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## ***Interactive comment on “Ice nucleation terminology” by G. Vali et al.***

### **Anonymous Referee #1**

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Review of “ice nucleation terminology” by Vali et al.

In this paper the authors suggest terminology for researchers to use in ice nucleation research. The authors are respected researchers in this field, and I appreciate their effort to try and make communication in this area of research easier. The document is timely since researchers from different areas such as atmospheric science and biology are now working actively on ice nucleation. I think the paper is appropriate for Atmospheric Chemistry and Physics, especially since the open review process allows anyone to add comments and suggest different terminology.

I support publication after the authors have adequately addressed the following comments:

Currently, I don't think there is adequate referencing or introductory discussion, and

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the paper does not put the contributions it makes in the context of existing published work. For example, the previous paper by Vali on nucleation terminology should be referenced and the overlap with the current manuscript mentioned. [ref: Vali, G. (1985), Nucleation terminology, J. Aerosol Sci, 16, 575– 576].

Specific places that I found that could benefit from references include the following: Page 22157, line 12-17; Page 22158, line 1-2; Page 22162, line 11.

Page 22156, line 14-16. Why did the authors decide to give special consideration to the need to bridge the types of expressions and language used in the physical and in the life sciences? An additional sentence of two to explain why they gave this special consideration would be useful.

Page 22157, line 1-2 (terminology = ice nucleation). Here and below, the authors refer to liquid water. Does this include aqueous salt-containing solutions, which are of atmospheric importance?

Page 22158. I think the terms “deposition” and “freezing” should be changed to “deposition nucleation” and “freezing nucleation”, otherwise these terms are too vague.

Page 22158, line 7-10. The definitions of deposition nucleation and freezing nucleation are relatively clear if one only considers bulk liquid water without solutes. In the atmosphere, ice nucleation can occur on a substrate immersed in an aqueous solution below water saturation. I believe in the literature this process has been referred to as both deposition nucleation and freezing nucleation. Could the authors give some guidance on the terminology researchers should use to describe this process?

Page 22158, line 22 (terminology = substrate). A recent paper in ACPD suggests that the substrate could be molecular, which I don't think fits within the terminology proposed by the authors here. See Pummer et al., ACPD, 2014, 14, 24273-24309. The authors may want to take this opportunity to make the definition of a substrate broad enough to include macromolecules.

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Page 22159, line 3-4. Does this statement/terminology apply to an atmospheric aqueous particle that contains mineral dust? In this case, I think the substrate (mineral dust) is technically not the particle. If this statement/terminology does not apply to the case mentioned above, then the statement/terminology should be modified.

Page 22160, 5-6. I don't understand when the  $\pm$  shorthand notation could be useful. Is the notation used to indicate that a substrate either passed or failed an ice nucleation essay? Please expand on when this would be useful and should be used.

Page 22160, line 8. I think that sometimes researchers have called "J" the nucleation rate constant. Perhaps the authors should acknowledge this point and mention why they picked nucleation rate over nucleation rate constant.

Page 22160, line 15-19. Consider removing the last sentence that mentions "freezing nucleation rate" since I think "freezing nucleation rate" makes the terminology more confusing. Nucleation rate and freezing nucleation rate sound like the same process.

Page 22160, line 27-28. Consider changing "metastable" to "liquid" to avoid confusion with a metastable phase of ice.

Page 22161, line 6. Is "nucleant surface" needed? I suggest to just use substrate, since "nucleant surface" is not defined.

Page 22161, line 24-29. Here the authors list the term "site-specific nucleation" but the first part of the description/terminology is on the "singular model" which is only one way to describe site-specific nucleation. Another way to describe site-specific nucleation is active site theory. I suggest the authors add "singular model" to the list of terminology in this manuscript, but remove "site-specific nucleation". They may also want to add  $ns(T)$  to the list of terminology.

Page 22162, line 9-20. Here the authors are discussing a way to add time dependence to  $ns(T)$  following the method proposed by Vali in an earlier publication. To me, this doesn't fit in a manuscript on ice nucleation terminology. Consider removing this

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section from the manuscript.

Page 22162. Line 20-25. This section (Section 3) should be removed before final publication.

Page 22161, line 15. Typo.

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 22155, 2014.

**ACPD**

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