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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Commentary on "Measurements of ice supersaturations exceeding 100% at the cold tropical tropopause" by E. Jensen et al." *by* D. M. Murphy

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Please note my comment "Correction to Figure 2" that the black curve on Figure 2 of the original submission overestimated the supersaturations at positive roll angles.

Detailed responses to the referee:

i) Figure 1. There is some correlation between roll and saturation ratio, but it is not totally convincing. I would like to see more examples.

Reply: I agree that there is no obvious correlation on Figure 1. During the period of Figure 1, the aircraft was descending through some very sharp vertical gradients in

temperature, so it may not be the best place to look for a correlation. The period of Figure 1 was chosen to correspond to the highest supersaturations.

ii) Figure 2 (and the text) indicates that the majority of the flight was flown with a 1 degree roll. This is very unlikely. A constant roll would mean that the pilot would have to fly with some rudder permanently applied to compensate, otherwise the aircraft would constantly be in a turn. If that were the case a constant offset in the yaw (yaw can be obtained through the combination of the gust system and inertial navigation system) should also be observed. Is this seen? It is more likely that there is simply a calibration problem with the roll variable for these flights. This possibility should be checked with the WB-57F operators.

Reply: There are no independent calibrations for the roll angle. However, the roll angle on all flights except January 29 and February 2 are strongly peaked at zero, as expected. As far as we know, no maintenance was done on this system by the aircraft mechanics during this period. The roll angle on the intervening flight (January 30) was normal. There is no apparent reason not to believe the recorded data. I did not use yaw data because what the WB-57F navigation system only provides aircraft heading and aircraft path. The difference between them is dominated by the effects of crosswinds and this obscures the true yaw. There was no separate 4 or 5 hold pressure probe on the aircraft, as there was during the CRYSTAL-FACE mission.

iii) What was the average roll for the other flights? If the average roll on the other flights was zero, as suggested in the text, then the black curve in fig. 2 is the strongest evidence that the observed saturation ratios of Ÿ2.2 are systematically overestimated by Ÿ30% during a roll of 2 degrees.

Reply: The average roll for every flight except January 29 and February 2 was close to zero. According to the corrected Figure 2, any systematic overestimate is less than 30% - perhaps 5 to 10%.

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 2463, 2005.