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Atmospheric Measurement Techniques Discussions

Interactive comment on "A cloud detection algorithm using the downwelling infrared radiance measured by an infrared pyrometer of the ground-based microwave radiometer" *by* M.-H. Ahn et al.

Anonymous Referee #3

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General Comments.

The authors do a nice job of explaining why cloud detection should accompany the radiometer measurements and do an adequate job framing the strengths of their technique compared to other techniques. I believe that the results presented are useful and the algorithm is justified. It is unclear if these results are applicable to other sites, i.e. if Equation 4 and 5 will need to be derived at every location. If it site specific then it is still useful but perhaps undermines the motivating notion that the ground-based

radiometers will be more common and the technique will be useful in characterizing cloud presence for these measurements. The main issue I see in improving the clarity of this paper is in regards to describing the cloud detection algorithm (Section 3).

Specific Comments:

Section 3 is not as clear as it could be. Perhaps start with a few sentences of general expectations of the algorithm. Save the validation statements for later. For instance: P9421 line 20-21, this sentence seems out of place.

The overall flow and labeling of variables in section 3 seemed disjointed and forces the reader to put the pieces together from the different sections. For instance P9424 lines 8-10: I am not sure how "data points having small temporal variability" were determined. Perhaps introduce section 3.2 first and then refer to the threshold used to create figure 6b. Is there a reason to introduce the spectral test first? Why not discuss the threshold values at the ends of sections 3.1 and 3.2? I do appreciate figure 10 and the description of it in the text but it would flow better to say what the threshold values are in the first paragraph of section 3.3 or in previous sections instead of at the end of the section.

Section 3.1: To create a fit to the data in the lower portions of 6b it appears that you used the reanalysis data to create Tb_klaps but you have already estimated Tb_klaps from e and T_sfc. Why not use the estimated Tb_klaps from Eq4 to derive eq5 and then determine a threshold value based on this uncertainty. Perhaps the two approaches are equivalent?

Your labels need to be consistent. For example: Fig 4 yaxis should match the text and be "log(Tb_klaps/T_sfc)" not "log(Tb/T_sfc)".

Basically it would be good if section 3 was organized such that a reader at a different site with the same instrumentation would to be able to step through this section and recreate a cloud detection algorithm similar to the one you describe.

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Do you think that equation 4 is applicable to other sites or does Tb_klaps need to be created at each site? This may be more fitting to discuss in the summary section. I do applaud your use of reanalysis data to validate the predicted Tb_clear. Do you think reanalysis data will be needed to produce an algorithm specific to each site?

Technical Comments:

P9414 Abstract line 14 and 15: I think “screened out” is ambiguous. Replace with “detected” or a word with an equivalent meaning.

P9414 Abstract line 19: “Failures” changed to “discrepancies”. From the paper it seems like the failure is due to limitation in the ceilometer not your detection scheme.

P9415 line 19: “multi-sensors” to “multi-sensor”

P9416 line 20-21: Confusing sentence. Simplify sentence to “One of the other issues with the narrow band approach is that other features, such as a thick aerosol or haze, are falsely detected as cloud.”

P9418 line 16: “. . . by IRT . . .” “. . . by an IRT . . .”

P9420 line 3: change “cloudy free” to “cloud free”

P9420 line 22: I am not sure what “2 $\sim$ 3 s” means. How do you get one minute averages from 2-3 data.

P9422 line 17: is the Zhnag et al 2007 reference supposed to be Zhang 2009?

P9424 line 18: change “spreadness” to “variability”

P9425 line 19: change to “ . . . the number of available Tb_irt data points . . .”

P9430 line 18-19: reword the phrase for clarity“ . . . two small bumps . . . “

P9432 line 2-3: It is unclear which instruments you are talking about. Perhaps change “ground based instrument” to “ ground based IRT”? Change “measured radiance” to “measured microwave radiometer radiance”?

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P9432 line 27-28". This sentence does not make sense and should be reworded or broken into two sentences.

P9434 line 5-6: Not accurate. Perhaps change to " The scene is determined to be cloud free only when . . ."

P9433 line 11: change "failures" to "discrepancies" since the failure is due to sampling error and ceilometer shortcomings, thus isn't necessarily a failure or your technique.

P9434 line 1: change " cloud cleared", this is confusing. Maybe "cloud classified" or "cloud detected"?

Make sure labels are large enough to be readable in the Figures (especially Figures 2, 6, 8, 12 and 14)

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 9413, 2014.