

This manuscript describes the laboratory experiments onto the glassy aerosol particles. The aim of the study was to understand the ice nucleating properties of these aerosol particles under different temperature and humidity conditions. The results are well presented and discussed. I recommend publication after a few comments are addressed.

### **Major concerns and questions:**

-Previous literature is cited many times, for e.g. line 11 page 8922 ...this is discussed in detail in a separate ..., this slows down the reading and the reader has to refer the cited article to understand the present article. Also, the companion paper, Wilson et al. (2012), is cited many times. I would suggest either add briefly the Wilson et al. (2012) statements that are referred to or reduce the scope of the paper to stand on its own with few Wilson et al. citations. For any other suggestions to improve to readability of the paper I will leave the option open to the authors.

-What was the motivation to study four different glassy aerosol particles described in this paper from atmospheric implications point of view (end of page 8924 and beginning of 8925). It is mentioned that these are selected on the basis of phase state diagrams. I wonder if these solutes have been observed in the atmosphere. If so, please cite the work. Please comment.

-The paper is focused on the pre-activation behavior of the aerosol particle. This ice nucleating property is briefly described in the section 1, where it is mentioned that enhanced ice nucleating ability is termed as pre-activation behavior. Please elaborate the definition of the pre-activation clearly defining why do you call enhanced ice nucleating ability as pre-activation, the enhancement can be also possible via modification of the aerosol surface property. Although these concepts are clearly described in the discussion section of the paper, there is not enough material in the introduction section.

-Paragraph beginning from the line 26, page 8929 till line 22, page 8930 describes the TDL system. Except first sentence, the remainder of the paragraph can be removed as there are discussions about the instrument calibrations and saturation ratio calculations (these are repeated here) that are not necessary to understand this article. Similarly, I would also recommend removing any unnecessary material from the article to improve the readability.

- I would suggest break down the sub-section 4.5. It has plenty of material to get the readers lost. Also at the end of this section, atmospheric implications are discussed. You may want to create a new section on this topic. Also in this section please discuss how such measurements can be used in the cloud models or can be parameterized.

### **Minor comments:**

-Page 8929, line 7: define PI

-Page 8931, line 18-19: please elaborate the sentence ... as the only 99% degree....It is not clear.

-Page 8951, line 26-28: Does the ice survival also depend upon the time? If the dust is exposed to ice sub-saturated conditions for long time periods (days) and then exposed to ice saturated conditions to activate the particle-would you still define this behavior pre-activation? I imagine if you expose the particle for long duration of time, the ice will sublime and may also modify the surface properties, and thus pre-activation behavior may or may not be observed. Therefore I think time parameter becomes important. Any comments? Also, why you think ice survives in the cavities or crevices of the particle surface?

-Page 8952, line 2-3: who proposed? Please cite the article.