

# Purple Crow Lidar NDACC Technical Report

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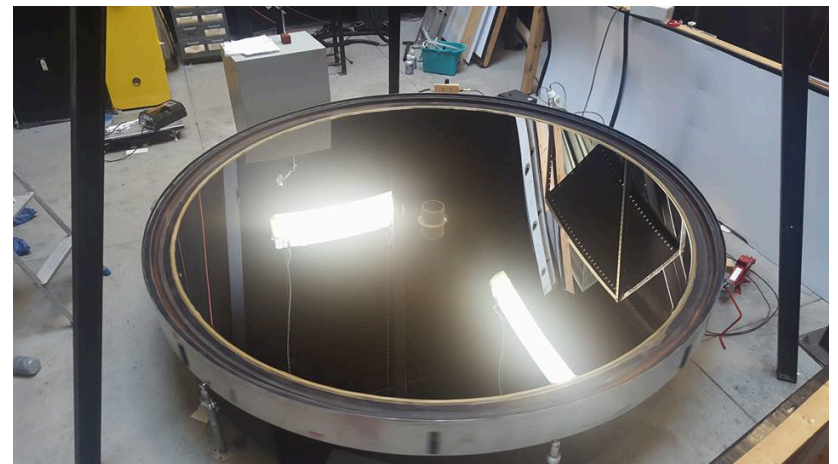
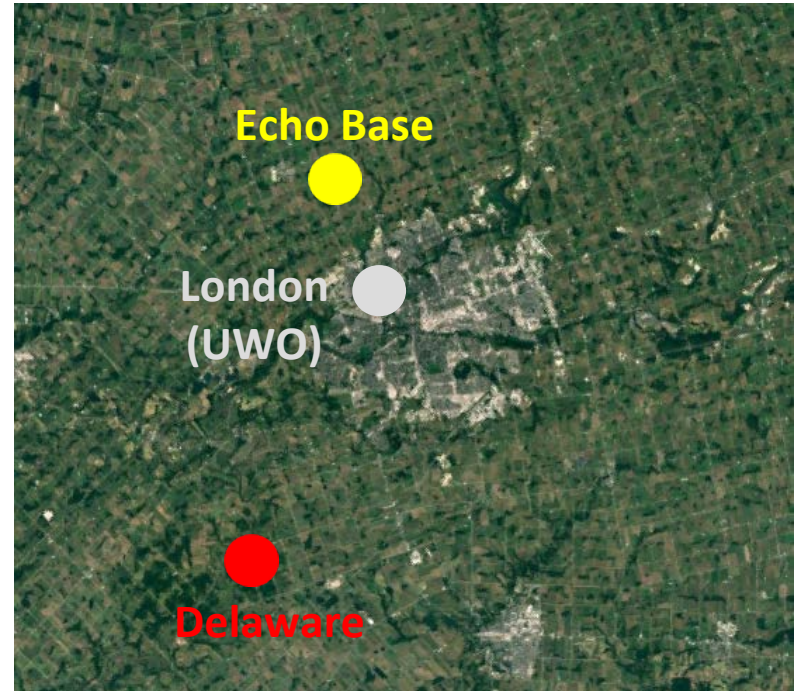
V. Wadehra



photo: H. Leparskas  
@purplecrowlidar  
13 June 2016

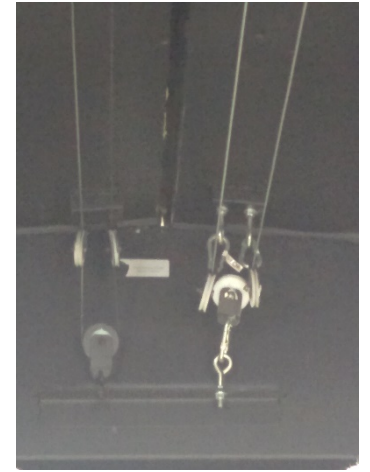
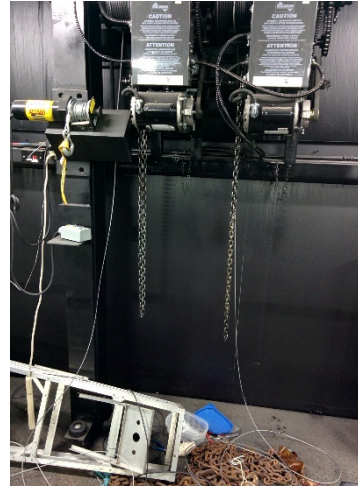
# PCL: at a glance

- **Location:** outside of London, ON (281m)
  - Delaware (1992-2010)
  - Echo Base (2010-present)
- **Laser:** ~1000mJ @ 30Hz, 532nm
- **Channels:**
  - 532 (Rayleigh, high gain)
  - 532 (Rayleigh, low gain)
  - 607 (Nitrogen)
  - 660 (Water Vapor)
- **Data:**
  - Temperature (1992-2010, 2012-2013)
  - Water Vapor (1999-2010, 2012-2013)
- **Mirror:**
  - 2.6m aperture
  - Liquid Mercury



# Repairs and minor issues

- Roof Hatch
- Water vapor/Low-gain Rayleigh multi-channel scaler/averager (SR430)
- Chopper controller
- Laser stability (power dropping over time)
- New type of elastic for mirror stepper motor
- Laser coolant pump motor



# Upgrades & Improvements

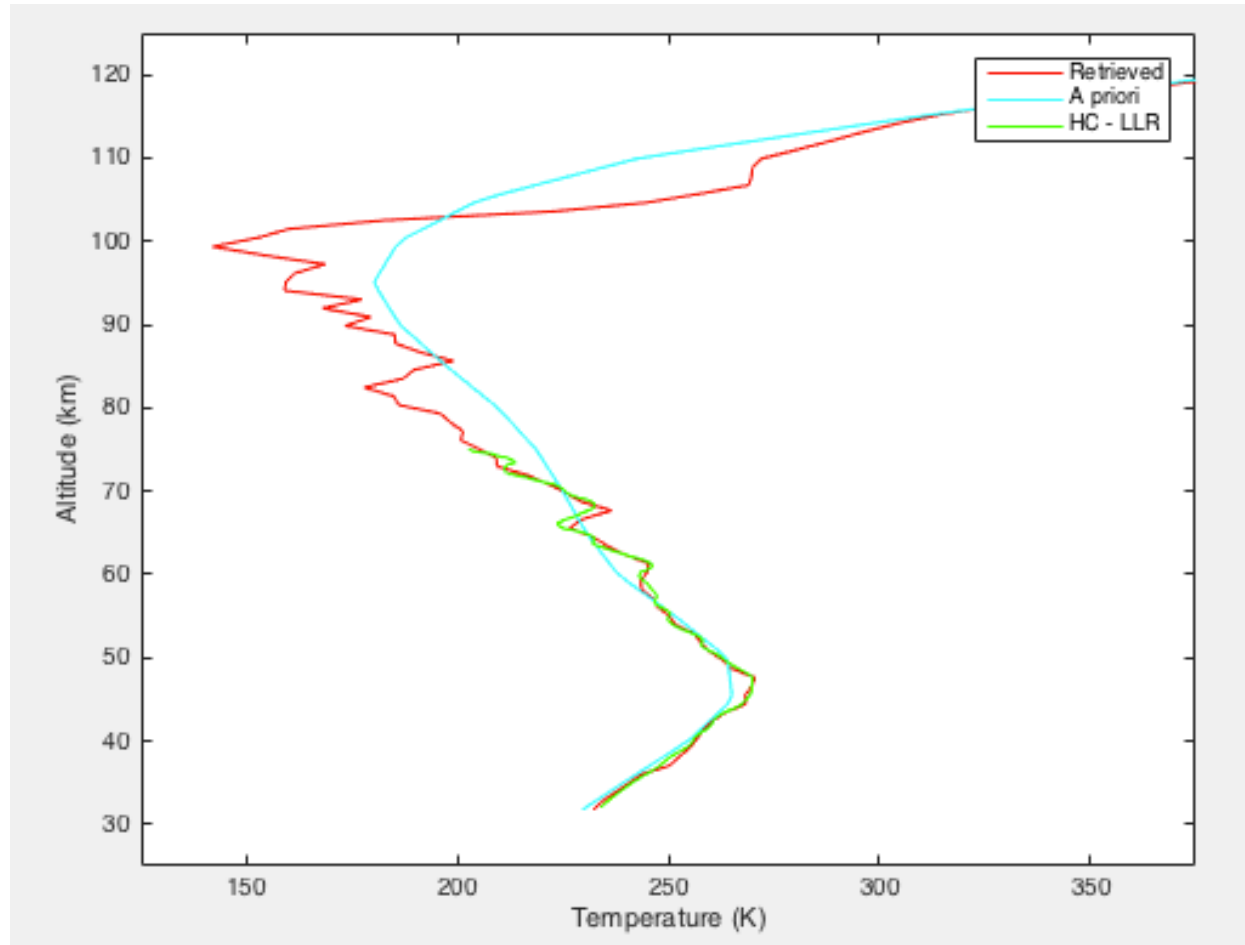
- New hose, electric bleed valve added to air line
- More back-up power supplies added
- New raspberry pi (mirror control program)
- Mounted lamp for white light calibration
- Set up webcam feed on Teamviewer link to monitor mirror





# PCL OEM temperature retrieval

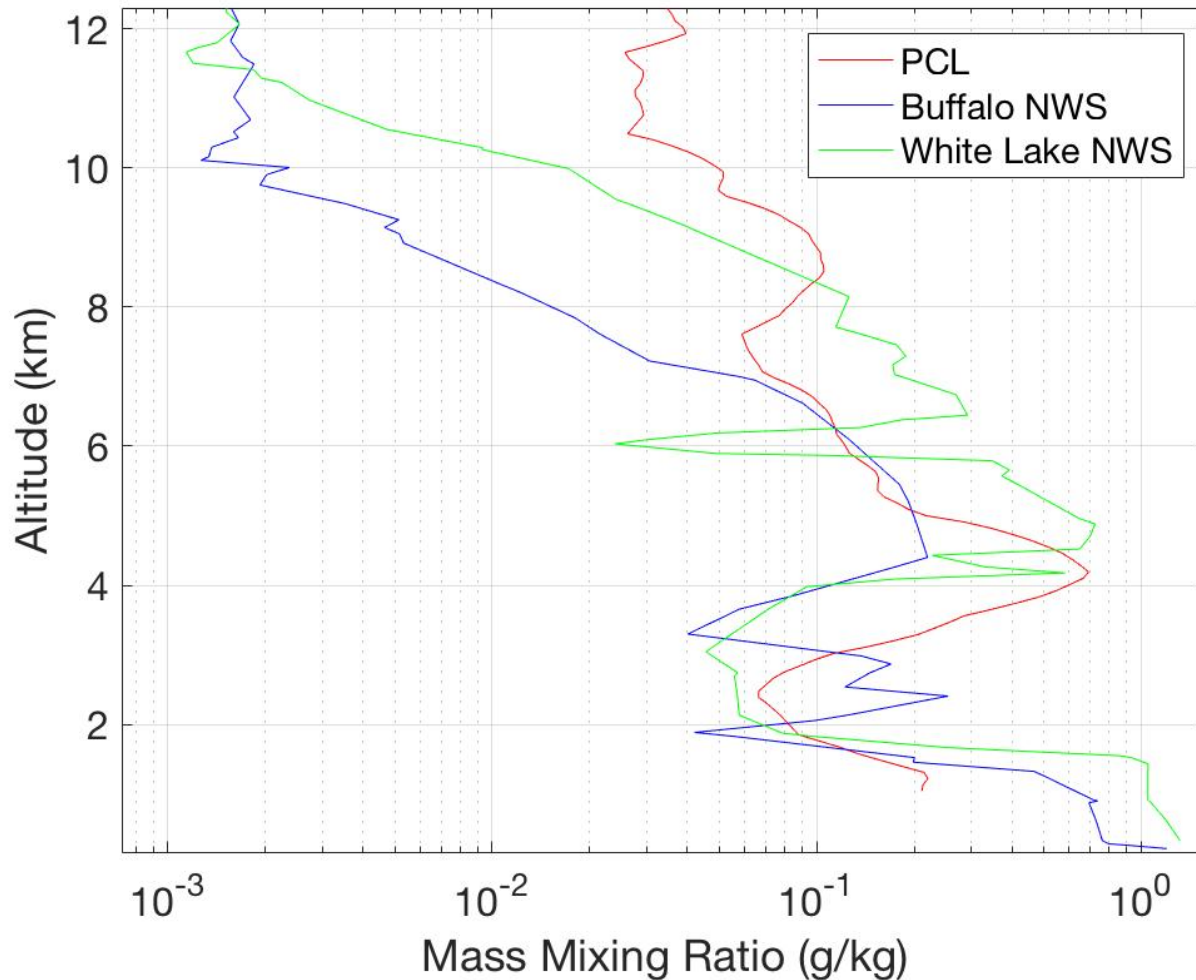
March 22, 2017



6 nights in 2016/2017

# Water Vapour Measurements

March 22, 2017



# Ongoing Concerns

- Lidar controller
- Air Compressor is aging
- Mirror control feedback system
  - occasionally out of sync

# PCL: Current Status

- New air system is working well and looks promising.
- Litron Laser is working
- Mirror closed/running well most of the time
- Still need to finish fine optical alignment (delayed by abnormally wet winter and spring)
- Routine operation on the horizon



# Papers

## Accepted

- Hicks-Jalali, S., Sica, R. J., Haefele, A. & Martucci, G., “A Calibration of the MeteoSwiss Raman Lidar for Meteorological Observations (RALMO) Water Vapour Mixing Ratio Measurements using a Radiosonde Trajectory Method.” EPJ Web of Conferences 176, 08015, 2018. (ILRC 28)
- VanKerkhove, J., Sica, R. J., Wing, R., & Argall, P. S., “Investigating potential wet bias in the Purple Crow Lidar water vapor measurements”, EPJ Web of Conferences 176, 05026, 2018. (ILRC 28)
- Jalali, A., Sica, R. J., & Haefele, A., “Validation of optimal estimation method retrievals of middle atmospheric temperature”, EPJ Web of Conferences 176, 03001, 2018. (ILRC 28)
- Sica, R. J., Haefele, A., Jalali, A., Gamage, S., & Farhani, G., “How to apply the optimal estimation method to your lidar measurements for improved retrievals of temperature and composition”, EPJ Web of Conferences 176, 01025, 2018. (ILRC 28)
- Gamage, S. Mahagammulla, Haefele, A., & Sica, R. J., “First application of the optimal estimation method to retrieve temperature from pure rotational raman scatter lidar measurements”, EPJ Web of Conferences 176, 01011, 2018. (ILRC 28)

## Submitted

- Jalali et al., “A middle latitude Rayleigh-scatter lidar temperature climatology determined using an optimal estimation method” (submitted to *Atmospheric Measurement Techniques*)

## In prep, to be submitted soon

- Farhani et al., “Optimal Estimation Method Retrievals of Stratospheric Ozone Profiles from a DIAL Lidar.”
- Gamage et al., “Retrieval of Tropospheric Temperature From a Multiple Channel Pure Rotational Raman-Scatter Lidar Using an Optimal Estimation Method.”
- Hicks et al., “Calibrating Water Vapour Lidars with a Radiosonde Trajectory Method”