Aerosol Lidar Validation Experiment (ALIVE)

Sky Research J-31

NASA Ames Airborne Tracking 14-channel Sun photometer (AATS-14)

Research Scanning Polarimeter (RSP) Navigational and Meteorological Parameters

Cessna 206

Raman Lidar

SGP, Sep 11-22, 2005

Micro Pulse Lidar

ARM

ALIVE Operations Summary

- Sep 11 – 22, 2005
- 23 research flight hours
- 12 flights over SGP on 8 days
- 5 coordinated flights with C206
- Flight duration: 45 – 150 min
- Altitude range: 500 ft agl – 23’000 ft
- ~40 vertical profiles over SGP CF
- Several profiles coordinated with radio sondes
- Cirrus clouds

14-channel Ames Airborne Tracking Sunphotometer (AATS-14)

Measures: Solar direct-beam transmission, T, at 14 wavelengths, λ, 353-2139 nm

Data products

- Aerosol optical depth (AOD) at 13 λ, 353-2139 nm
- Water vapor column content [using T(940 nm)]
- Aerosol extinction, 340-2139 nm
- Water vapor density

} When A/C flies vertical profiles

Langley Plot Calibration Mauna Loa

Pre-mission August 16-25, 2005

Post-mission October 12-20, 2005

Change

354	380	453	499	519	604	675
0.1%	**-0.3%**	**-12.9%**	**-5.5%**	**-0.3%**	**0.5%**	**-0.1%**

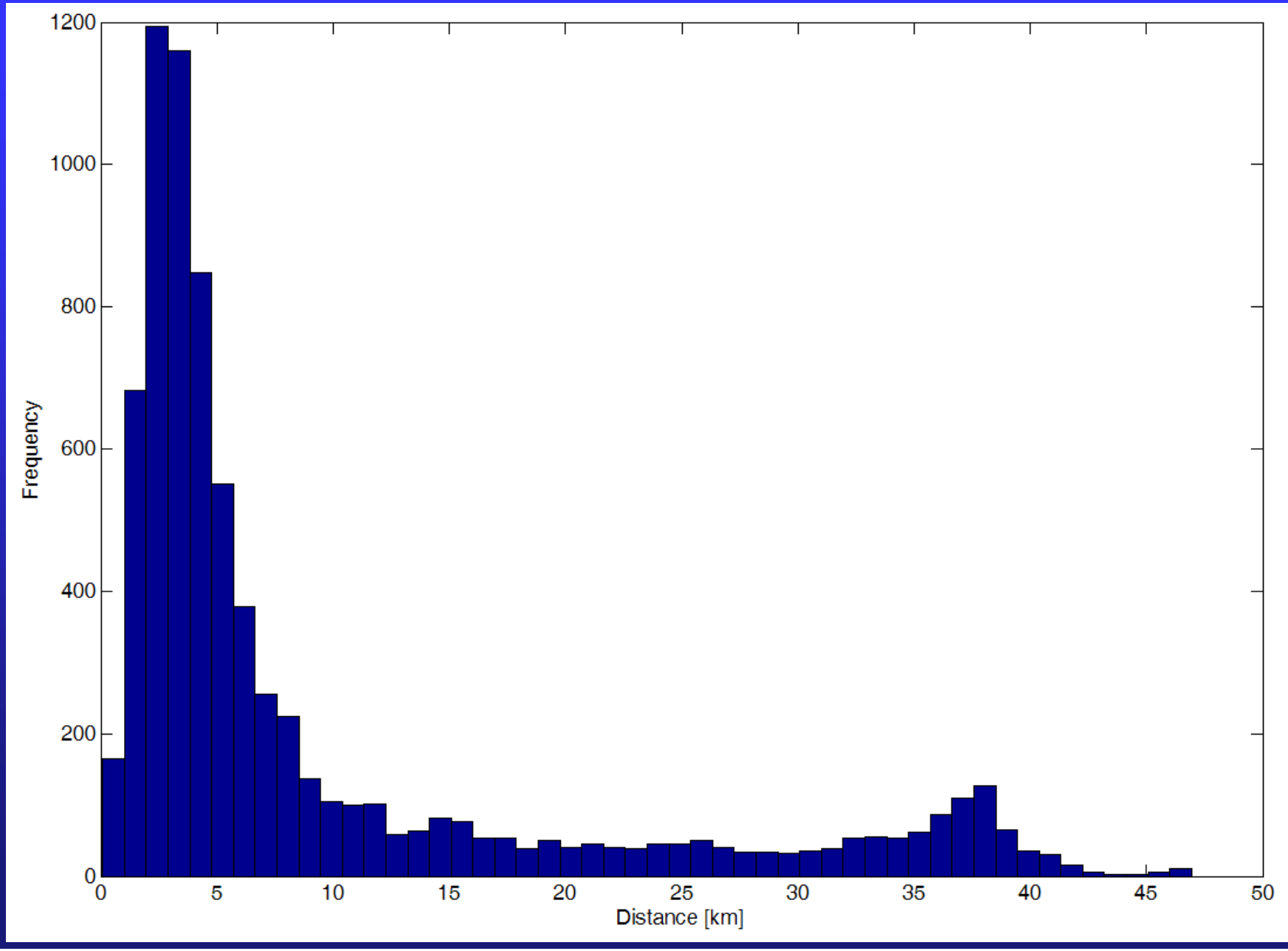
778	864	940	1019	1240	1558	2139
0.4%	**0.0%**	**-0.7%**	**-0.1%**	**-3.4%**	**-0.4%**	**-0.1%**

AATS-14 in ALIVE Summary

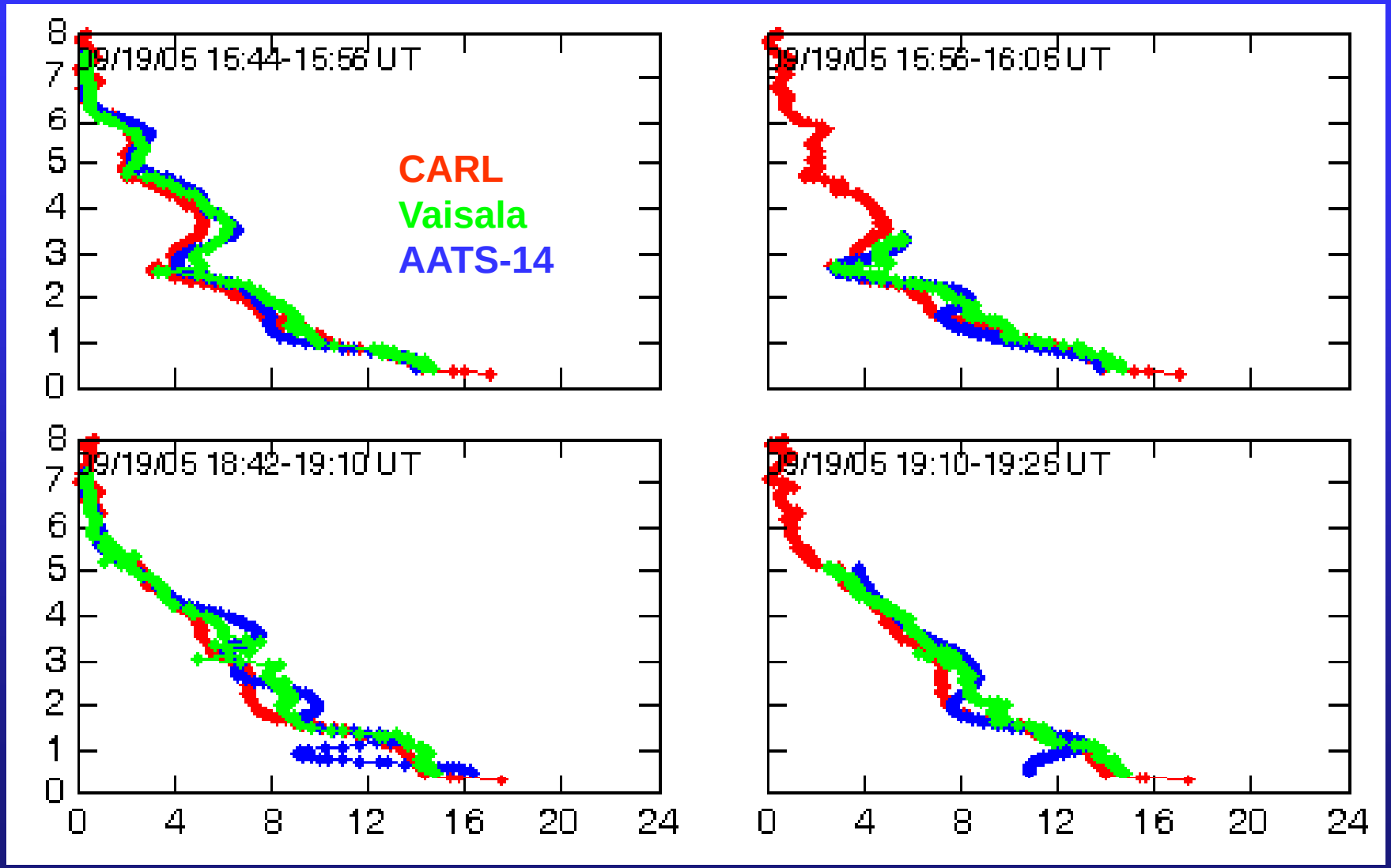
- Archived AOD and CWV data for all flights (12 science, 4 ferry, 1 test)
- Archived AOD and extinction profiles (Total of 34; 30 over SGP)
- 30 AOD/Extinction profiles to compare with CARL and MPL (AIOP 11 and 19)
- Cleaner than in AIOP
- Archived CWV and H_2O density profiles (Total of 64; 57 over SGP)
- 57 CWV and H_2O density profiles to compare with CARL (AIOP 21)

Distance from SGP

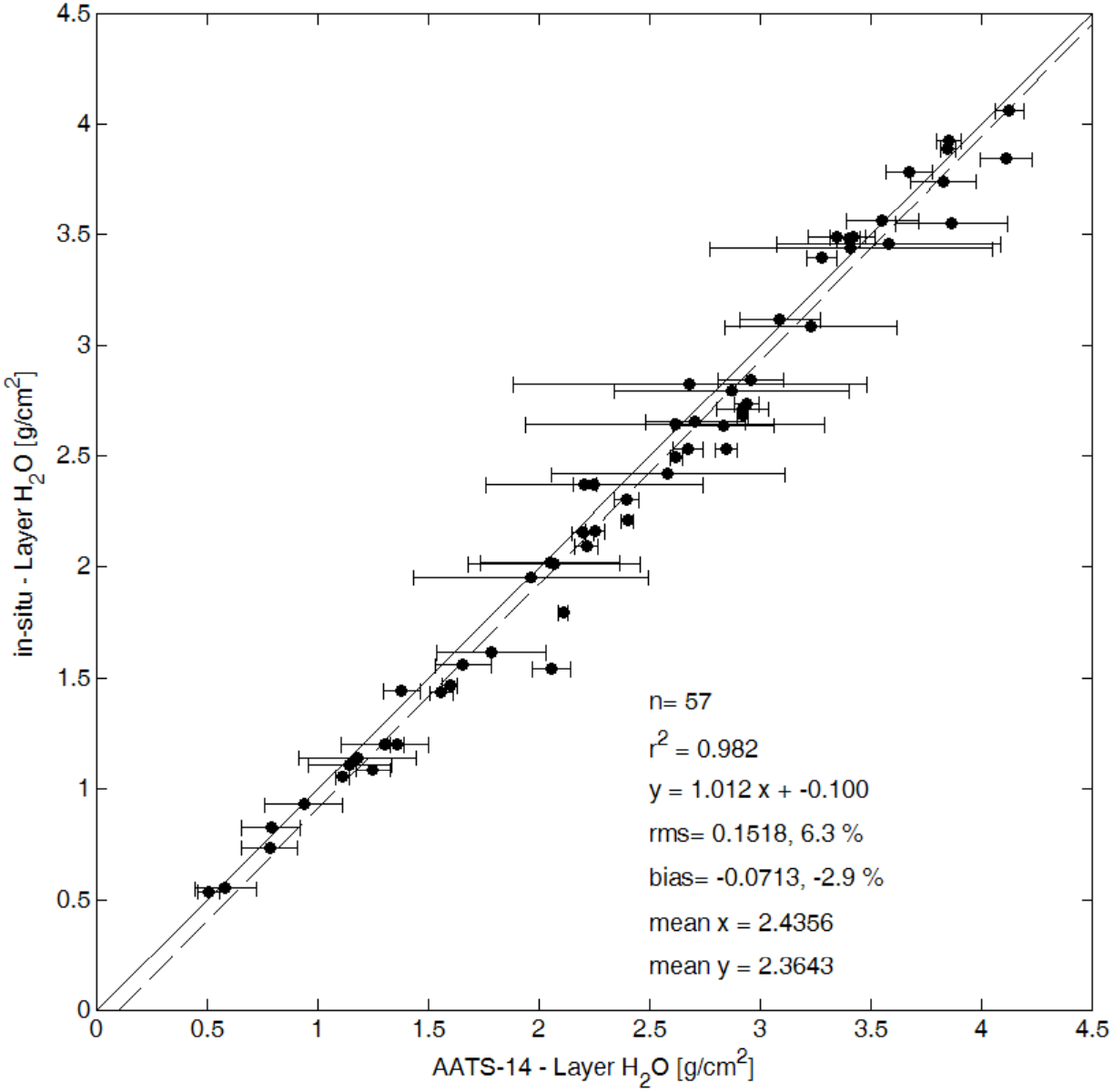
All H_2O profiles over SGP



Water Vapor Density Profiles

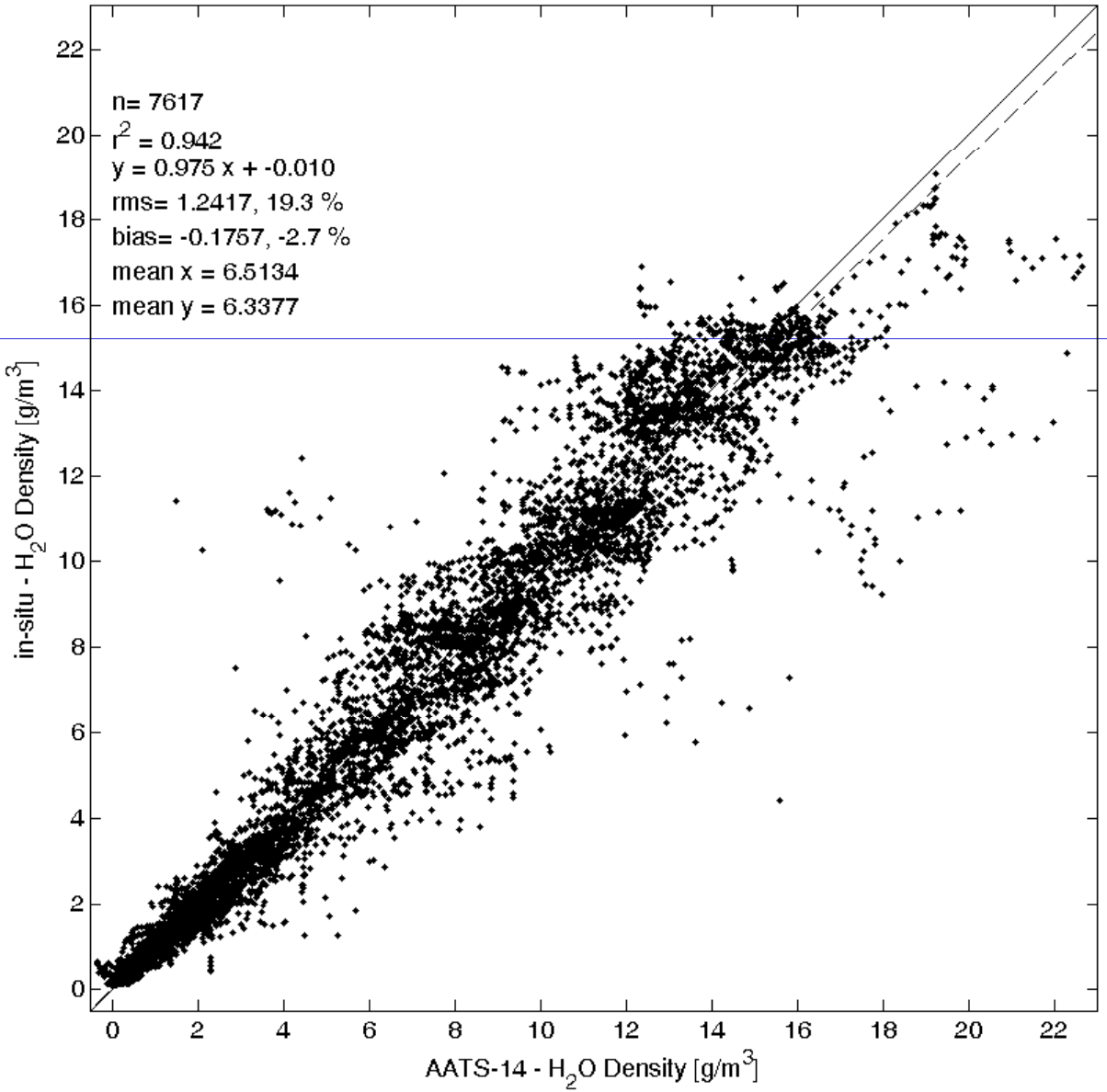


Layer Water Vapor
AATS-14 vs. Vaisala HMP 243, both on J-31



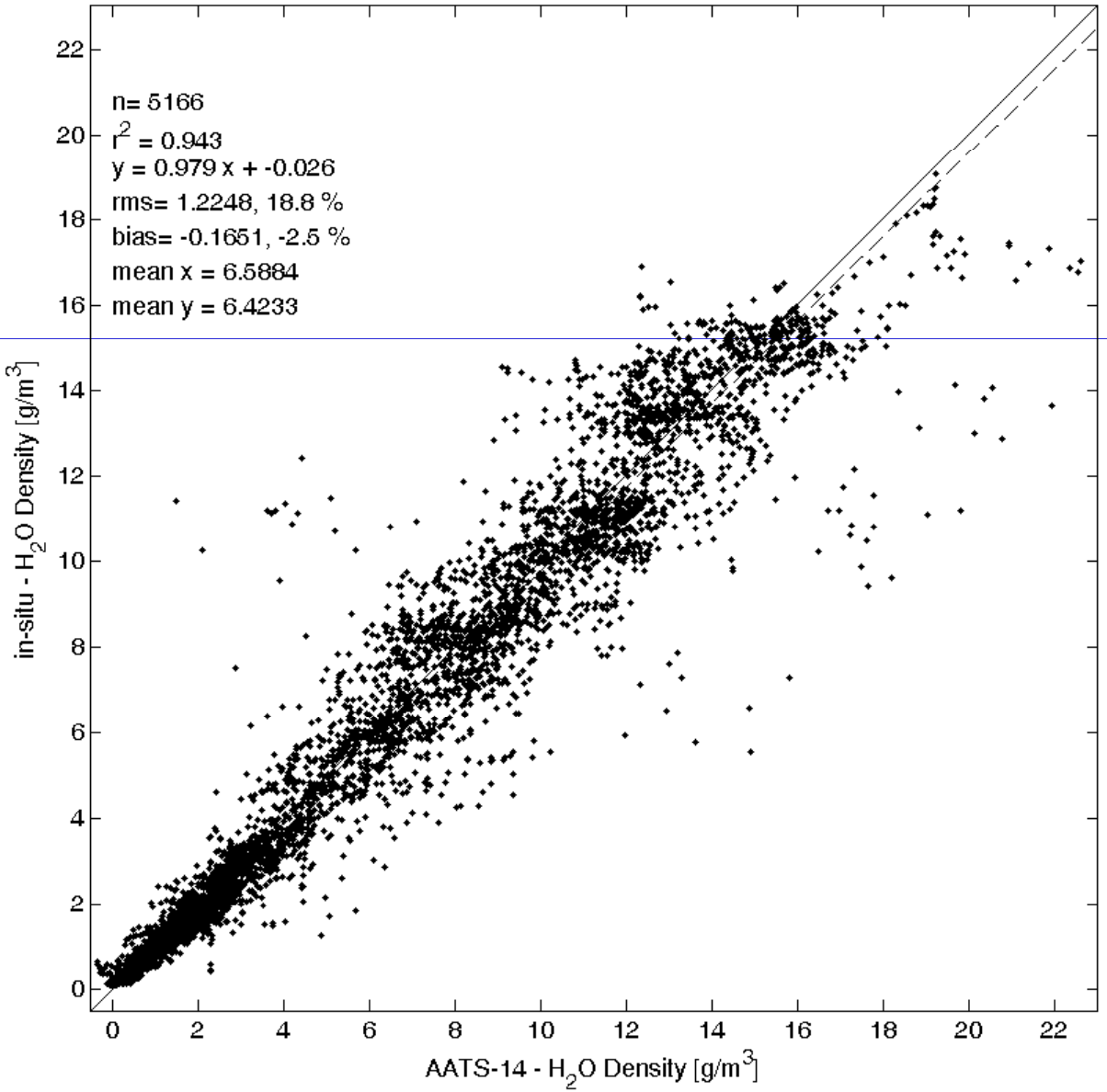
All ALIVE profiles over SGP

Water Vapor Density
AATS-14 vs. Vaisala HMP 243, both on J-31



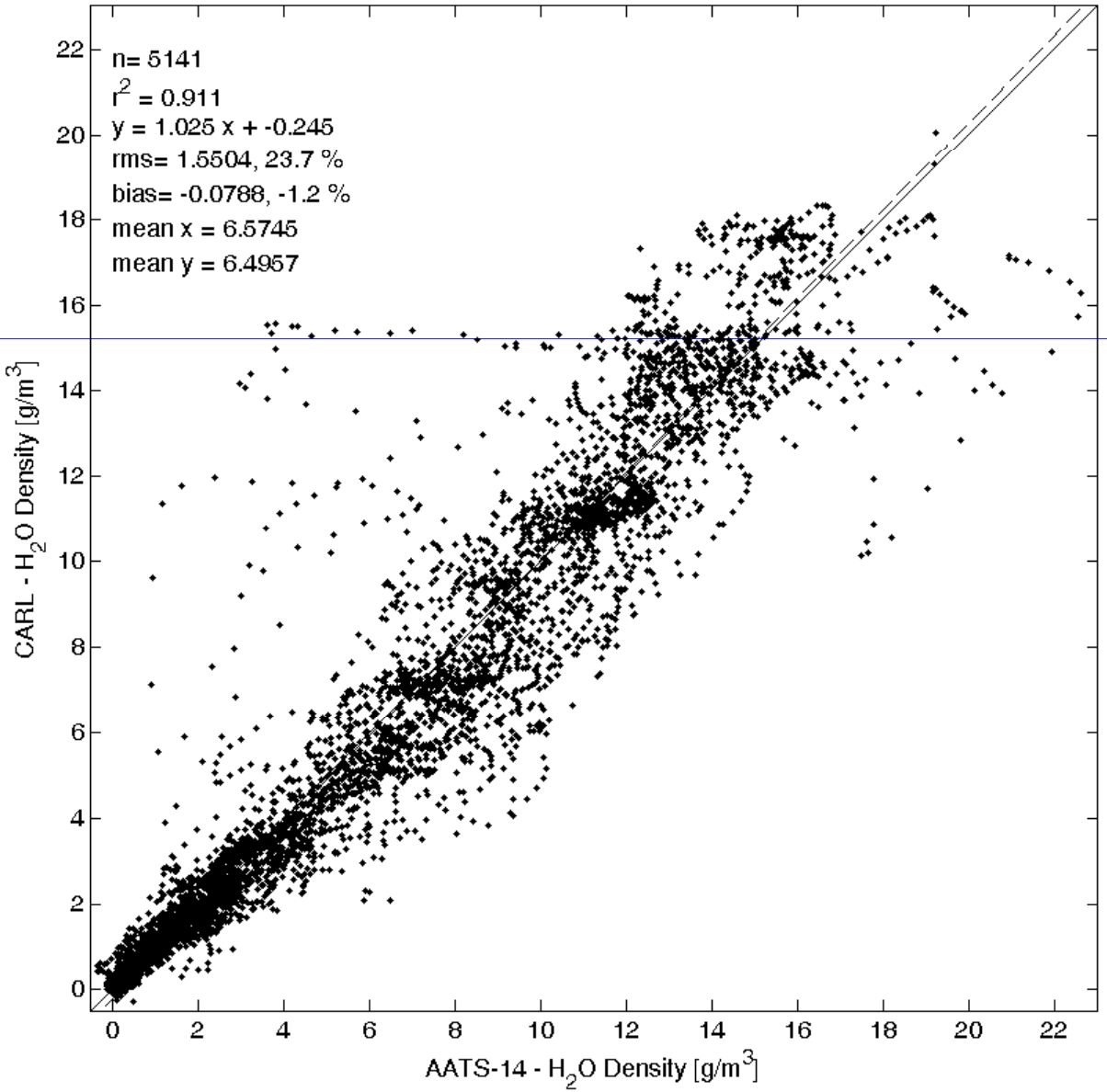
All ALIVE profiles over SGP

Water Vapor Density
AATS-14 vs. Vaisala HMP 243, both on J-31



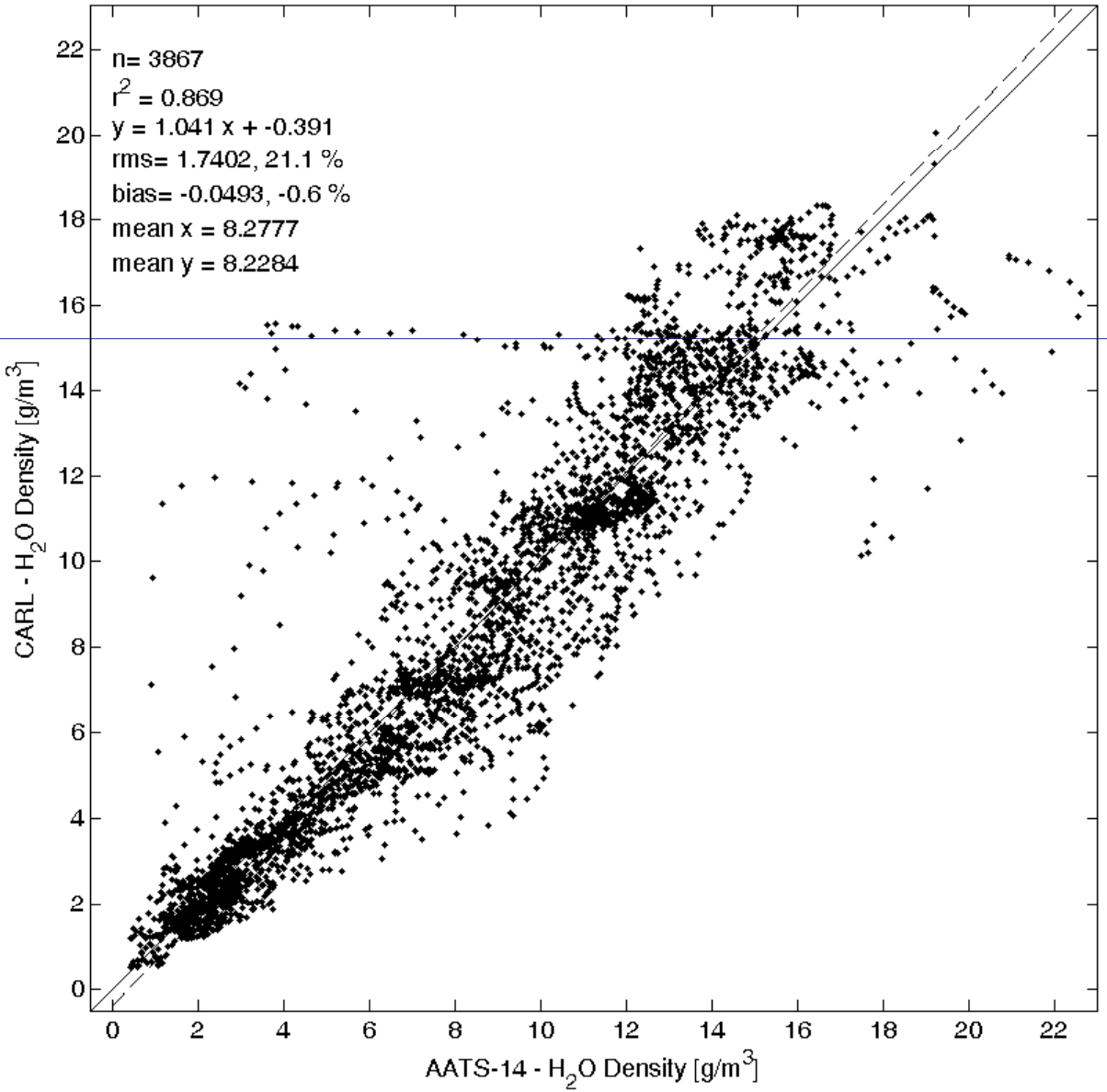
All ALIVE profiles over SGP
39 m bins

Water Vapor Density
AATS-14 vs. CARL



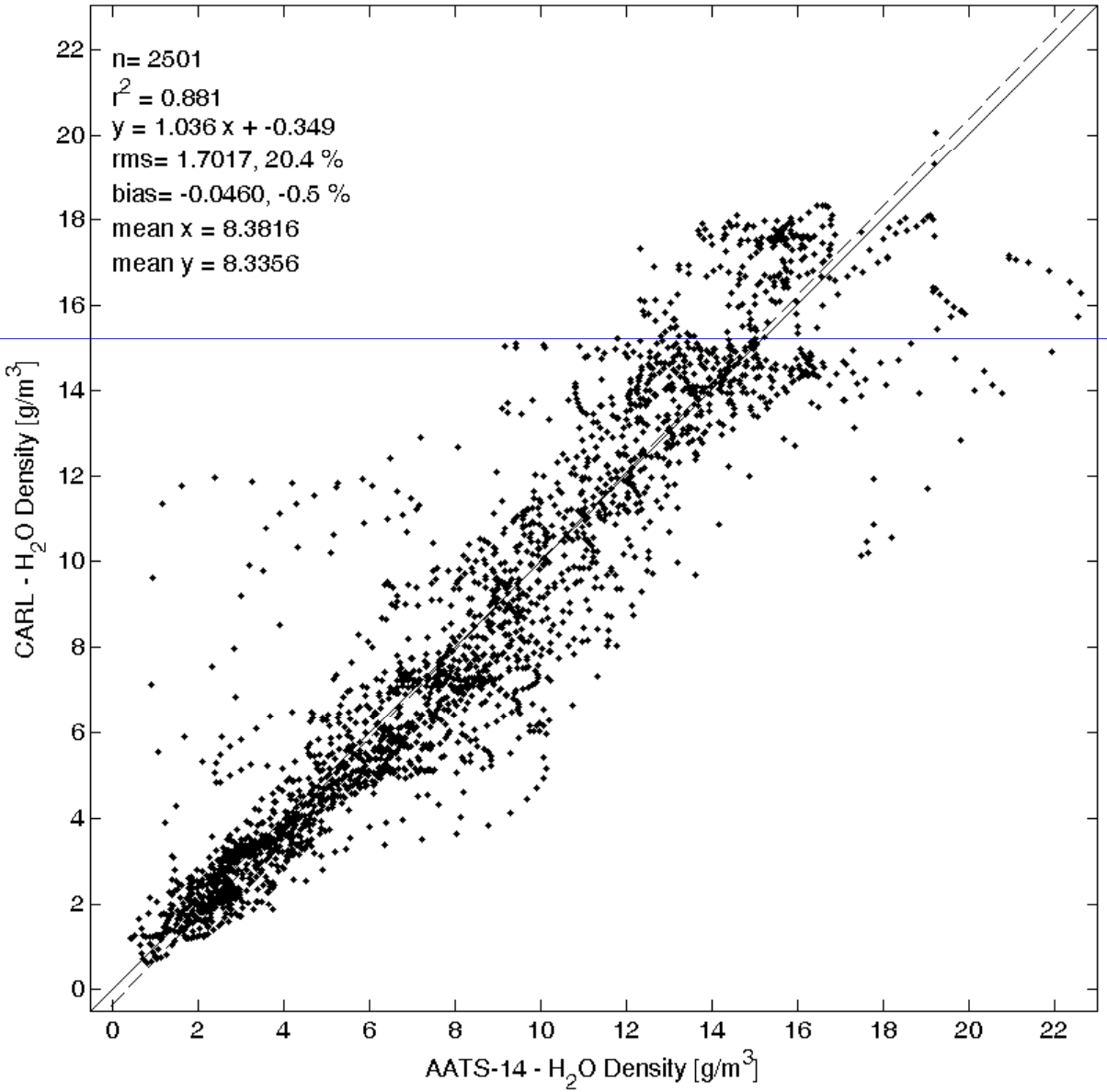
All ALIVE profiles over SGP
39 m bins
-0.5< CARL <100 g/m3

Water Vapor Density
AATS-14 vs. CARL



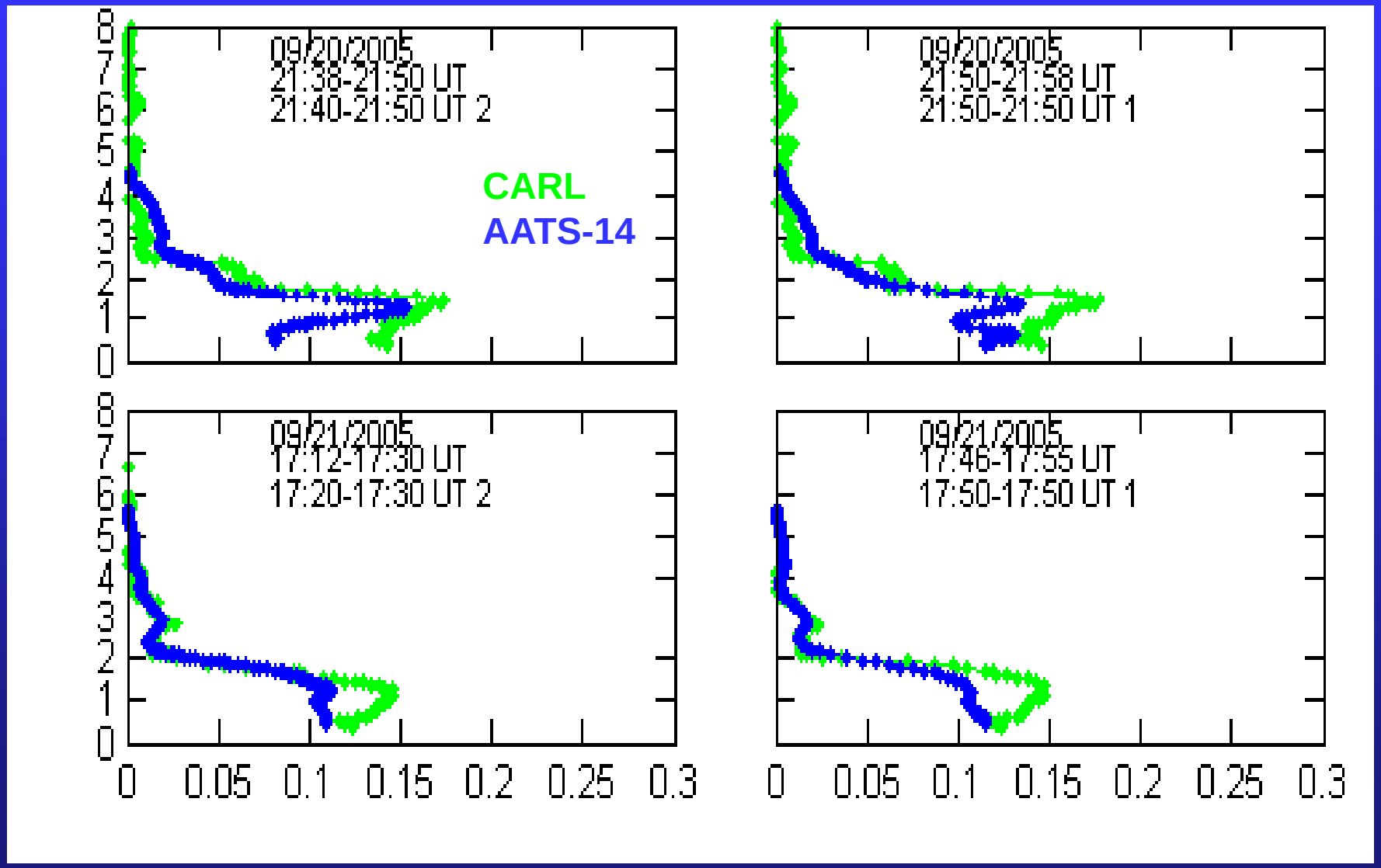
All ALIVE profiles over SGP
39 m bins
Using w_max criterion

Water Vapor Density
AATS-14 vs. CARL

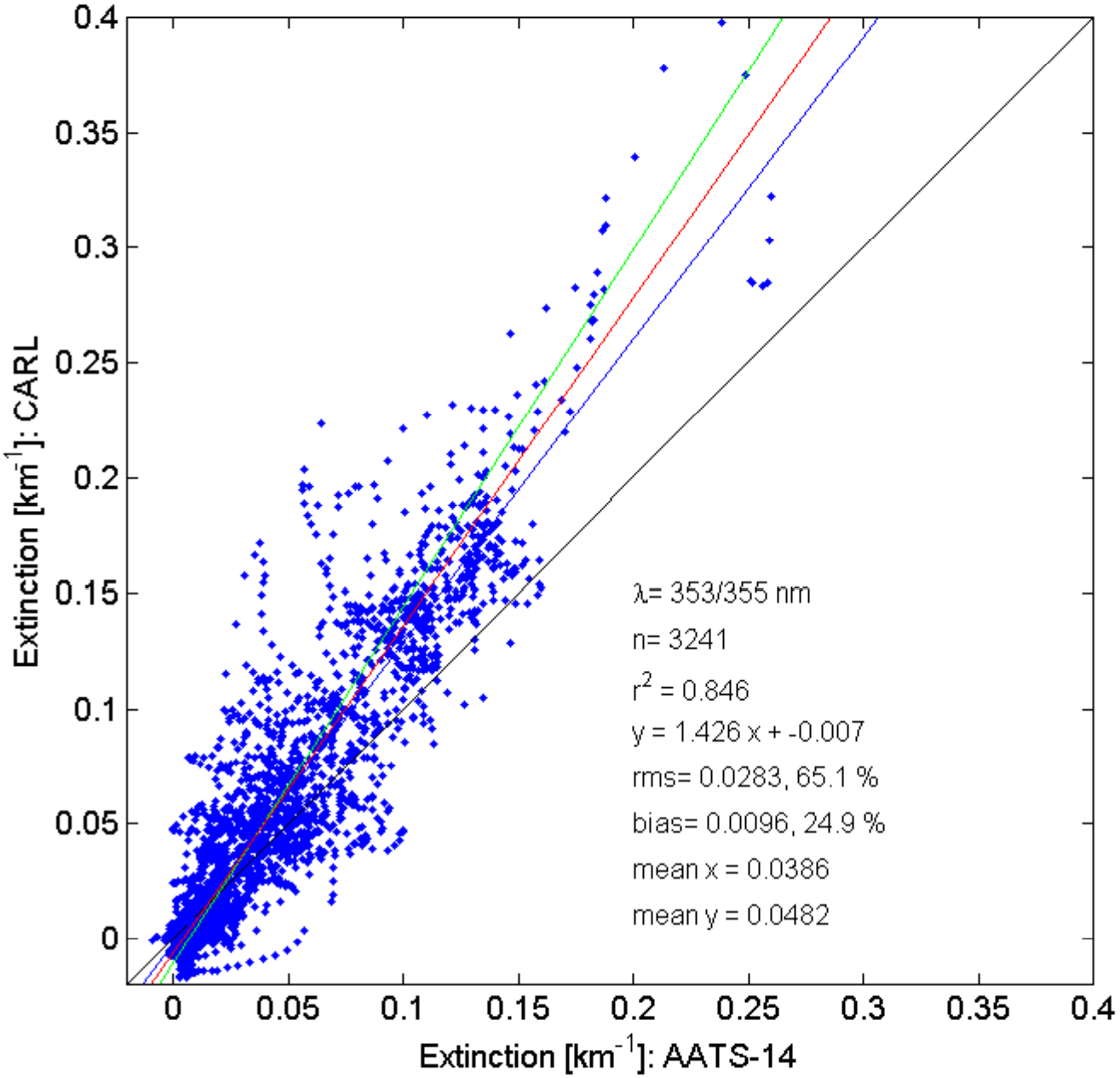


All ALIVE profiles over SGP within 30 km
39 m bins
Using w_max criterion

Aerosol Extinction: AATS-14 and CARL @ 354 nm

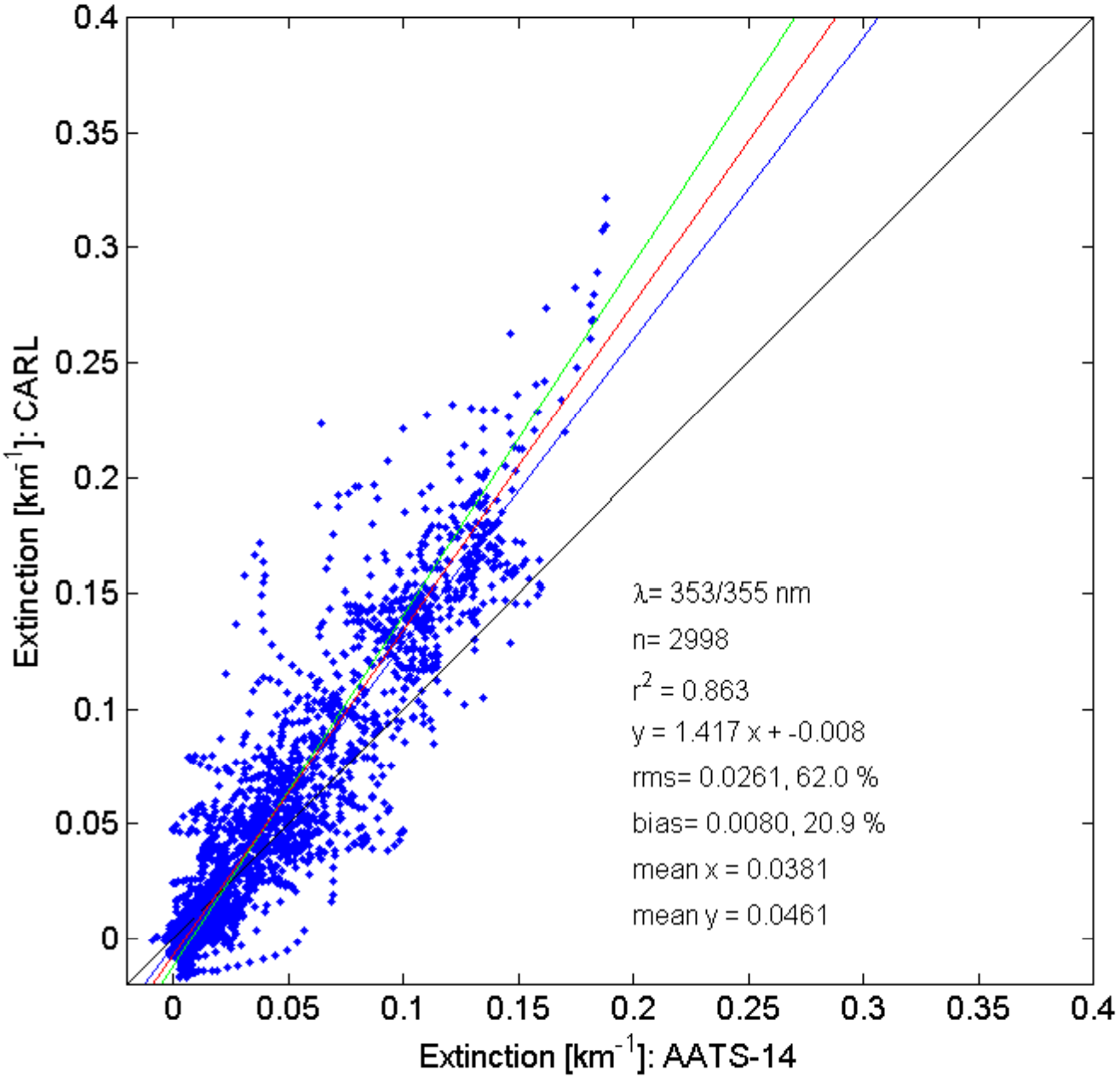


Aerosol Extinction: AATS-14 and CARL @ 354 nm



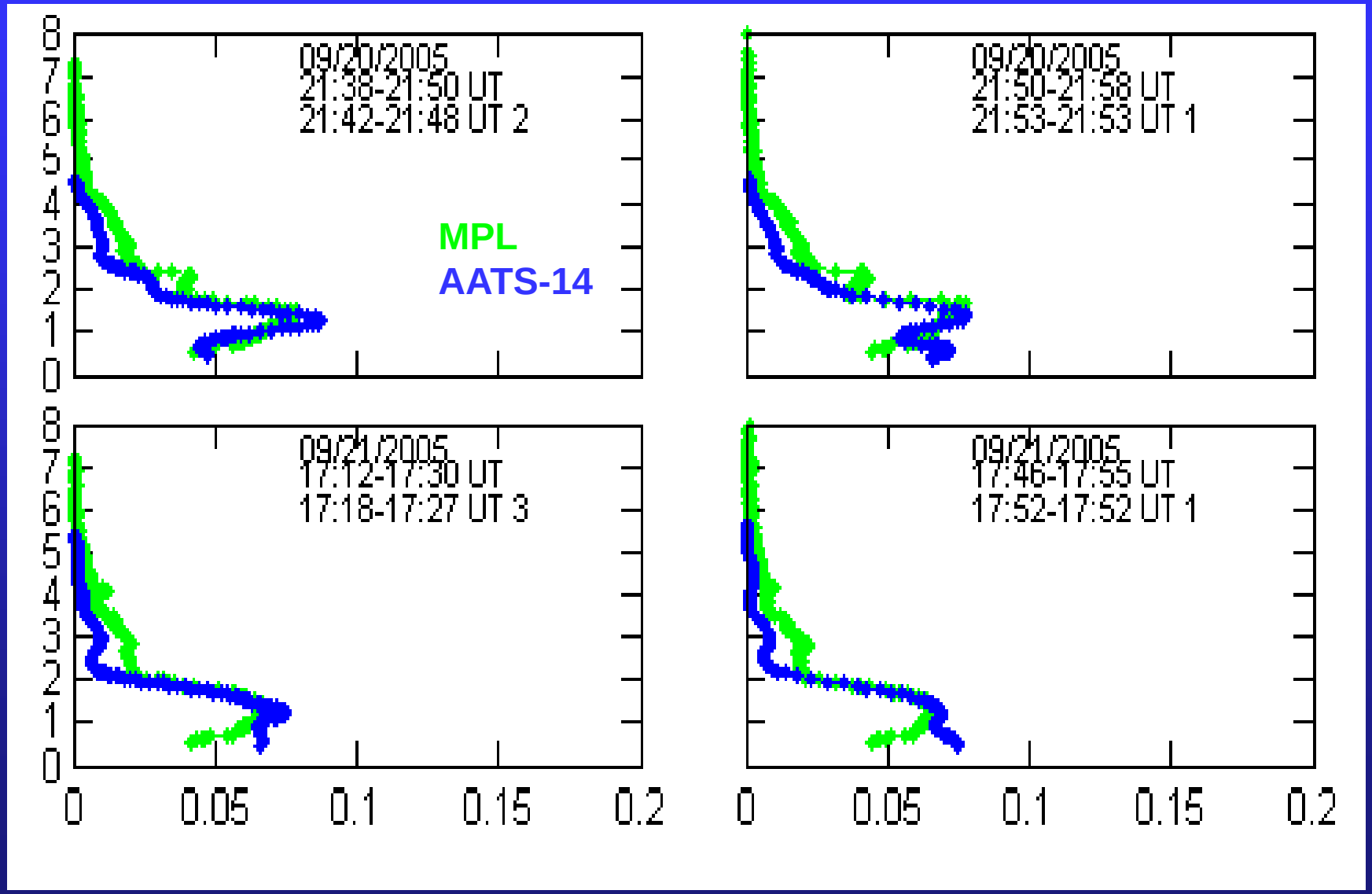
All data points over SGP
39 m bins
CARL ext<0.4

Aerosol Extinction: AATS-14 and CARL @ 354 nm

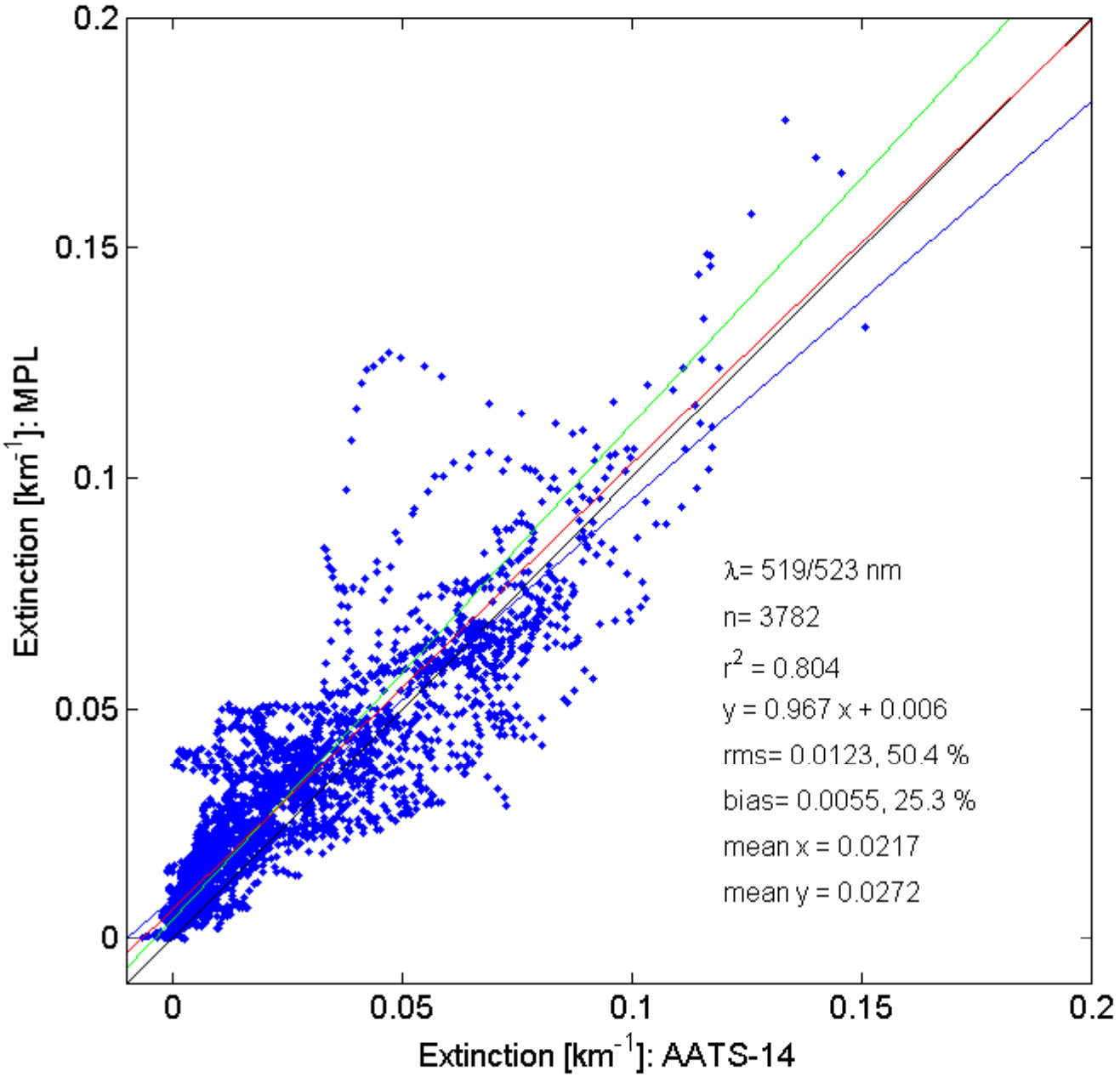


All data points over SGP
Distance from Lidar<30 km
39 m bins
CARL ext<0.4

Aerosol Extinction: AATS-14 and MPL @ 523 nm

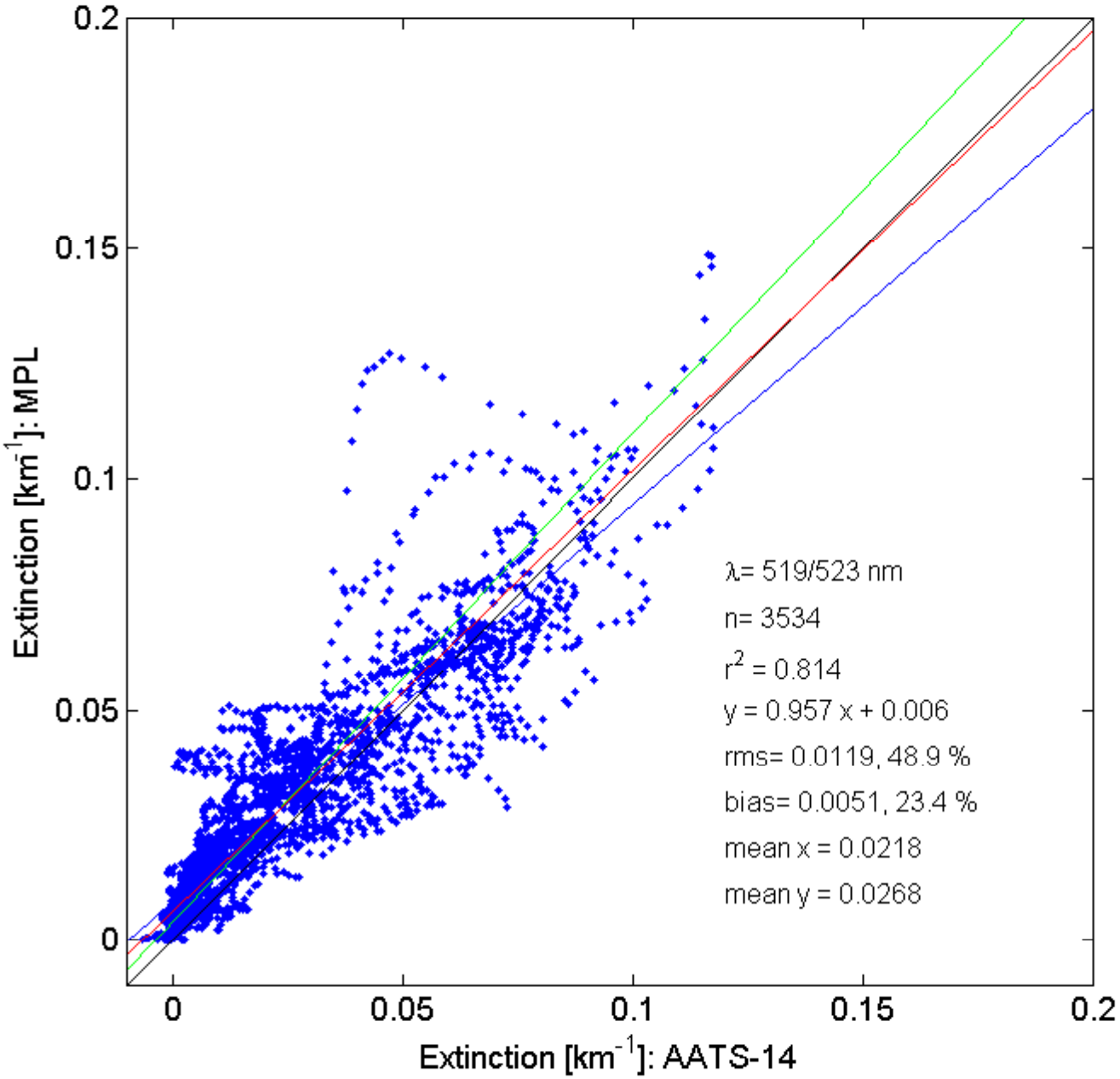


Aerosol Extinction: AATS-14 and MPL @ 523 nm

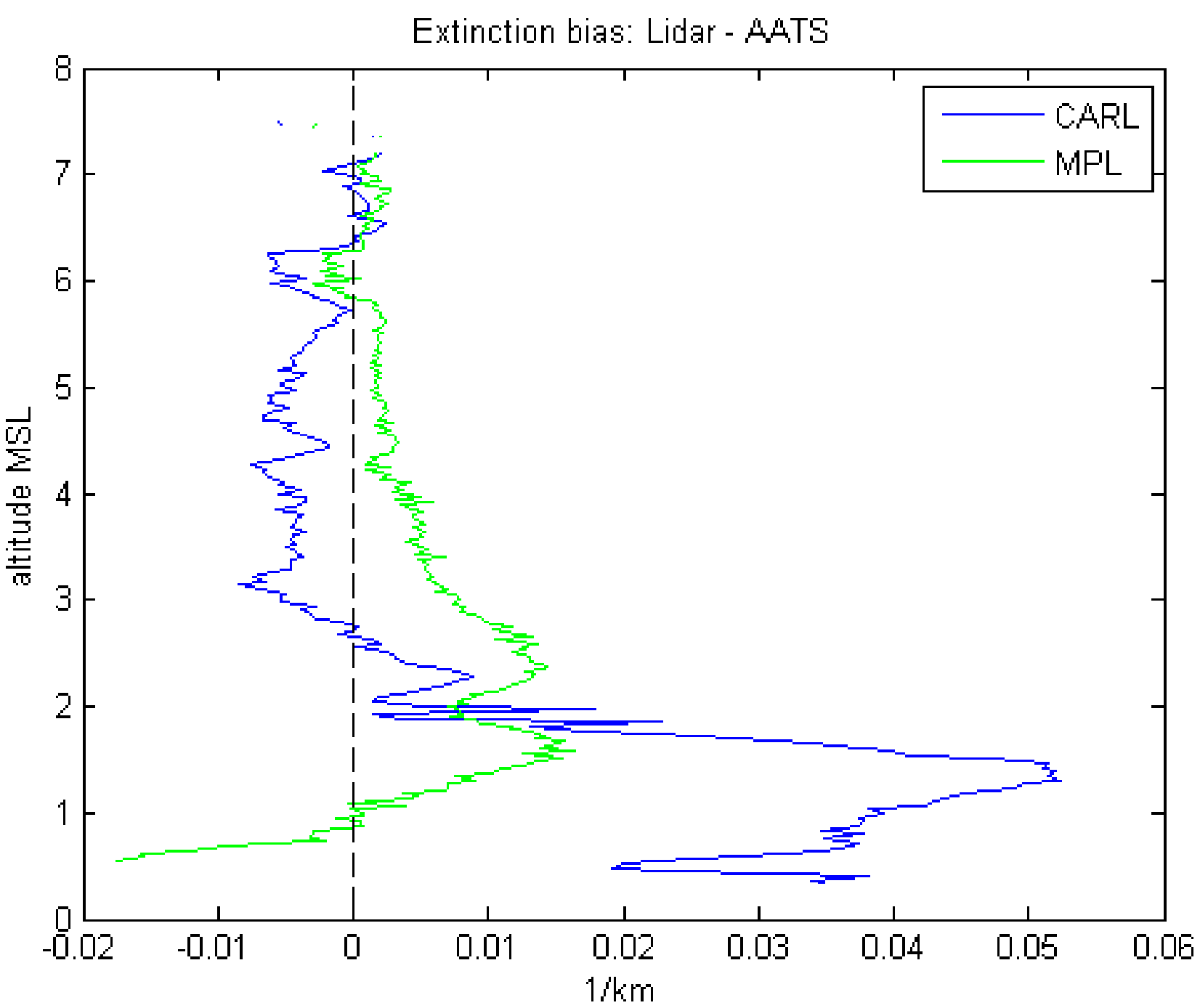


All data points over SGP
30 m bins

Aerosol Extinction: AATS-14 and MPL @ 523 nm

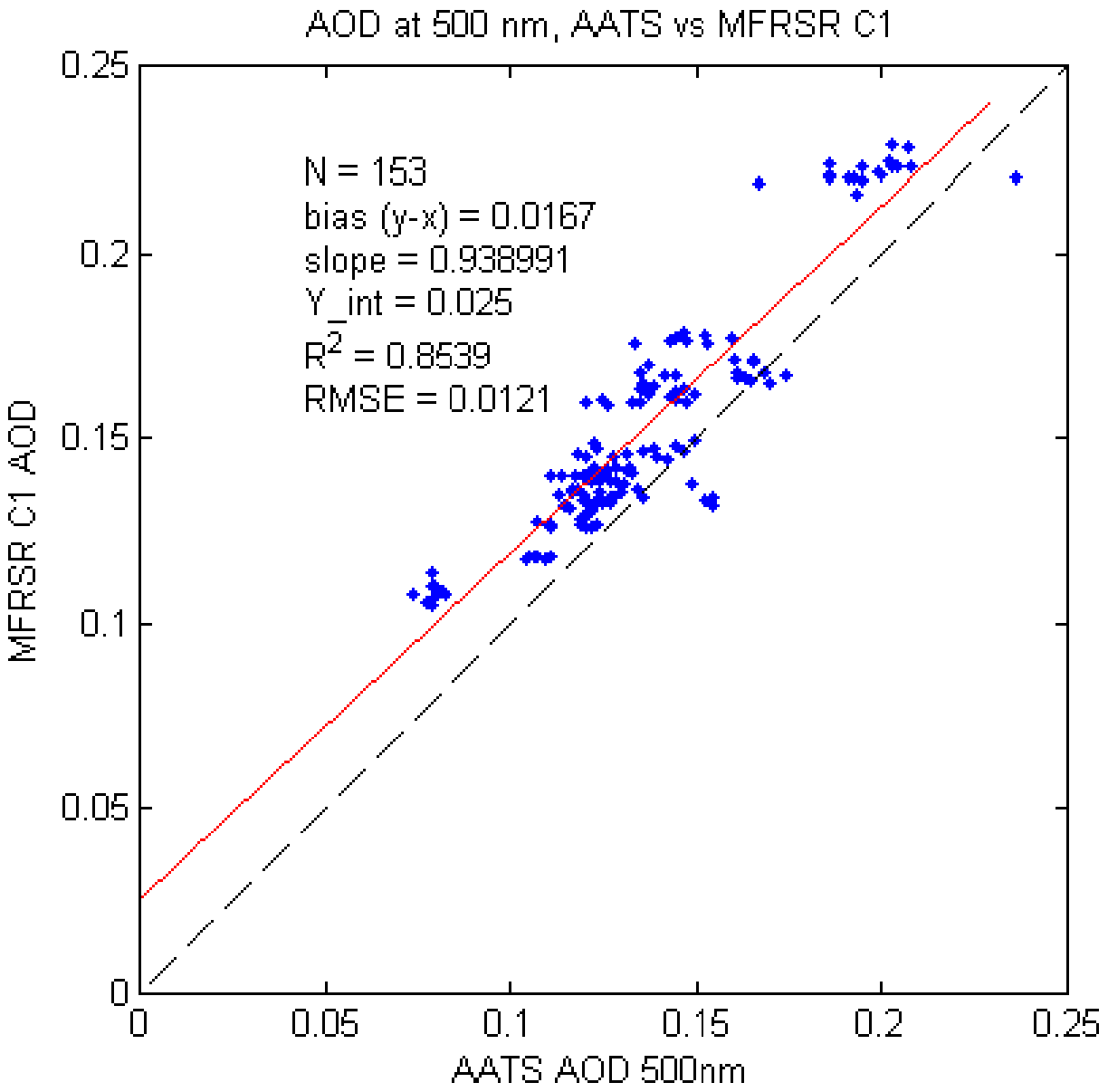


All data points over SGP
30 m bins
Distance from Lidar <30 km


Extinction bias: Lidar - AATS
CARL
MPL
altitude MSL
1/km
0
1
2
3
4
5
6
7
8
-0.02
-0.01
0
0.01
0.02
0.03
0.04
0.05
0.06

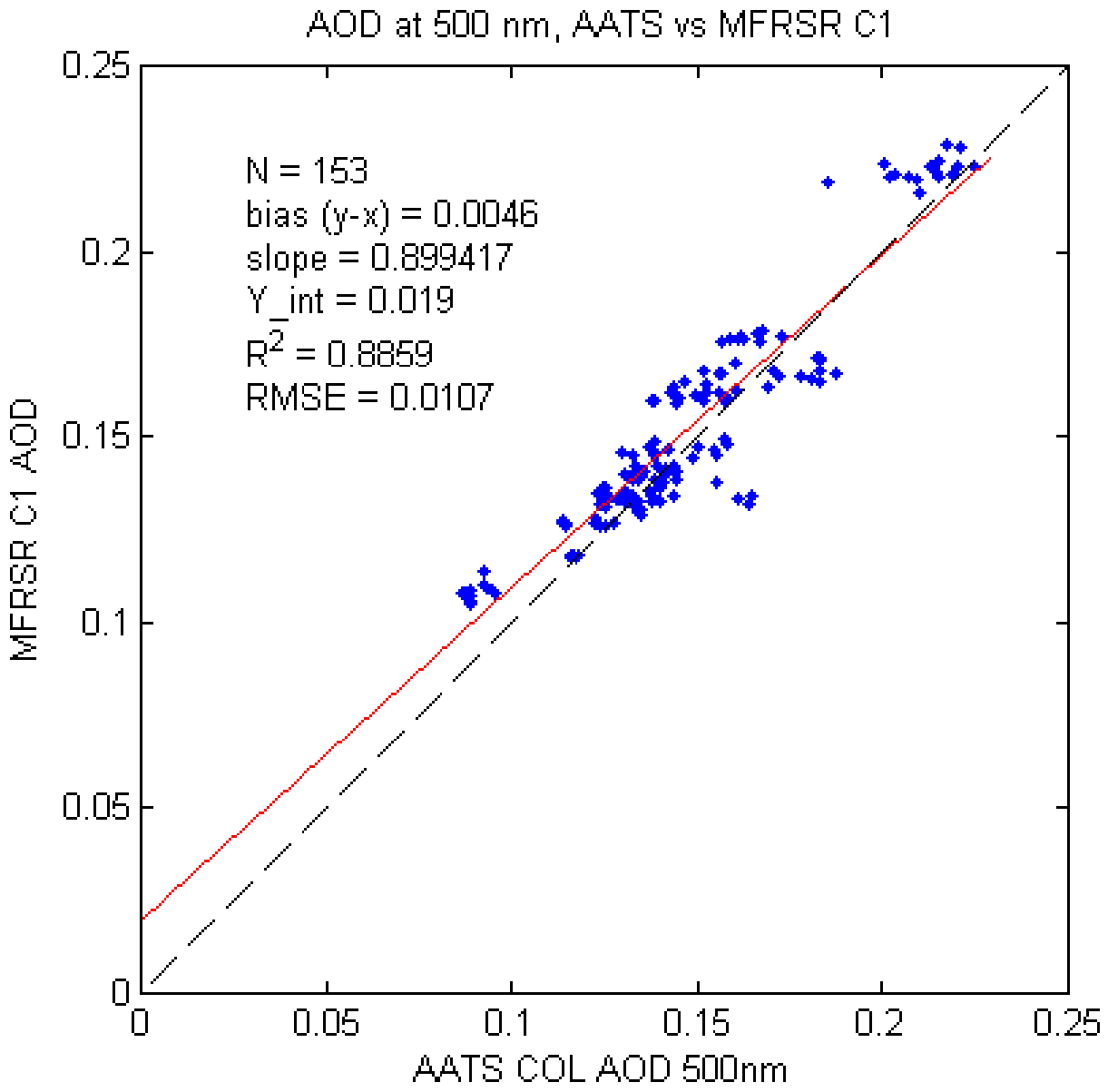
Fly-by AOD comparison

Raw



Fly-by AOD comparison

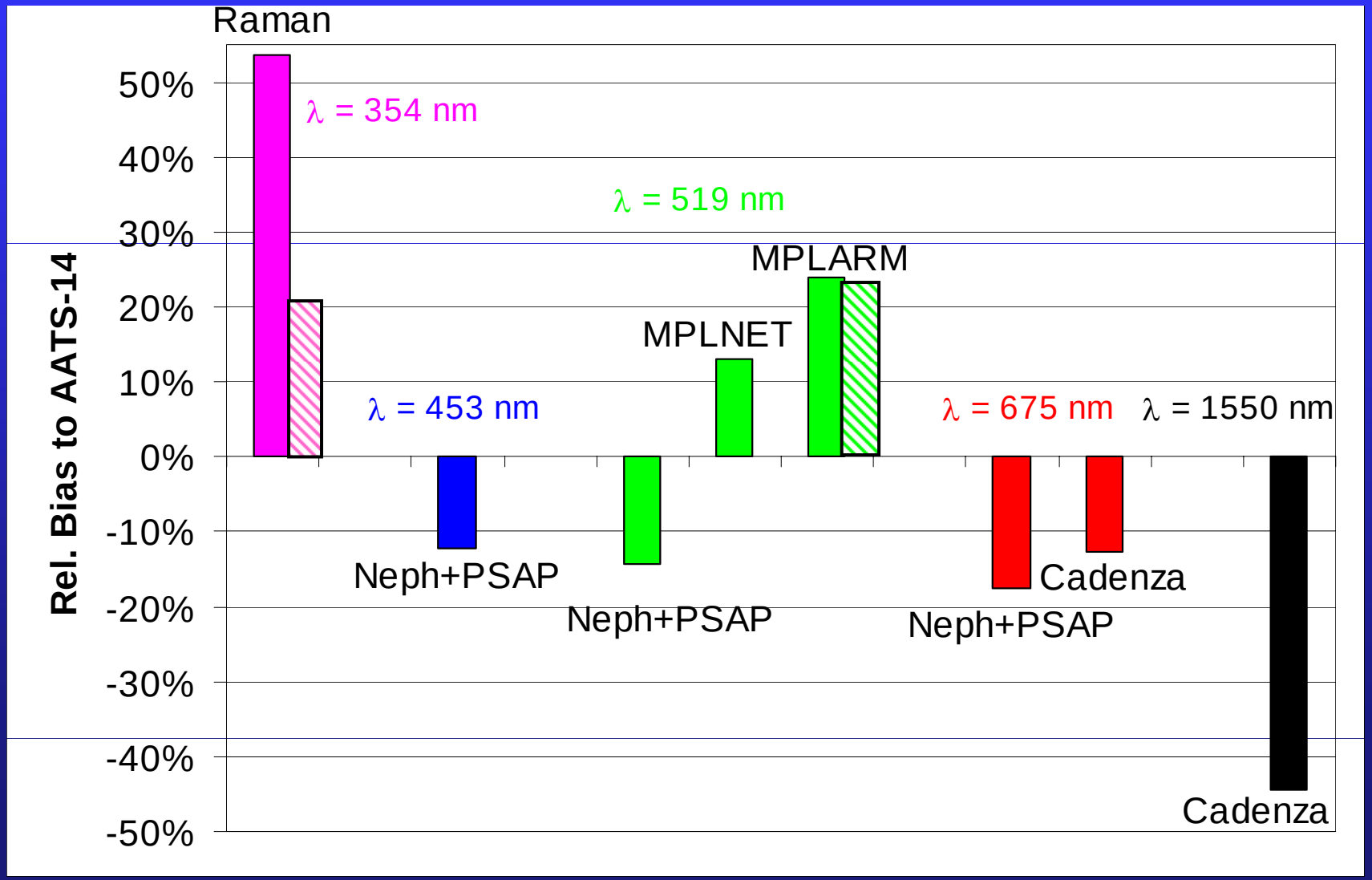
Corrected for flight altitude above ground



ALIVE: Improvement in Lidar Extinction

(ALIVE hatched bars) over situation in 2003 (Aerosol IOP, solid bars)

Schmid, Ferrare, Flynn, Turner



Next Steps

- Comparison with CARL N_2 and "married" extinction retrievals
- Comparison with C206 extinction
- Publication of this and other efforts