

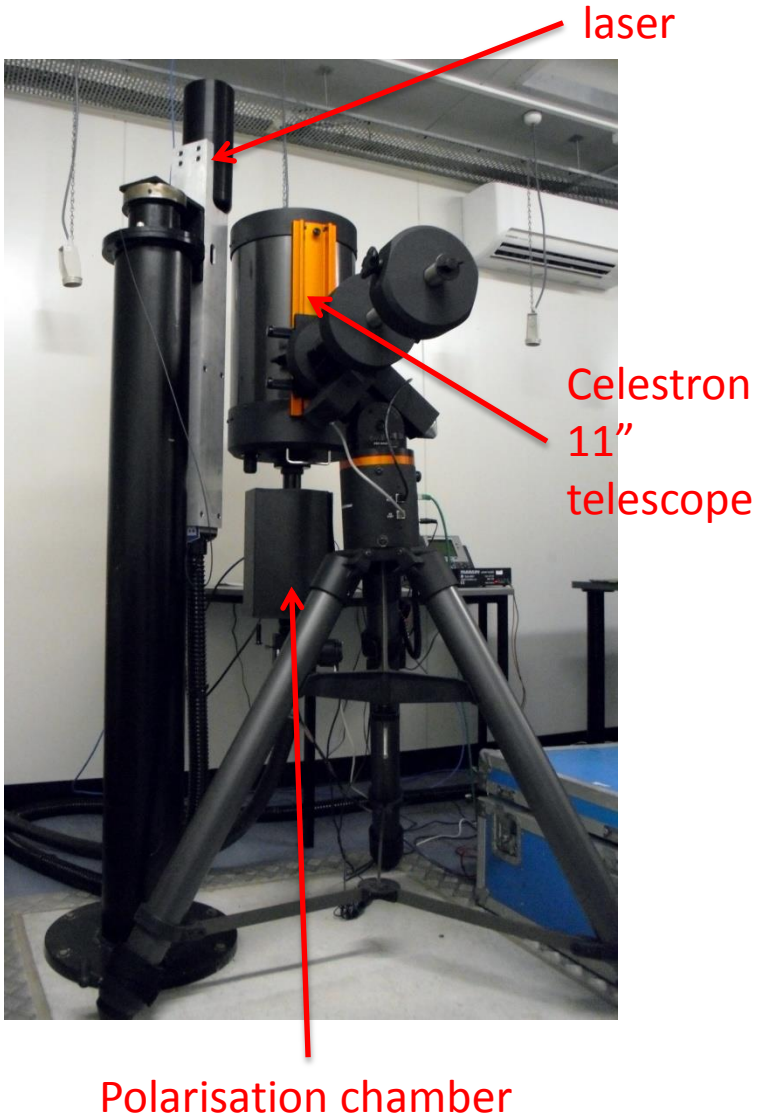
Temperature and cloud observations to be made with a Rayleigh lidar in Hobart, Australia (43S) during DEEPWAVE

**Simon Alexander, Andrew Klekociuk, Damian Murphy
Australian Antarctic Division
Hobart, Australia**

Outline

- System Description
- Case study results from winter 2013 at Hobart
 - High cirrus cloud, pre-frontal conditions
 - Boundary layer cloud: satellite & aircraft co-incidence
- Case study results from Davis (69S)
 - Illustration of temperature data which could be retrieved at Hobart

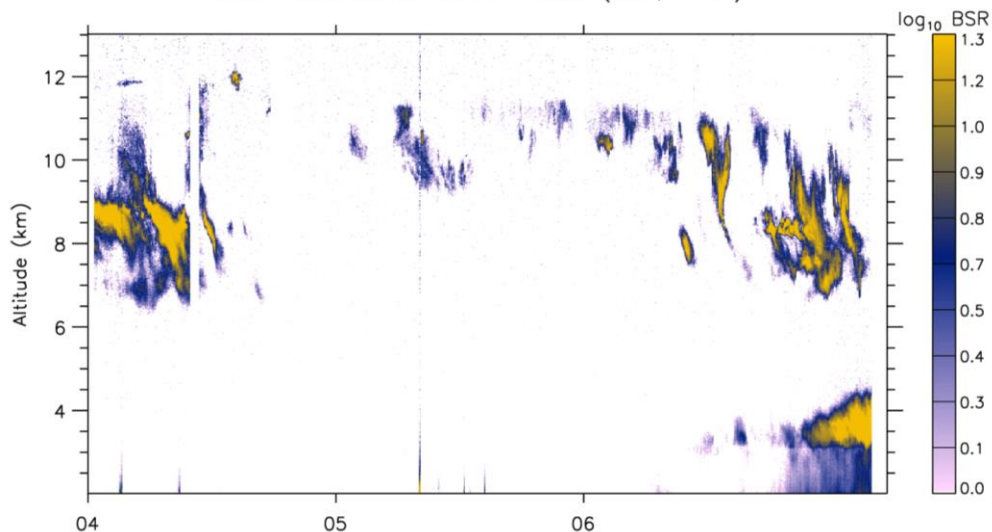
System Description



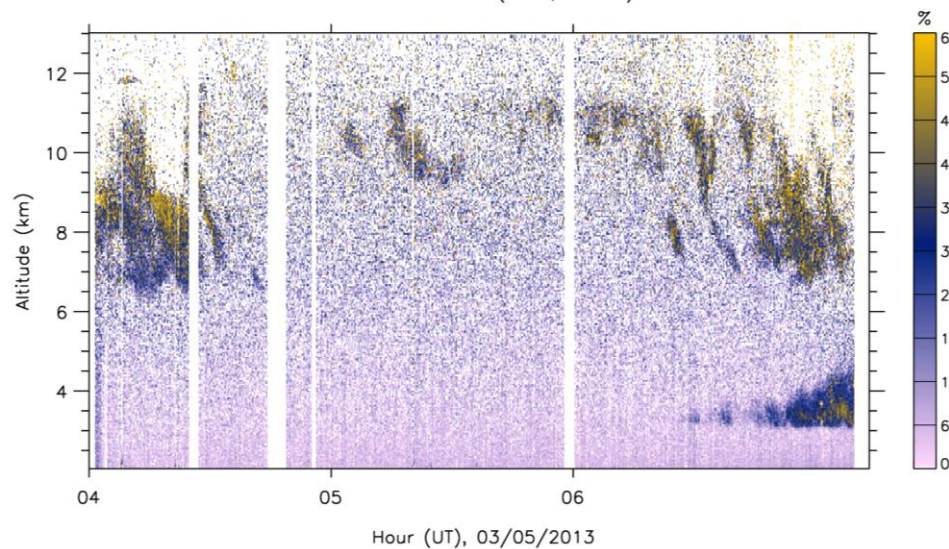
- Located at Australian Antarctic Division headquarters, about 12km south of Hobart
- Quantel 3W 532nm laser
- Polarising capability
- Presently only vertically-pointing but hoping to have off-zenith capability by late autumn (hardware being constructed)
- Able to make observations of thin ($\tau < 3$) tropospheric cloud from boundary layer to the tropopause (day and nighttime)
- Rayleigh temperature retrievals during nighttime up to ~40-50km with resolution ~1km x 1hr (only during clear-sky or thin-cloud conditions)

Pre-frontal cloud observed at Hobart with lidar (43S)

Lidar Backscatter Ratio: Hobart (43S, 147E)

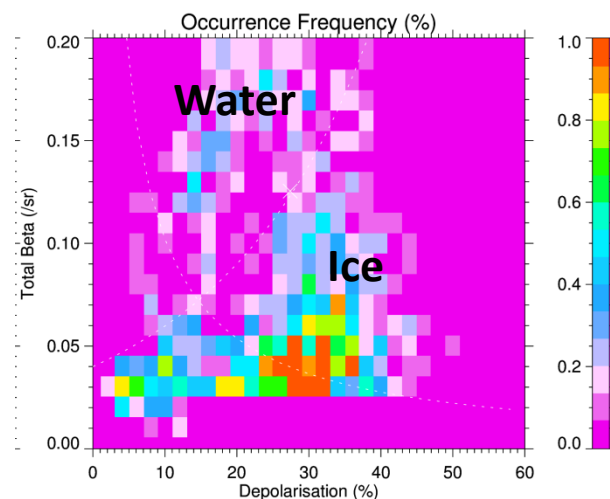


Lidar δ : Hobart (43S, 147E)

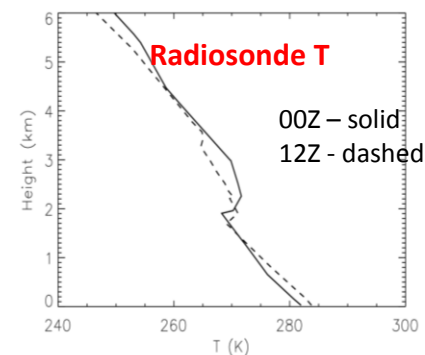
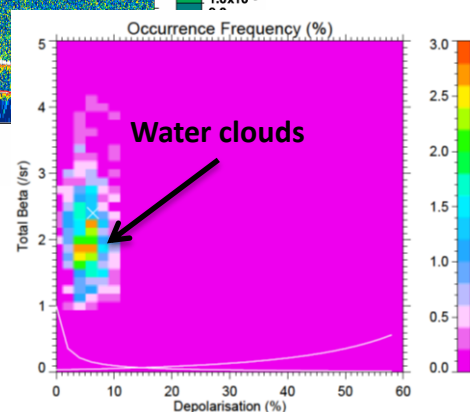
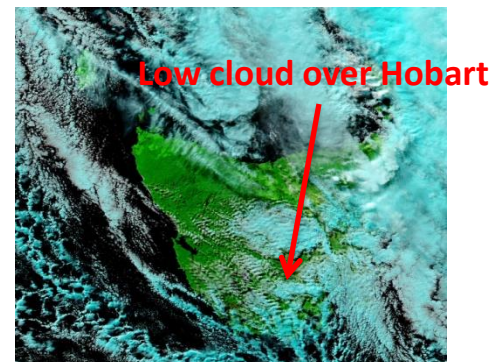
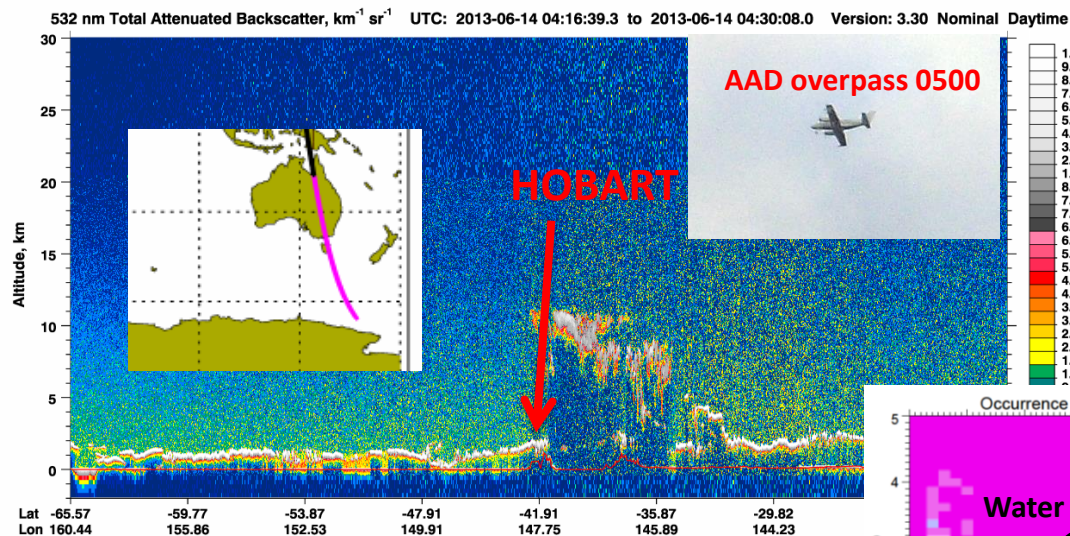


Example from 3 May 2013 (Preliminary):

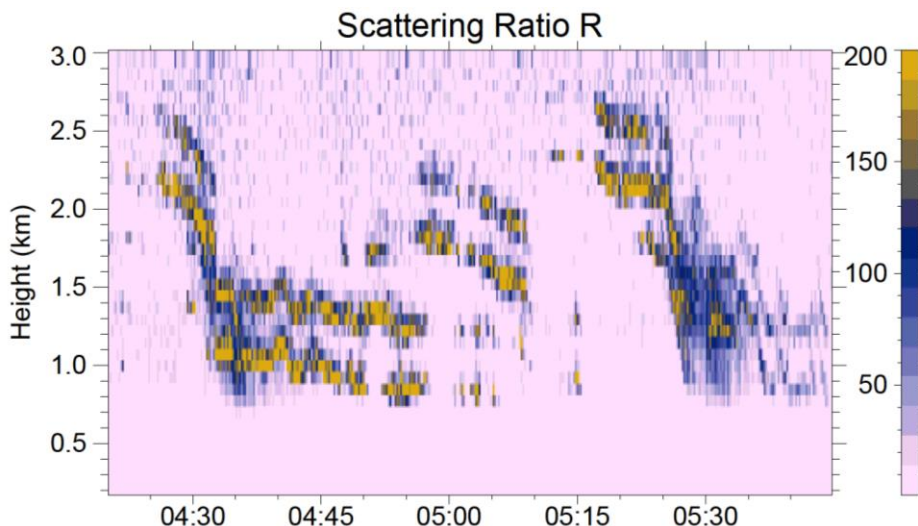
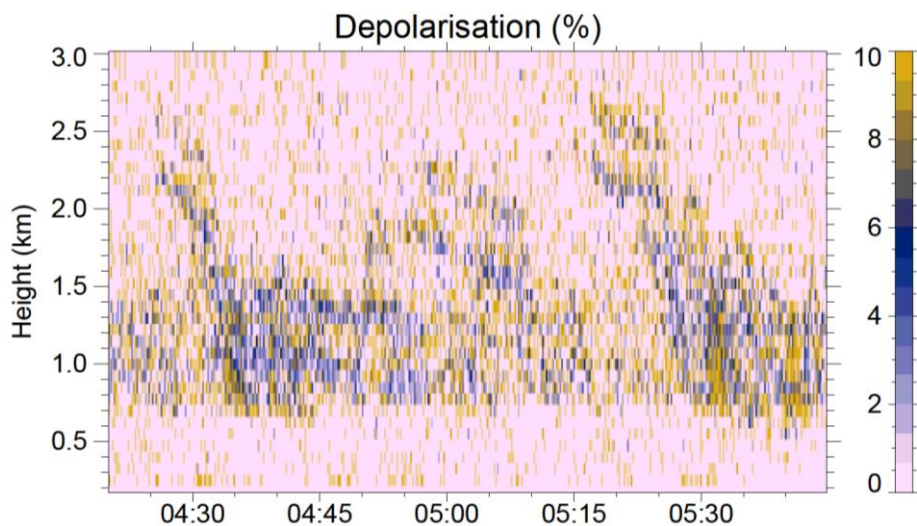
- Pre-frontal high cirrus cloud
- Cloud tops \sim tropopause level \sim 11km
- Orographic wave cloud from upstream topography
- Thick cloud below 4km toward end of observation session
- Observation session ended due to light rain
- Highly depolarized high cloud – ice particles
- Low cloud \sim 4km likely mixed phase or water.



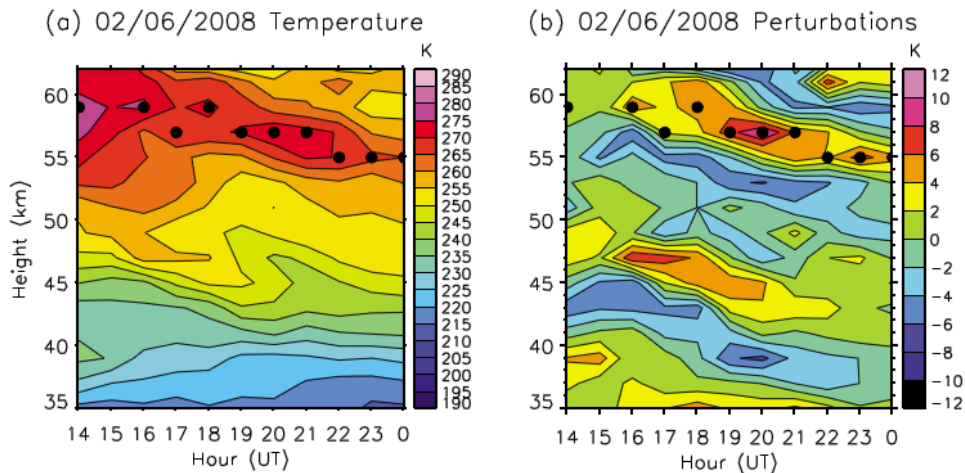
14 June 2013: CALIOP and aircraft co-incidence with Hobart lidar - Preliminary



- Very bright clouds (high scattering ratio)
- Low depolarisation, i.e. composed of liquid water
- Ended observations due to rain



Example of temperature observations at Davis (Antarctica)



- For the Hobart 3 W system, we should be able to resolve T up to ~40-50km and produce similar temperature profiles with similar accuracy under clear-sky conditions (or thin clouds).

- 1 hr x 2 km resolution temperatures derived from data collected with the 30 W lidar (532nm Rayleigh)
- $\Delta T \sim 1K$ at 47km.
- 1 hr x 1 km resolution temperatures derived from data collected with the 30 W lidar at Davis (609nm Raman)
- Data gaps marked white (Raman not possible during sunlit conditions as it's much weaker than Rayleigh)

