

Cirrus induced polarization in 122 GHz aura Microwave Limb Sounder radiances, Davis, C. P.; Wu, D. L.; Emde, C.; Jiang, J. H.; Cofield, R. E.; Harwood, R. S., *Geophys. Res. Lett.*, Vol. 32, No. 14, L14806 10.1029/2005GL022681

MLS contact: Cory Davis, cory@met.ed.ac.uk, +44-(0)131-6505092

Summary

Previous simulation studies have outlined the possibility of significant polarization signals in microwave limb sounding due to horizontally aligned ice crystals in cirrus clouds. From the recently launched Aura MLS instrument, we present the first polarized microwave limb sounding observations of cirrus clouds. We also present polarized radiative transfer simulations, which show qualitative agreement with these observations, and indicate the limits to which aligned non-spherical particles are influencing bulk optical properties of cirrus clouds at microwave wavelengths. Although 122 GHz is not ideal for cloud measurements due to strong O₂ absorption, data and simulations suggest that preferential crystal orientation is causing small, but noticeable, partial vertical polarization, which can be replicated in simulations by considering all particles as horizontally aligned oblate spheroids with aspect ratios of around 1.2 ± 0.15 .

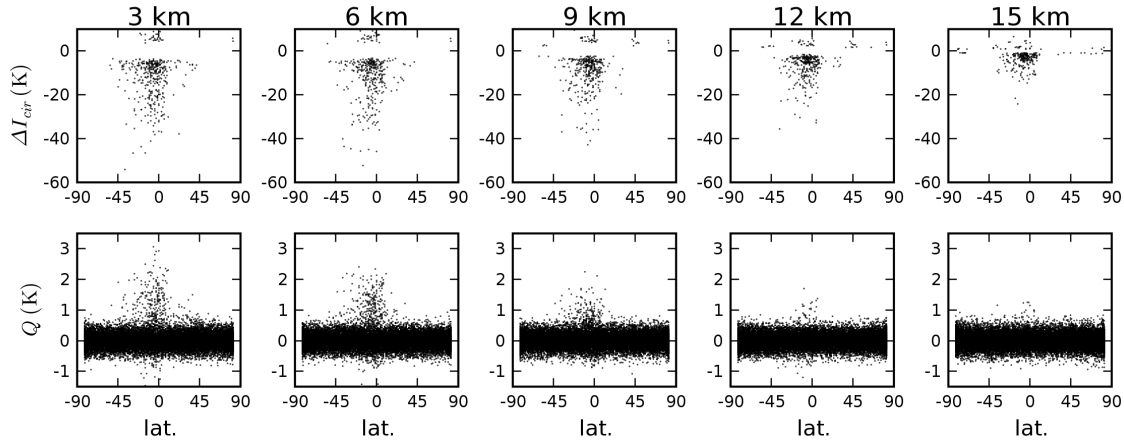


Figure 1: Cloud induced radiance, ΔI_{cir} , and polarization difference, Q , for January 3 - 8, 2005.

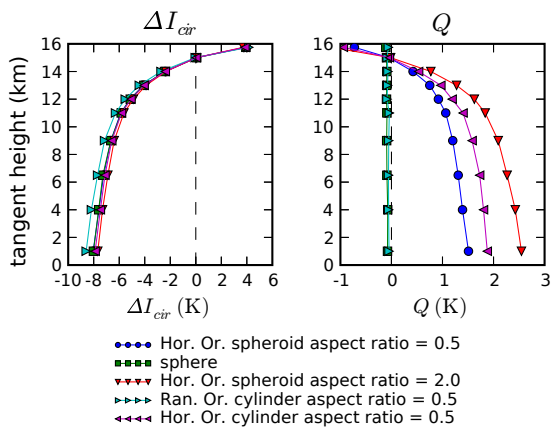


Figure 2: Example 122 GHz radiative transfer simulations for a 3D deep cirrus scenario with different shape/orientation combinations.

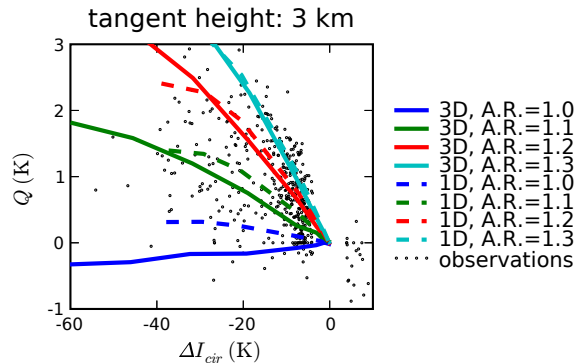


Figure 3: Observed and simulated Q vs. ΔI_{cir} .