This manuscript (acpd-14-16493-2014) provides interesting findings on the potential of hematite particles to be Ice nuclei when the conditions for the creation of cirrus clouds are present. The manuscript is appropriate, and will make a nice contribution to ACP. However, I have several general comments, as well as several minor comments that would increase its clarity.

General comments

The most important point I would like to make is in regards to the use of hematite particles. Why was Hematite chosen as dust particles for cirrus clouds? Is there prior evidence of its presence in cirrus clouds? The author refers us to the a paper by Matsuki et al. (2010) which examined mineral dust particles from cloud residual and clear sky in Niger. Matsuki et al. shows in Fig 4 in their paper that out of the different types of mineral dust particles that were found in cloud droplets residual, hematite frequency was very small compared to all other mineral dust particles as clay minerals. In addition hematite particles are different than most of the atmospheric dust particles (in term of mineralogy and shape), can that also affect their IN ability? Since the atmosphere does not only contain hematite particle but a combination of different dust particles type, why not then combine all dust measurements and try to get an isoline that will represent all of them?.

Another general comment is that this manuscript will substantially benefit if the author will start the paragraphs with words other than figure or we, in addition there are too many places that are written in first body (e.g. page 16505 lines 4 and 29, page 16506 line 9 etc.).

Section 1 Introduction

A literature overview that shows the actual presence of hematite particles in cirrus clouds is missing. Only in section 3.2 the author mentions the present of hematite particles in the atmosphere but still not in cirrus clouds. It should be mentioned that Matsuki et al. (2010) did not mention that the dust particles measurements were taken from cirrus cloud, therefore we need to ask are we sure hematite particles can be found in cirrus clouds?

Section 2 Method

Section 2.1 Description of hematite particles

Additional information in the method part is needed.

TSI mentioned on the SSPD 3433 web page that it can sufficient deagglomerate most dry particles in the range from 0.5 to 50 μm, in the paper the authors mention that they size selected 200nm, which is below the threshold of this equipment.

In addition, did the author verify that the size that were selected by the DMA were similar to the size distribution that came out of the DMA?

Section 2.3 Ice nucleation parameterization and modeling

Section 2.3 page 16500 line 27 to page 16501 line 3

Was a 1000nm surface area used for all three selected sizes, please clarify?.

The value of 1000nm that were taken from Hiranuma et al. (2014) does not represent size selected measurement but values from looking on the entire distribution, does the authors expect it to be the same value?

Page 16501 line 13

The author mentioned that for T>-36 the parameterization from M92 was used in the model, however it is known (and also mentioned in page 16496 line 21) that M92 parameterization is relevant for -7>T>-23, therefore I am not sure if the model can represent well the creation of ice for temperature between -23<T<-36.

Section 3 Results

3.2 Comparison with previous studies

Page 16506 lines 4-8

I think that this part should also be mentioned in the introduction part.

Page 16507 lines 14-22

Can the author say something's about some of the points on figure 3 that does not match the ns isoline, spatially those measured by AIDA.

Page 16508 lines 3

I think that the part of supplement material 3 should be part of the paper, since all the measurement represent measurement below water saturation the reader should see in detail how that isonline above water saturation were calculated.

Page 16508 lines 12-17 (regarding Figure 4b)

Why using a third degree polynomial if it does not represent the experimental work?

Section 3.4 Model simulations

Page 16509 first paragraph

The whole section is not clear it is not clear, which figure represent figure 4b?

Some of the sentence needs clarification as lines 14-20

There is hardly reference to figure 6

Secession 4 Discussions

The first paragraph is not so clear, the SCF was mentioned only briefly in secession 3.2. I recommend the authors to rewriting this paragraph again.

Page 16511 lines 21-23
Not all the point on figure 2 match the hematite particles therefore I do not think it is correct to assume that all dust will behave in the same way is hematite particles.

Tables and figures

Table 1:

- Organize the table in a way that will be easier on the reader, for example based on T from warm to cold T or particle size.
- Please add to the table a column that will give information on which of experiments were taken from Skrotzki et al. (2013) and which one from Hiranuma et al. (2014) etc.
- No information regarding how the evaluated ns values of T and RH is mentioned in the text, why and how these value were chosen?

Figure 2 and 3

- It will be better to increase the figures size on the expend of the legend which take too much space of the figure, which does not allow to see all the values.

Figure 2

- It is very hard to distinguish between the different values; it might be the red color, especially around -40°C where the points are overlapping one another. Please mark them in a different marker or color. Please also mark in a different color the immersion freezing measurement so it will be easy to identify them from the one from this work (mentioned also in page 16504 lines 23).

Figure 5 and 6

- It is very hard to distinguish between some of the lines. Perhaps using another color indicator or showing only pressure of 0-600 will highlight the differences.
- An addition line which will represent observation will be a nice addition for this plot, something that will represent the observation to show how the new parameterization is compared to it.
- Consider changing figure 5 and 6 to one figure as 5a and b, it will be easier for the reader to understand the comparison of the two.