



Large ($\simeq 100 \mu\text{m}$) ice crystals and high supersaturations observed near the tropical tropopause during CRAVE

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During the NASA CRAVE mission, the tropical tropopause was anomalously cold ($T \simeq 182\text{--}187 \text{ K}$), and subvisible cirrus were sampled extensively with the WB-57 aircraft on flights out of San Jose, Costa Rica. In situ imaging instruments indicated the presence of relatively large ($\simeq 100 \mu\text{m}$ length), thin (aspect ratios of 5–10) hexagonal plate ice crystals near the tropical tropopause in very low concentrations ($< 0.1 \text{ L}^{-1}$). These crystals were not produced by deep convection or aggregation. Growth-sedimentation calculations indicate that regardless of assumptions about temperature profile, deposition coefficient, ice nucleation threshold, or ice phase, growth of the observed crystals would only have been possible if the air in the tropopause region was highly supersaturated with respect to ice. Water vapor measurements were made with multiple instruments on the NASA WB-57 aircraft. Although there were significant discrepancies between the different H_2O measurements, those on the higher end do indicate large ice supersaturations (RHI $\sim 200\%$) near the tropopause. We will discuss implications for ice nucleation processes at very low temperatures.