

Interactive  
Comment

## ***Interactive comment on “Growth-deviation model to understand the perceived variety of falling snow” by J. Nelson***

**J. Nelson**

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### Specific comments

a) Concerning the simplifying assumptions, I now address the assumptions about humidity and single crystallinity. The humidity assumption is a good one to worry about, as there must be situations in mixed-phase clouds where the air does not have liquid-water saturation. I address this issue in the first paragraph of the revised section 6.4. Also, as suggested by the referee, I now mention in section 2.4 that the results apply only to liquid-rich conditions. Finally, about single-versus-polycrystallinity, I now explain in section 2.4 why the model is restricted to single crystals (we have no growth-rate data on polycrystals). Also, the situation in which droplets freeze as polycrystals is mentioned in the footnote of section 3.1

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b) I now clarify in the introduction that variety is often equated with the number of possible forms. The only difference between variety and diversity is that the latter is the logarithm of the former. This is now mentioned in section 2.1. About developing the idea further, I'd like to, but the extra discussion would be distracting. So, I instead added a footnote in section 2.1 about how this idea can be developed.

c) The data suggests that the growth-rate curve is a little steeper on the warm side of the peak. The way that growth on one side can be distinguished is through temperature changes, as an increase in temperature decreases the growth rate on one side but increases the rate on the other side. In the model, this difference enters through the trajectory, and leads to the asymmetry in the mitten curve. This is discussed in section 6.2.

d) As suggested, a list of symbols has been added to the appendix. This is now appendix A.

Technical corrections (numbering below is my own)

1) Title. I changed the title so it does not have 'perceived'

2) Abstract. I rewrote the abstract - it no longer has 'I'.

3) (4409-9) I rewrote the introduction - it no longer has 'determined' and does not claim that the cause is now known.

4) (4410-7,8) I rewrote this subsection, and it no longer has the double negative.

5) (4410-17) I made the change.

6) (4411-6) It was with respect to ice. I changed this to 'vapor pressure' and largely rewrote the section.

7) (4412-3) I went through the text and found all such uses of 'this' without further specification, and either rewrote the part or added a specification to avoid confusing the reader.

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8) (4412-4) I now emphasize that the treatment is applied only to single crystals. In particular, the heading of section 2.3 now makes this clear. We do not know the growth rates of polycrystals, so this is a necessary assumption. I mention this justification in section 2.4. Also, the start of section 3.1 addresses various effects from freezing, specifically mentioning that polycrystallinity is more common at lower temperatures.

9) (4412-24) I followed the suggested change in wording.

10) (4413-22) It was not referring to v. But to avoid confusion, I changed the sentence.

11) (4423-2) I deleted the 'well-known'. About a reference, one was already given (the text by Feller).

12) (4433-fig.3) I added clarification on the curves.

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Interactive comment on Atmos. Chem. Phys. Discuss., 8, 4407, 2008.

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