**We would like to thank the reviewers for reading the manuscript and making constructive comments that have helped improve the paper. An updated version of the manuscript has been uploaded.**

**Reviewer #2**

We thank this reviewer for their helpful comments.

“However, I agree with referee #1 that uncertainties should be discussed. “

**Ans. We have done this.**

“Further,

1. I think the manuscript needs language polishing (maybe here the native English speaking co-authors can help) and tightening”

**The manuscript language has been polished with special focus on the abstract and conclusions.**

1. I suggest to add already in this paper an example of the observed/modelled number concentrations and fall speeds of ice particles as these are crucial parameters in cirrus properties which are mentioned in the manuscript several times

**Ans.**

**We have added observed and modeled ice water contents and ice number concentrations for several times during the early stages of the cloud passing over the ARM site. We don’t wish to make the modeling too much of a focus on this paper rather we have included modeling results just to indicate that the case is likely appropriate for the inter-comparison rather than an assessment with the observations. We have therefore chosen to hold off showing the fall speeds until the model intercomparison paper.**

1. the discussion of the influence of nucleation modes on cirrus development should be extended and maybe accompanied by a graph.

Specifically, can you explain the physics behind the statement on page 2768, line 7 ff:

’... however, since the ascent rate is weak heterogeneous nucleation was the dominant mode in the cloud formation. Runs with only homogeneous nucleation switched on required much greater initial super-saturation (or much stronger forcings), which did not agree with the water vapour profile at the time of cloud formation.

**Ans.**

**We have extended the discussion of the nucleation modes, especially our reasoning for believing it is het. We have reworded the section that you highlighted to make it more clear. In terms of physics, the source of RHi is the ascent rate and the sink is the deposition of vapour onto the ice that have formed. The two processes compete based resulting in either a relaxation of the RHi to ice saturation or thereabouts or continued rising of the RHi until homogeneous nucleation is reached and a portion of the large number of solution aerosol are nucleated and quench the humidity rapidly.**

Minor comments:

1) Title: The title of the paper is somehow clumsy, I suggest:

GEWEX Cloud System Study (GCSS) cirrus cloud working group: development of an observation based case study for model validation

**Ans. Changed**

2) Abstract: the abstract should be shortened.

**Ans. Done**

3) A list of used acronyms would be helpful.

**Ans.**

**This list has been included in the paper.**

**3DVOM – 3-dimensional Velocities Over Mountains**

**ARM – Atmospheric Radiation Measurement**

**CF – Central Facility**

**CPMCP – Cirrus Parcel Model Comparison Project**

**CSMs – Cloud Scale Models**

**CVAM – Constrained Variational Analysis Method**

**ECMWF – European Centre for Medium Range Weather Forecasting**

**FSL – Forecast Systems Laboratory**

**GCMs – General circulation Models**

**GCSS – GEWEX Cloud System Study**

**GEWEX – Global Energy and Water Cycle Experiment**

**ICMCP – Idealized Cirrus Model comparison Project**

**INC – Ice number Concentration**

**IOP – Intensive Observation Period**

**IR – Infrared**

**IWC – Ice Water Content**

**IWMR – Ice Water Mixing Ratio**

**IWP – Ice Water Path**

**LEM – Large Eddy simulation Model**

**MMCR – Millimeter Cloud Radar**

**NCEP – National Center for Environmental Prediction**

**NOAA – National Oceanic and Atmospheric Administration**

**PSD – Particle Size Distribution**

**RM – Rocky Mountains**

**RUC – Rapid Update Cycle**

**SCMs – Single Column Models**

**SGP – Southern Great Plains**

**WG2 – Working Group 2**

4) Conclusions: The conclusion section is more a summary and should be entitled as this. Further, it also should be shortened and tightened.

**Ans. Changed to ‘Summary’. We have worked on making the summary shorter and clearer.**

5) Fig. 4, left column:

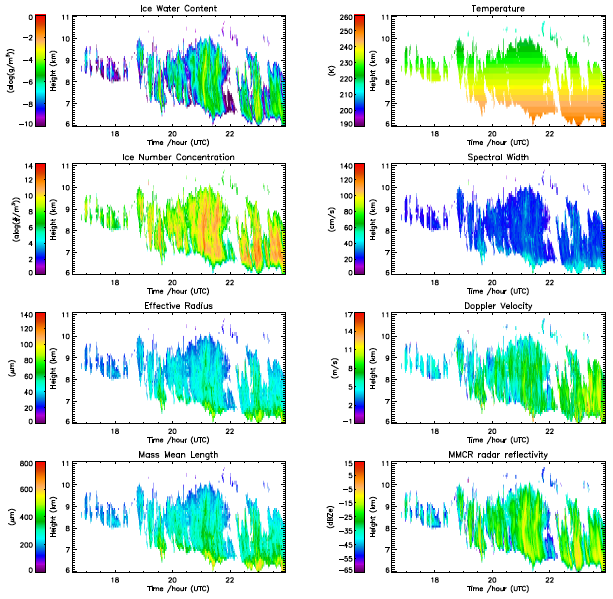


Figure 5

a) The quality of the plot is insufficient,

**Ans. All the plots have been re-drawn.**

b) The units of Effective radius and Mass mean length is cm ?? Not micrometer ??

**Ans. Typo. This has been changed to micron.**

c) The time scale is noted as UTC, but the numbers seem to be something else.

**Ans. The x-axes in all plots have been aligned in time properly and quality improved.**

6) Fig. 10: what time do you mean? Please synchronize the time in all plots.

**Ans. The plot has been updated with UTC time.**

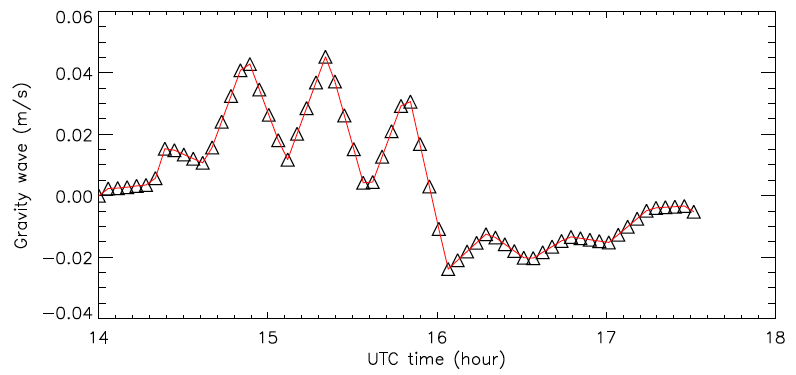


Figure 6