

2015 Thule & Mauna Loa Site Reports



Mauna Loa, Hawaii



Thule, Greenland

NDACC/IRWG Archival Status

- MLO (1995-2012)
- TAB (1999-2013)

to end of 2014 for both sites

- Water is pre-retrieved for all relevant species
- If a pre-retrieved water profile is not available we use ERA-Interim daily water profile

N ₂ O	1999-2013
CH ₄	1999-2013
CO	1999-2013
C ₂ H ₆	1999-2013
HCN	1999-2013



IRWG 2015, Toronto Canada



Recent / Current Publications

<http://dx.doi.org/10.1175/BAMS-D-14-00072.1>

Journal of Geophysical Research

- **Recent northern hemisphere hydrogen chloride increase due to atmospheric circulation change**, E. Mahieu, M.P. Chipperfield, J. Notholt, T. Reddman, J. Anderson, P.F. Bernath, T. Blumenstock, M.T. Coffey, S. Dhomse, W. Feng, B. Franco, L. Froidevaux, D.W.T. Griffith, J. Hannigan, F. Hase, R. Hossaini, N.B. Jones, I. Morino, I. Murata, H. Nakajima, M. Palm, C. Paton-Walsh, J.M. Russell III, M. Schneider, C. Servais, D. Smale, K.A. Walker, 104-107, Nature, Vol 515, 6 November 2014, doi:10.1038/nature13857
- **Measurements of the absorption cross section of $^{13}\text{CHO}^{13}\text{CHO}$ at visible wavelengths and application to DOAS retrievals**, N. R. Goss, E. M. Waxman, S. C. Coburn, T. K. Koenig, R. Thalman, J. Dommen, J. W. Hannigan, G. S. Tyndall and R. Volkamer, J. Phys. Chem. A, Dec 31, 2014, DOI: 10.1021/jp511357s

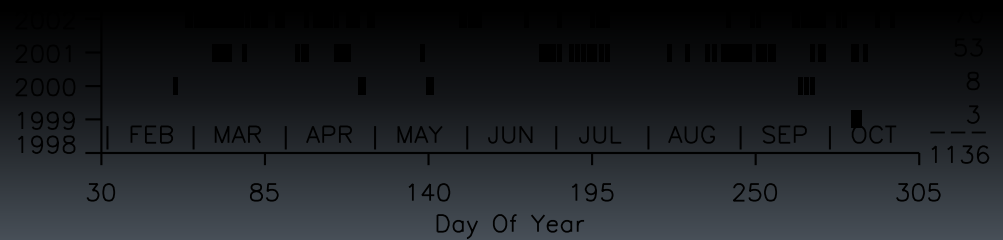


IRWG 2015, Toronto Canada



Thule News & Observations

- Still working out the bugs of the New automated observation system



Thule Autonomous Configuration

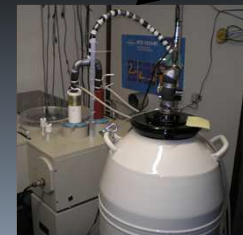
- Lack of documentation and support
- OPUS pipe communication is not stable!!
- OPUS macros automatically determine gain settings
- All programs in C and Python
 - Will be made publically available

Thule Configuration



Linux Computer

Windows
Computer
OPUS



LN2 Dewar



IRWG 2015, Toronto Canada



Thule Tracker

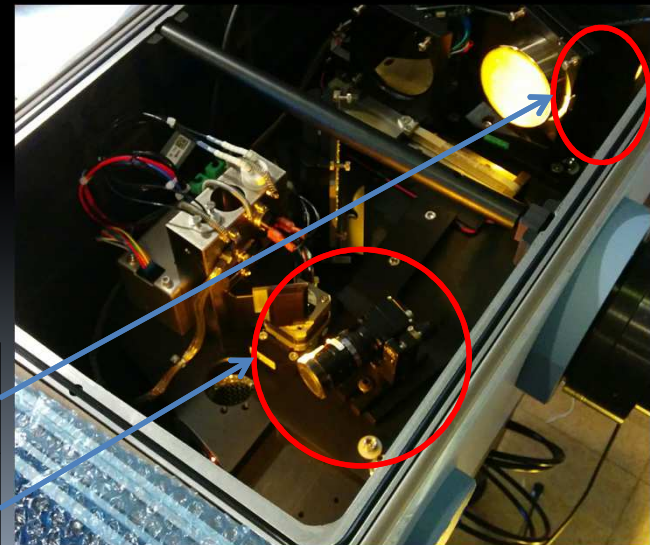
determine cloudless path to sun

- Borosilicate Au coated mirrors

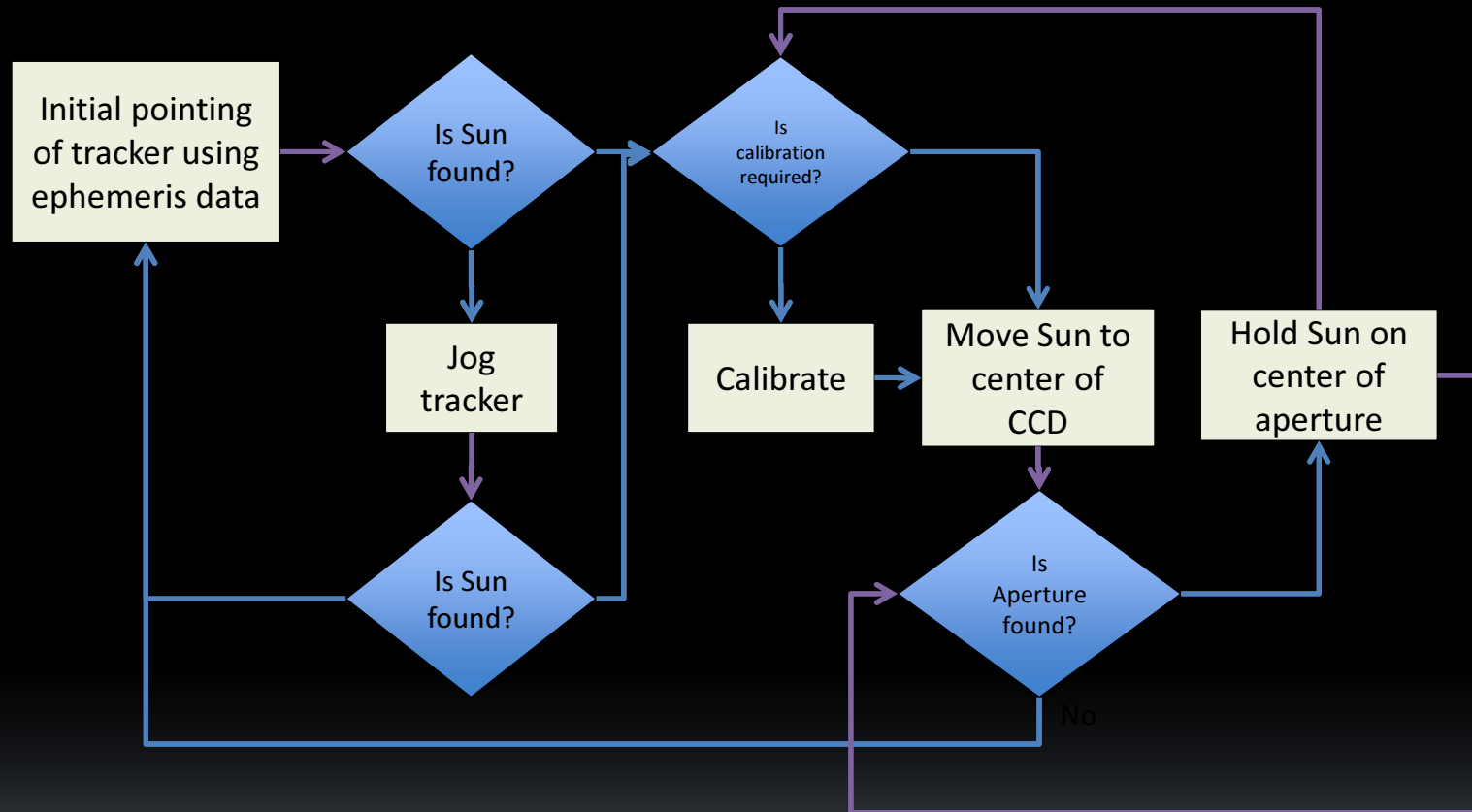


Thule Tracker Algorithm

transformation matrix found using least-squares solver with calibration points



Thule Tracker Algorithm

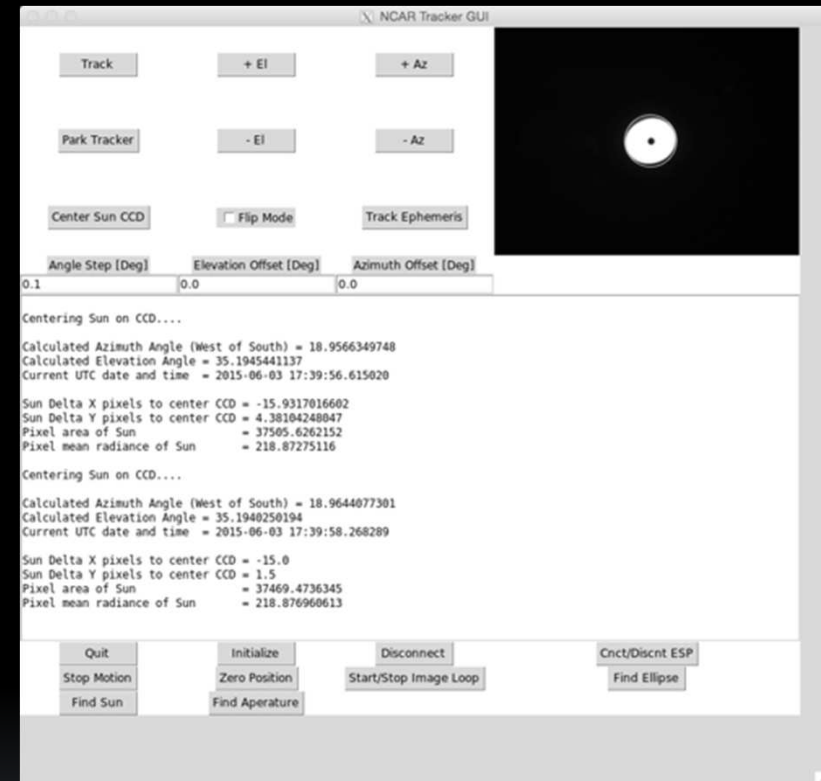


- Calibration performed every two hours
- Testing of rotation of transformation matrix based on azimuth angle to be done
 - This will enable a single calibration at start up

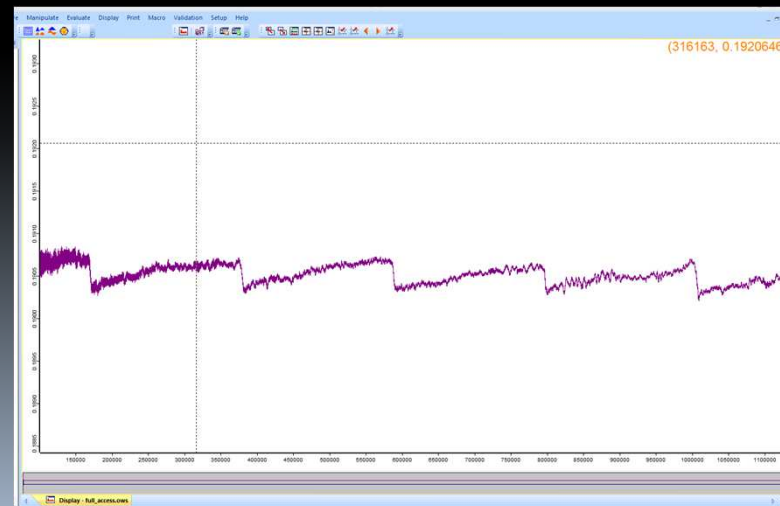
Thule Tracker Algorithm

Determination of aperture location
on CCD

- Day to day operation does not occur in GUI mode



Thule Tracker Performance

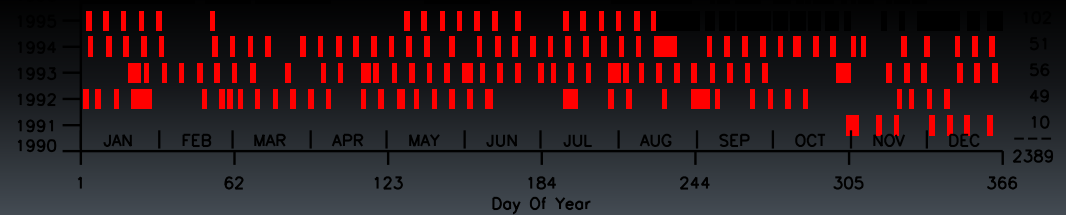


All Instruments are in “NDACC” Building

- Sun photometer
- Aerosol LIDAR
- Microwave Radiometer
- O3 Sondes (winter)
- Aerosol Sampler
- IR Radiometer
- Solar FTS
- AERONET/NASA
- U Rome
- INGV Rome
- DMI
- U Sienna
- U Sienna
- NCAR
- UV spectro-radiometer
- *Removed – but may be returned in 2016*
- Water μ -wave
- DMI
- Univ Bern
- Campaign Summer 2015



MLO News & Observations



Red indicates Bomem observations from DU.
Have yet to be reprocessed.

MLO Configuration

- Extremely buggy/unstable
- Not supported
- Minimal features
- No dynamic solar tracking
 - Based on ephemeris calculation
- XPM files with set gains

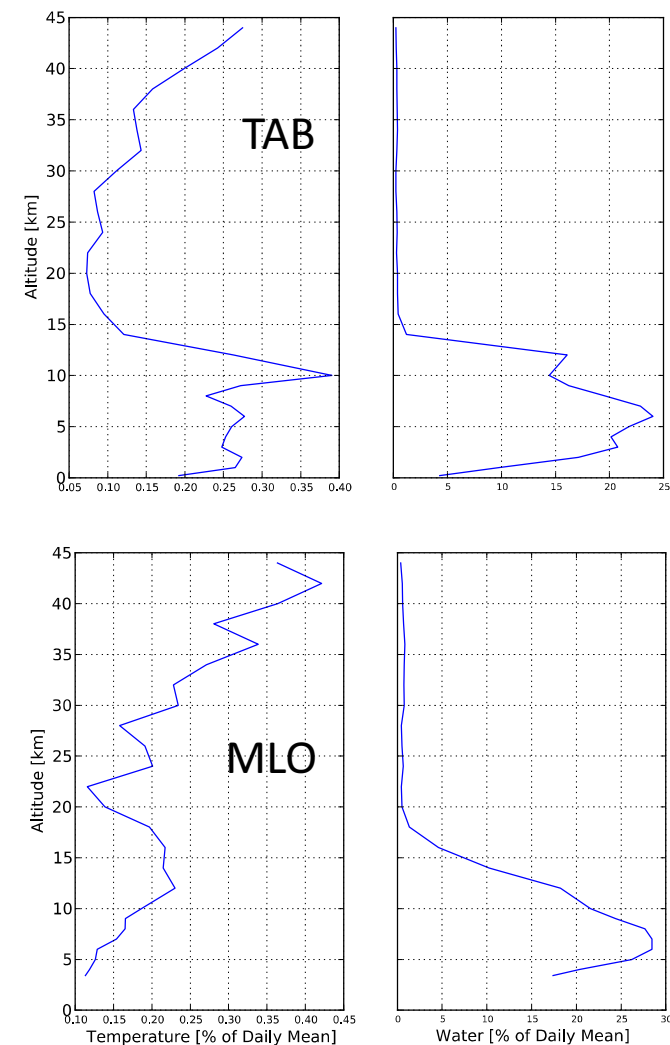


LN2 Dewar

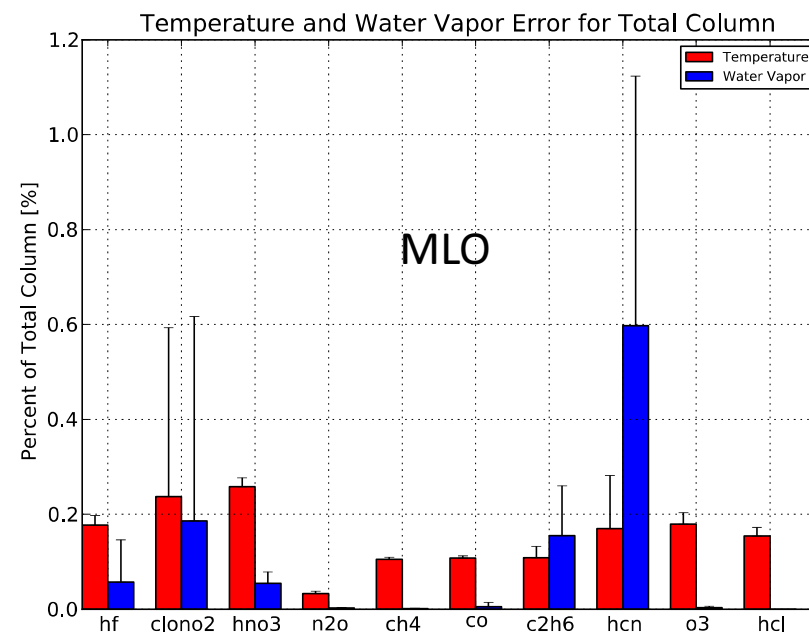
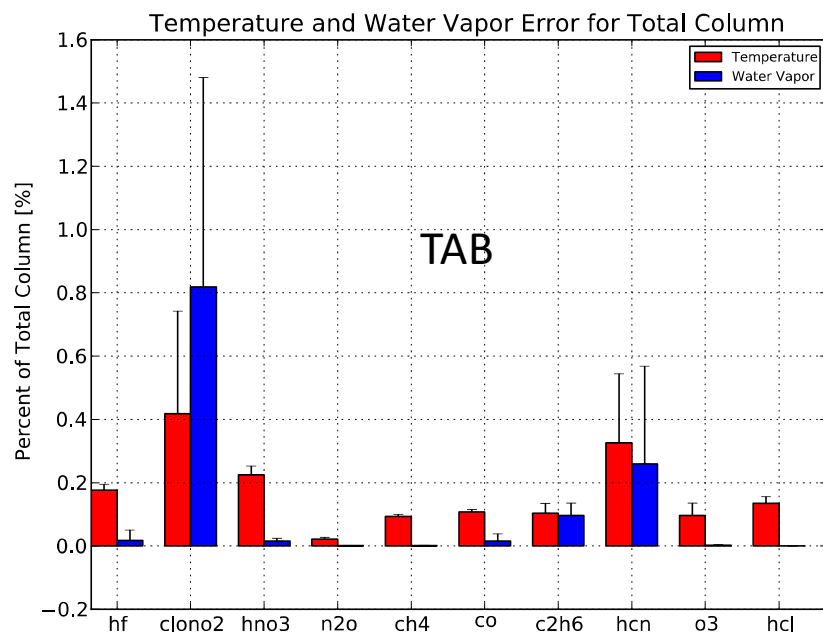


Effect of Diurnal Cycle of Temperature and Water Vapor

- Diurnal variability of temperature and water
- Sensitivity of the retrieval to water vapor and temperature



Effect of Diurnal Cycle of Temperature and Water Vapor



Boulder News

NO₂, CH₂O

- Characterize differences in diurnal variation of surface and column observations for key trace gases and aerosols
- Examine horizontal scales of variability affecting satellites and model calculations
- COCCON EM27/SUN
 - March 2015

HBr & N₂O Cell Update



- After initial calibration cells will be shipped back to NCAR and then distributed to each group
- Each group should re-verify calibration of HBr

SFIT4 Development

