added a citation of Williams in the Introduction, saying that future urbanization may affect cloud height (pg 2 line 19).

> There are many non-traditional abbreviations that I find distracting. For example: ERS, LRS, DS, MSD, TWI. By the half-way point of page 3 I'm fearing that at some point the entire paper may be abbreviated. I recommend unabbreviating some or all of the abbreviations that I list above and I believe doing so will enhance the interpretability
> and impact of the paper.

Other reviewers had this comment as well. We removed the seasonal abbreviations but left in the "trade wind inversion" with a TWI abbreviation; it is used in numerous publications and is better known than the rest of the abbreviations that had been used.

> P4 L2-3: I think there is a word missing from this sentence.

The sentence now reads "Ceilometer data used in this study were the altitudes of the lowest cloud layer at a point above the instrument; the cloud layer base is the bottom of a vertically continuous layer at least 100 m thick with no vertical visibility (defined according to a 5% contrast threshold; http://www.vaisala.com)."

> P4 L28-30: It is not indicated what the time-step is for the values considered in this correlation analysis. Daily or annual cycles would cause correlation even if variability that is independent of the cycles is not correlated.

We added the word "hourly". The hourly data was used to correlate with clouds on a 5-day and monthly basis.