

Interactive comment on “Formation of large ($\approx 100 \mu\text{m}$) ice crystals near the tropical tropopause” by E. J. Jensen et al.

E. J. Jensen et al.

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The reviewer makes an important and correct point that the hexagonal-plate ice crystals may be nearly oriented. In the original manuscript, we only considered the Reynolds number threshold for complete orientation, which is important for optical effects. However, as pointed out by the reviewer, Breon and Dubrulle [2004] showed that even for plate dimensions as small as about 15 microns, the crystals can be with about 10 deg of horizontal orientation. We have therefore redone the growth-sedimentation calculations using fallspeed expressions for oriented crystals given by Fuchs [1964].

Note that when redoing these calculations, we discovered an inconsistency in the way we were treating shape effects on growth and sedimentation as the crystal size changed. We now assume the crystals are equidimensional when they are very small (equivalent-volume diameter less than the plate c-axis length, where the c-axis length

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is calculated from the maximum plate dimension and assumed aspect ratio). The aspect ratio then changes as the crystals get larger, with the c-axis length remaining constant. The combination of this correction and the oriented-plate fallspeed correction resulted in very little overall change in the threshold water vapor concentrations required to grow the large crystals.

The reviewer also suggested removing the third sentence of the abstract ("Uncertainties...") could be removed. However, we feel it is important to state early in the abstract that uncertainties in ice crystal habit limit our ability to make precise conclusions. Including this caveat sets up the more specific statements later in the abstract.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 6293, 2007.

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