

Airborne High Spectral Resolution Lidar (HSRL) Aerosol Measurements During CalNex and CARES

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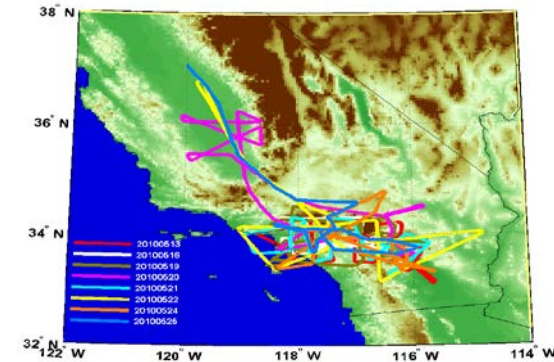
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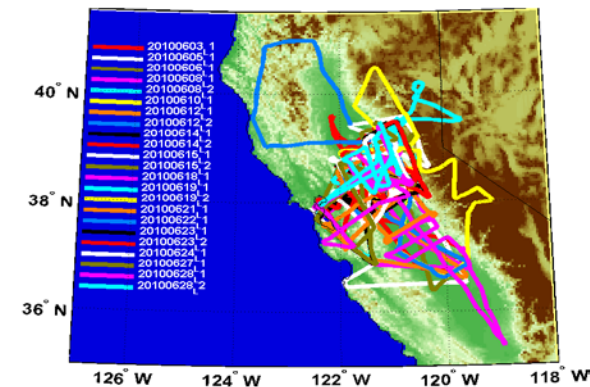
CalNex Deployment May 2010

- Ontario, California
- May 13-25
- 8 science flights (~29.5 hours)
 - 6 with CIRPAS Twin Otter
 - 2 with NOAA P-3
 - 6 with MODIS and/or MISR



CARES Deployment June 2010

- Sacramento, California
- June 3 -28
- 23 science flights (~68 hours)
 - 19 with DOE G1
 - 1 with NOAA R/V Atlantis
 - 2 with NOAA P3
 - 6 with NOAA Twin Otter
 - 11 with MODIS and/or MISR
- Instruments deployed for CALNEX and CARES
 - High Spectral Resolution Lidar (HSRL) (NASA/LaRC)
 - Research Scanning Polarimeter (RSP) (NASA/GISS)



HSRL Aerosol Data Products:

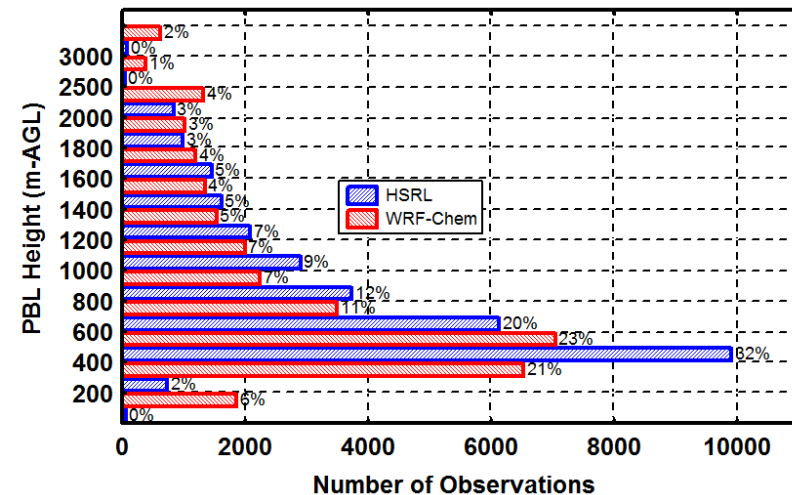
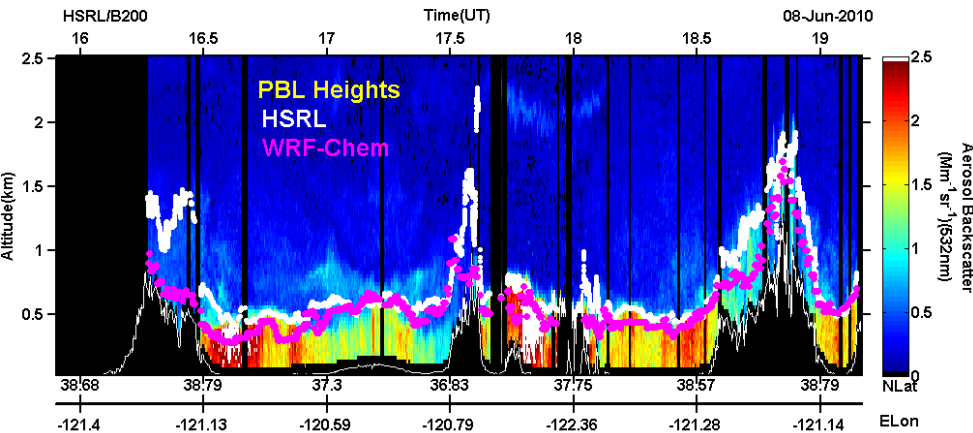
- Scattering ratio (532 nm)
- Backscatter coefficient (532, 1064 nm)
- Extinction Coefficient (532 nm)
- Optical Thickness (AOT) (532 nm)
- Backscatter Wavelength Dependence (532/1064 nm)
- Extinction/Backscatter Ratio (“lidar ratio”) (532 nm)
- Depolarization (532, 1064 nm)

HSRL Data Status:

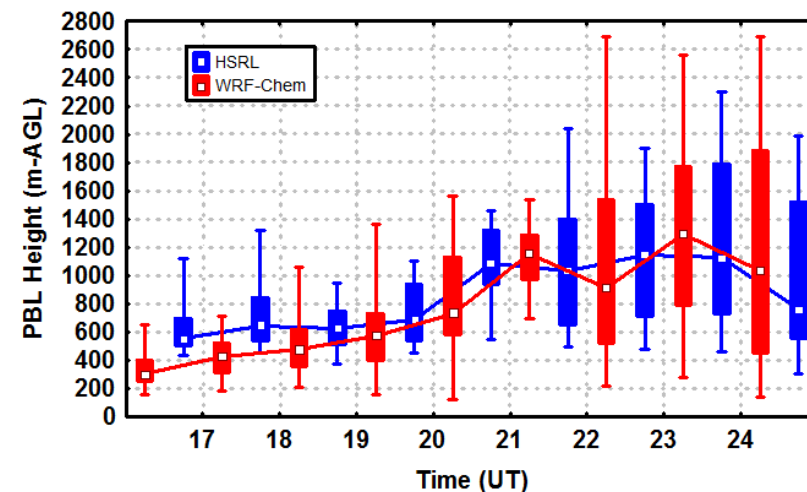
- Data and images for both CALNEX and CARES submitted to and available from DOE ARM Archive
- Data are available in both hdf and ascii ICARTT formats
- Data and images are also available from NASA Langley ftp site

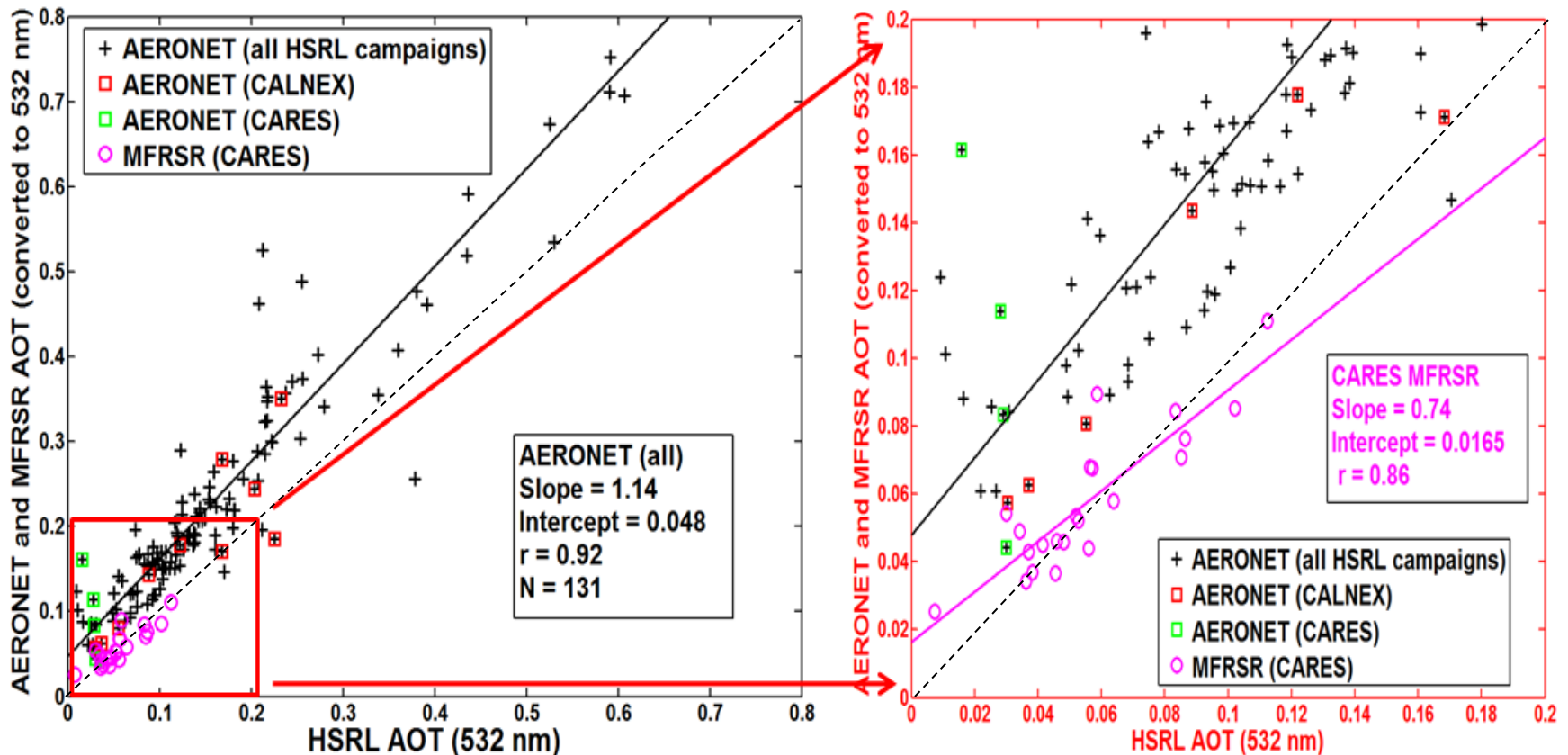
RSP Data Status:

- Data and images for both CALNEX and CARES are available via ftp at <ftp://ftp.giss.nasa.gov/pub/rsp/CARES>
- Data and images will be placed in DOE ARM archive



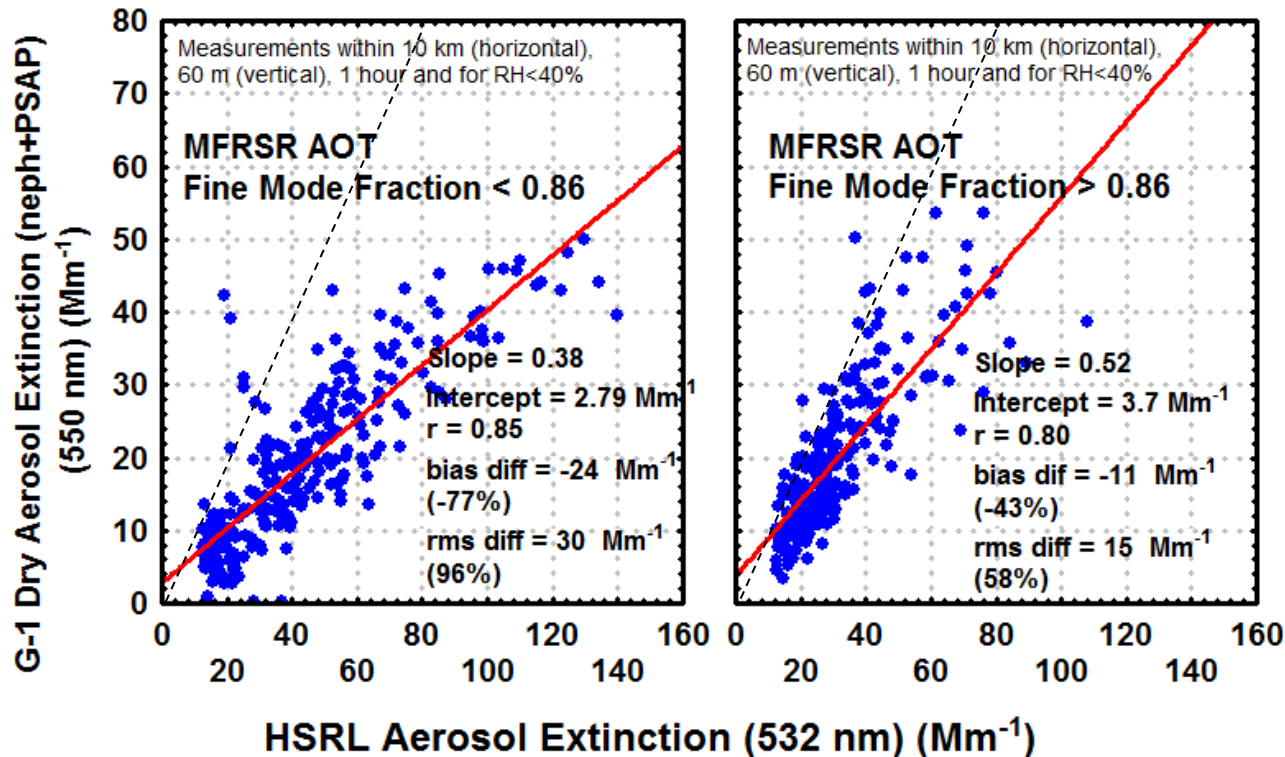
HSRL and WRF-Chem PBL heights are in reasonably good agreement (within ~ 50 m) during the local afternoon. HSRL PBL heights were generally larger by 100-200 m during the morning which may be due to limitations of the HSRL wavelet based analysis for low PBL heights and also to the difference in how the PBL height is determined (HSRL uses aerosol gradient, WRF-Chem uses temperature gradient)





HSRL, AERONET, and MFRSR AOT retrievals are generally in good agreement (rms and bias differences < 0.015, <25%)

- Comparisons performed for dry (RH < 40%) conditions
- G-1 aerosol extinction = scattering (neph) + absorption (PSAP)
- HSRL and G-1 data within 10 km (horizontal), 60 m (vertical) and 1 hour (temporal)



HSRL aerosol extinction measurements are about 10-25 Mm^{-1} (40-80%) higher than aerosol extinction derived from G-1 in situ measurements. Differences are smaller during days with larger fine mode AOT fraction. Similar results when comparing aerosol extinction from HSRL and NOAA P3 CRD measurements

- Evgueni Kassianov et al. found coarse mode had significant impacts on several days during CARES
 - MFRSR retrievals of fine and coarse mode AOT
 - AERONET retrievals of fine and coarse mode AOT and size distribution
 - APS measurements of size distribution at T0
- Justin Langridge (NOAA) used measured size distributions on NOAA P3 to estimate scattering from particles with diameters between 2 – 6 micrometers
 - “...it appears that scattering in the LA basin from particles in the 2-6 micron range is often of the order of several 10's of percent of that from sub-2 micron particles”



- **Aerosol classification and apportionment of AOT**
- **PBL height retrievals**
- **WRF-Chem model assessment**
- **Intercomparison of aerosol measurements**
- **Development and assessment of advanced lidar+polarimeter aerosol retrievals**