First of all, we wish to thank both the reviewers for going through the manuscript carefully, appreciating the actual content of the manuscript and providing constructive comments/suggestions for the improvement of the manuscript content. Point-to-point replies to each of the comments/suggestions made by both reviewers are provided below.

Replies to reviewer2 comments

This is a suitable submission for the EGU Journal AMT. I have a large number of specific comments in this round. Once the revised version is available, I will be happy to provide additional input (if any needed).

Reply: First of all we wish to thank the reviewer for appreciating the actual content of the manuscript and providing the specific comments which are taken care of in the revised manuscript to the maximum possible extent.

- L 42-43: Remained very general without any specifics: Which measurements (parameters, variables, etc.) were assessed? What is the key scientific motivation of these intercomparison? What do you mean by "consistency" for validating balloon borne measurements against satellite and ground based measurements? Is it property? temporal or vertical variability? Such specifics need to be mentioned for clarity and fruitful scientific discussion. Please note that the documentation is not for the authors but for the readers. So, such specifics are required in an AMT manuscript.

Reply: This sentence has been revised to "Balloon-borne measurements are assessed using the data from simultaneous observations of ground-based, space-borne remote sensing instruments".

Range corrected signals (RCS) from Mie Lidar, Micro Pulse Lidar (MPL), total attenuated backscatter (km-1) from CALIPSO satellite, backscatter ratio (at 455nm, 940nm wavelengths) from COBALD and total cloud particle number concentration (#/cc) from CPS were assessed.

The key scientific motivation is to verify the response of a combination of balloon-borne sensors (COBALD and CPS) for aerosol and/or cloud presence in the profile with ground-based and space-borne remote sensing measurements. It is also to identify the portion of the aerosol/cloud profile missed, if any, by the ground-based/space-borne lidars.

Using the word consistency, we mean to say, the features of aerosol/cloud presence in the atmospheric column obtained from balloon-borne observations is in-line with ground truth/satellite data. The wording 'consistency' is now changed in the revised manuscript.

It is the vertical variability that we want to compare among balloon-borne observations, ground truth, and satellite observations. Such aspects are mentioned clearly in the revised manuscript.

- "A good agreement": Purely a qualitative statement. Please note the MAE, STD, correlation while quantifying such intercomparisons.

Reply: As mentioned above, the physical quantities/measurement techniques among the different sensors/instruments are different. Moreover, retrieval of physical quantities involves several assumptions. Thus, our intention is to do a qualitative

assessment to show the similarities of different instruments in representing aerosol/cloud features. Independently the balloon-borne sensors are proven but for the first time, a combination is used in the BACIS Campaign. Retrieval of physical quantities involves assumptions. The wording 'A good agreement' is now changed in the revised manuscript.

- "To complement": In what sense? Temporal or vertical data gap or both? Again, please be specifics.

Reply: The word complement has been removed. Here 'Profiling' word means vertical variability in aerosol/cloud features. Such aspects are taken care of in the revised manuscript.

- L 49-50: Please separate these results and present more carefully. Parenthesis are the most confusing components in reporting results.

Reply: Thank you for the valuable suggestion. The usage of parenthesis is now removed.

- L 52: "Further Investigation" Again unclear phrase without specific goals or objectives. One can always do "further investigation". In a research paper, in particular, in abstracts such general phrases do not carry any scientific value.

Reply: Thank you for the suggestion. The word 'further investigation' is now removed.

- Overall, the abstract was poorly crafted. Please bring the scientific needs for the statements made at the beginning and provide specific results rather than stating "good", "consistent" etc.

Reply: Thank you for the suggestion. The abstract is now revised by taking care of the above mentioned suggestions.

Introduction

- L62: Please update your statement following Sixth Assessment Report of IPCC. 2013 is really outdated now.

Reply: Thank you for the suggestion. The latest IPCC report is referred to.

- L78: "Different" Do you mean many variable results or contradictory. Please clarify.

Reply: We mean to say, results vary among reports of different grid resolutions of the analysis. The statement is modified as per the suggestion.

- L 85: Comprehensive picture of what and how?

Reply: We mean, a comprehensive picture of aerosol, cloud and associated environmental parameters to understand aerosol-cloud interaction. The statement is revised as per the suggestion.

- L84-107: A series of papers got referred here. Readers are curious about "So What". What are missing in those papers that this manuscript is going to address and how can you improve the existing gaps in knowledge and understanding remained the key of such reviews. This list could be exhaustive otherwise as well.

Reply: A list of references has been mentioned here wherein a combination of ground-based multi-instrumental setup had been deployed and the focus was mainly on the low-level (liquid) clouds. Contrary to this, our approach/observations could provide

vertical variability in aerosol/cloud and for all types of cloud. This can't be exhaustive but only indicative.

- L109: Best" Please be careful before you demonstrate that. Introduction is not the right place unless some other papers have shown this to be the "Best".

Reply: We have now removed the word 'best' in the revised document.

- L115-120: Not appropriate for introduction. Should be in site or methods.

Reply: These details are now removed in the revised manuscript.

- L 121-125: Not required. Please remove. Readers will forget what was said 6 pages ago while reading. Such sentences make a manuscript longer than needed.

Reply: These lines are now removed in the revised manuscript.

- Overall, in the introduction, authors should clearly state the objectives of this manuscript.

Reply: The objectives/purpose of the manuscript is now mentioned at the end of the introduction section of the revised manuscript.

- Describing some instrument and showing the results without any scientific goals remained merely insignificant to move science forward.

Reply: Instrument details are provided in the second section. A paragraph on the purpose of the manuscript is given in the introduction section of the revised manuscript.

Section 2

- What is backscatter sonde? Please explain in one or two sentences.

Reply: Similar to the principle of active remote sensing technique, 'Backscatter sonde is a balloon-borne sensor which measures the backscattered light from molecules, aerosol and clouds at multiple wavelengths in the vicinity of sonde as it passes through the atmospheric column. This sentence is added to the revised manuscript. More details about backscatter sonde (COBALD) are already mentioned in the manuscript section 2.1.1.

- Ceilometer description is added under MPL

Reply: Ceilometer was operated during non-available dates of MPL. Details about the ceilometer are now kept in a separate paragraph. Sec.2.2.1 is renamed to MPL/Ceilometer.

- Section 2.4: Just replace by "Methods" only

Reply: As suggested, it is now rephrased to 'Methods' only in the revised manuscript.

- Phrasing of different components do not read well. Many examples: L 165: was made available. Same occurred at many other places. L 243.

Reply: Rephrasing of the word 'was made available' is done in the revised manuscript.

- L217: "the entire concept". What is the concept? I would recommend to add another panel with information about vertical sampling resolution, temporal resolution, dynamic ranges of all the instruments to cover different portions of the

atmospheric layers and discuss those as was stated in the reminder part of this section.

Reply: The word 'entire concept' is replaced with 'observational approach' in the revised manuscript. The temporal, vertical resolutions etc., are given in the instruments section (second section).

- Table 1 just shows the list of variables and purposes. Additionally, how all these purposes get together and make the story of your manuscript needs to be documented as well. Otherwise, they still remained as pieces which is not the goal of this manuscript.

Reply: The lines 226-238, show how these parameters can be combined to address the issue of aerosol-cloud interaction.

- L255: Laser ceilometer. Do we have any other types of ceilometers? I am not aware of.

Reply: The word 'Laser ceilometer' is replaced by 'Ceilometer' in the revised manuscript.

- L 262: “Demonstration of the potential of the multi-instrumental approach” What is the scientific goals. If you add another instrument, it will be more. If you take out one, it will be one less. So, we are interested what was the goal of these measurements to observe simultaneously.

Reply: The final goal of the measurements is to quantify 'aerosol-cloud interaction'. This is intended to be carried out in a sequence of steps as mentioned in the scientific objectives of the campaign (point i to vii). "Demonstration of the potential of the multi-instrumental approach" means to show all the physical parameters required for aerosol-cloud interaction are measured using the multi-instrumental approach adopted in the campaigns. This was shown in the results section (3.1)

- L264: Show consistency of balloon borne in-situ measurements. Looks like you and now readers already know the results that their exist consistency. Then, why should we read the rest of the manuscript. Please follow such basics about presenting your scientific results. Sounds very odd to me as I explained above.

Reply: Now the word 'Consistency' is removed in the revised document. The sub-heading is now changed to 'Comparison of balloon measurements’

- L266: Mixture of a complete sentence and bullet point. Please do either of these…otherwise, readers are confused.

Reply: The sentence 'this is a prerequisite to use balloon information for aerosol-cloud studies' is now removed in the revised document.

- L268: Testing aerosol cloud interactions…what is that? Also, we study “influence” of something on something. This part remained unclear too.

Reply: This is central to the science objective. 'Testing aerosol-cloud interactions' means, testing the already proposed pathways (hypothesis), by which aerosol interacts with clouds and modify their properties. Moreover, these interactions are intervened by meteorological parameters like temperature, humidity and dynamical parameters like turbulence, and vertical wind leading to further changes in the way aerosol affect cloud properties. The quantification of aerosol-cloud interaction is discussed below.

The word 'Testing' is now changed to 'Verifying' in the revised document.

- L270: What is “magnitude of aerosol-cloud interaction”. Readers have no clue at this point as this terminology was not mentioned or reviewed for other papers. I repeat here, please provide the required scientific information to guide the readers. You do not expect readers to find out things but read the materials and understand.

Reply: The word 'magnitude' is replaced with 'estimates' in the revised document.
In general, the interaction between aerosol and cloud is quantified using the formulations given in Feingold et al., 2003. We do adopt the same formations for the estimates which are popularly known as 'aerosol-cloud interaction index (ACI index)' or 'magnitude of aerosol-cloud interaction'. These details are given in the 'Methods section (2.4.6).
Readers are expected to go through the complete manuscript for understanding the content of the manuscript.

- L272: “These” Which ones you are referring to.

Reply: We are referring to the 'indirect effects of aerosols. The word 'these' is removed for better clarity.

- L273: Which model and why? Also, model simulates everything about the meteorological processes. What are you aiming at?

Reply: We would like to simulate the processes involving aerosol and clouds in the Weather and Climate models for example WRF model using the data from the campaign observations. This is the aim of this objective.

Section 3

- L 434-437: Please remove. This makes a paper lengthy. That’s all it does.

Reply: Deleted.

- L 438: When you add a phrase like “consistency” in the header. The result is already known.

Reply: The word consistency is replaced with comparison.

- L439: Please delete. It is a repetition.

Reply: The repetition sentence is now deleted in the revised document.

- Henceforth, I have a general comment: Before discussing each component of the results, please bring the goal of the work shown, and findings at the end in a summary statement.

Reply: The comment/suggestion is taken care of in the revised manuscript to the extent possible.

We thank once again the reviewer for going through the manuscript carefully, appreciating the actual content of the manuscript and for providing constructive comments/suggestions which made us improve the manuscript content further.

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