



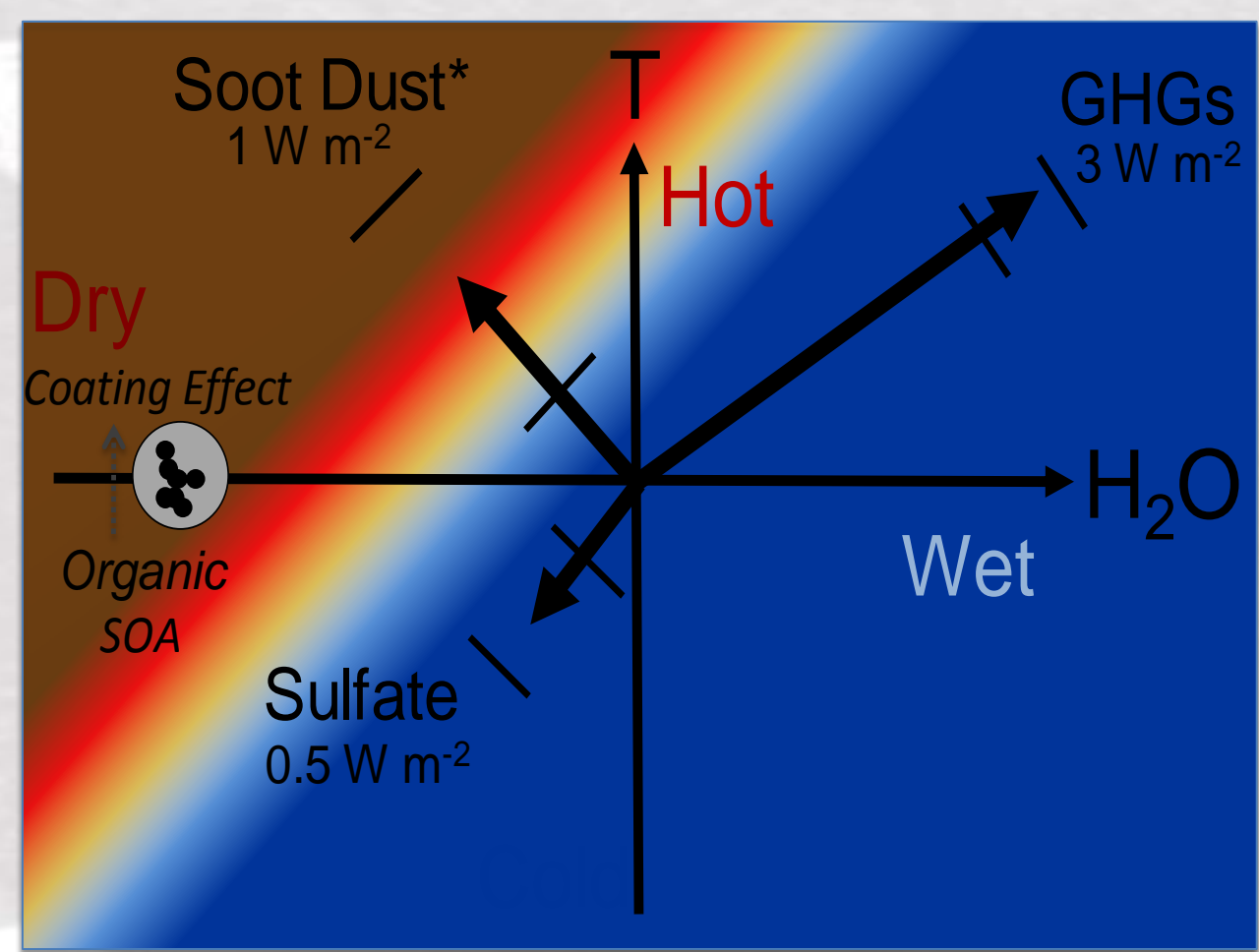
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## Introduction

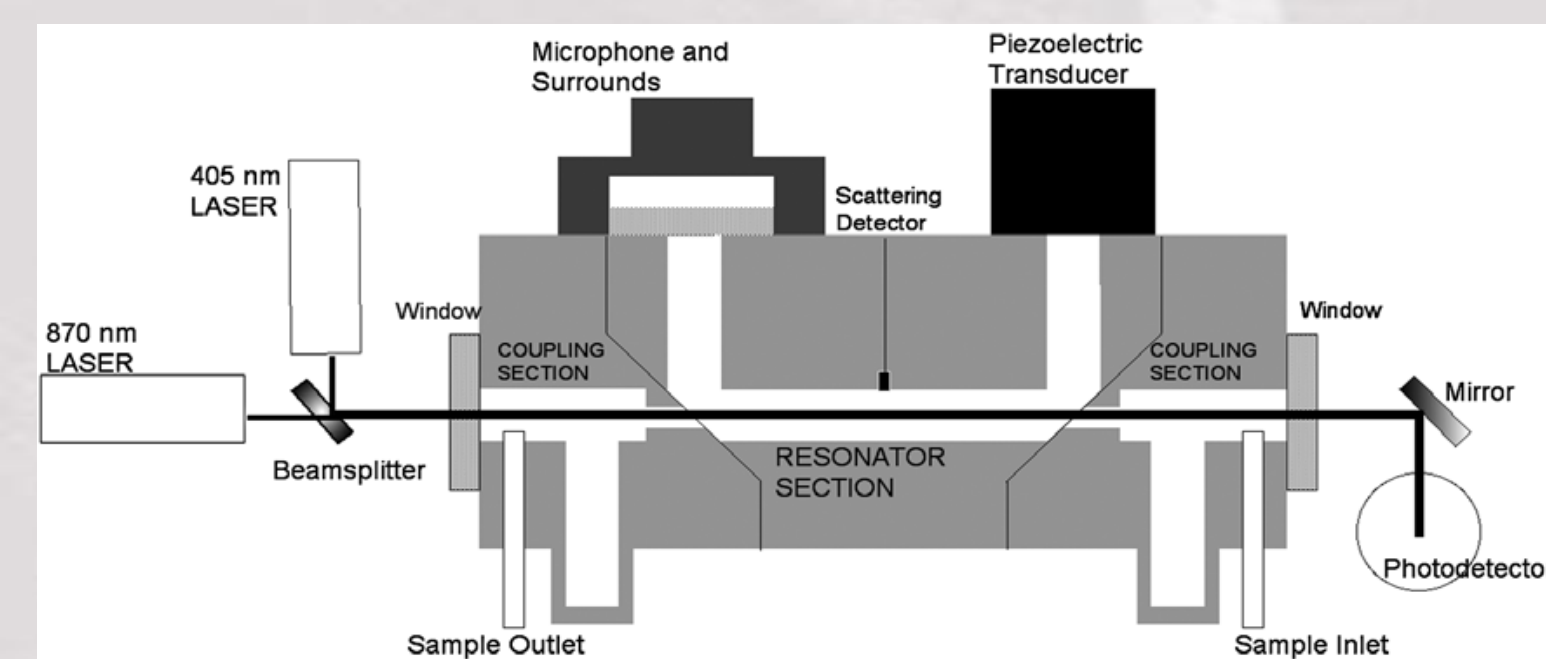
- Absorbing aerosols:
  - Warm the atmosphere (unlike most aerosols that are cooling)
  - Most uncertain factor in GCM's? (~0.4 - 1.2 W m<sup>-2</sup>)
- Absorption can lower SSA and contribute to a warmer and drier atmosphere



- How do aerosol optical properties differ at different locations and at different times of the year at a fixed site?

## PASS-3

- PhotoAcoustic Soot Spectrometer (PASS-3, DMT): Direct, online measurement of absorption



- 405, 532, 781 nm
- Aerosol Absorption ( $\beta_{abs}$ ) and Scattering ( $\beta_{sca}$ ) Coefficient s
- Single Scatter Albedo (SSA)

$$SSA = \frac{\beta_{sca}}{(\beta_{sca} + \beta_{abs})}$$

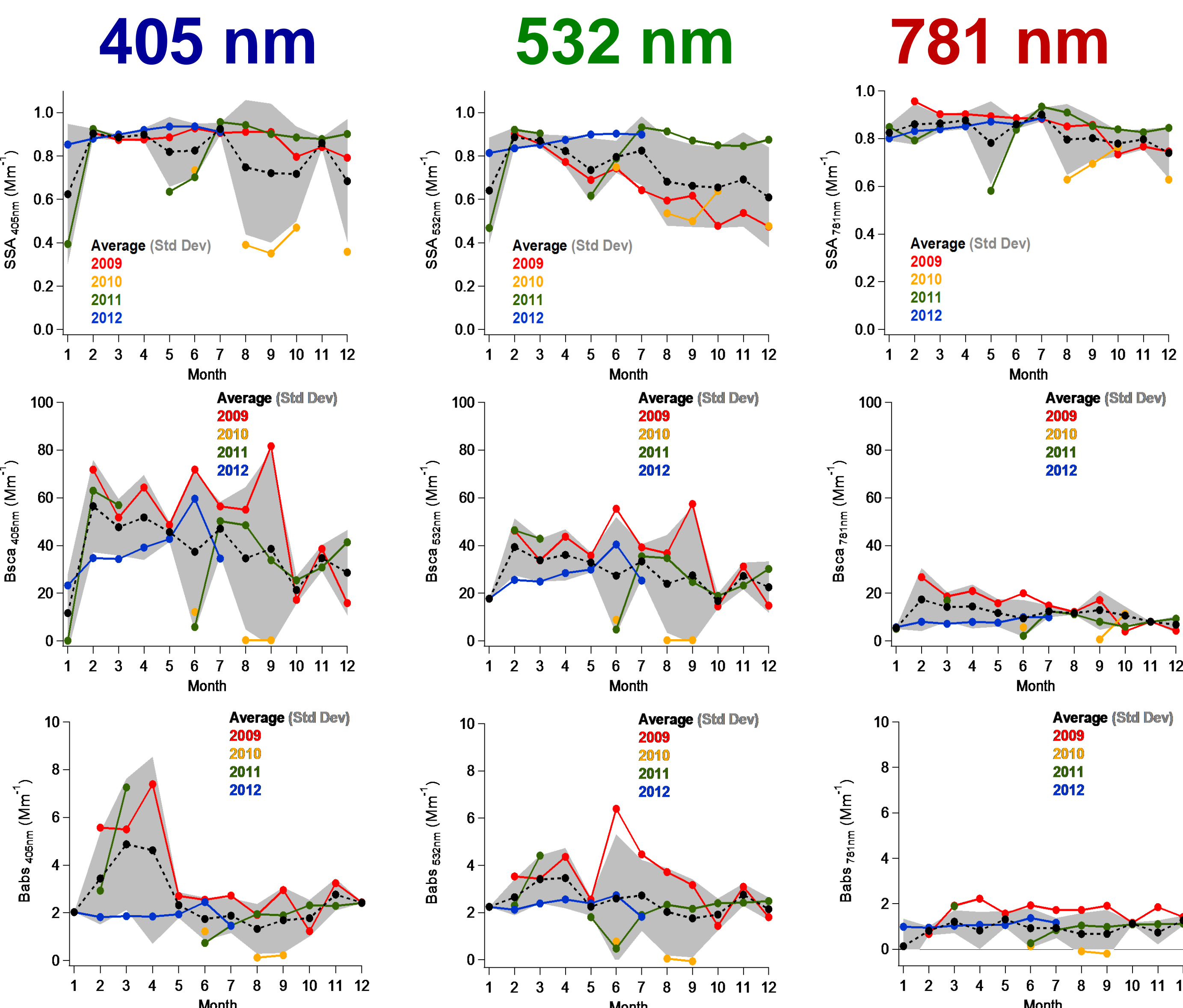
- Angstrom Exponent (AE)

$$\frac{\beta_{\lambda}}{\beta_{\lambda_0}} = \left(\frac{\lambda}{\lambda_0}\right)^{AE}$$

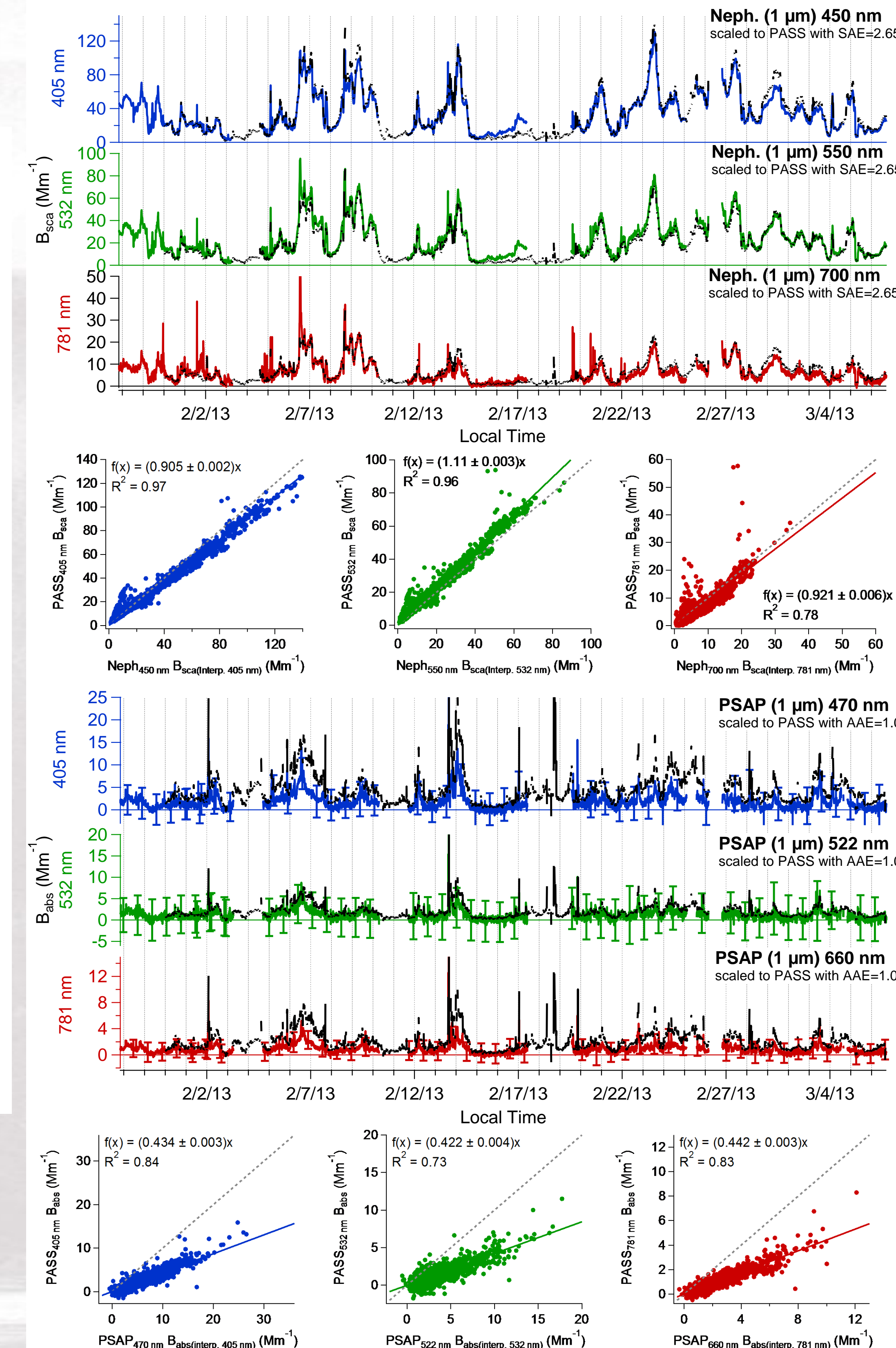
## Southern Great Plains (SGP: Lamont, OK)

- PASS-3 data from Feb. 2009 – Present
- Summary of Annual Averages (below) July 2011-2012

aospass3w: <http://dx.doi.org/10.5439/1046187>



	$B_{sca}$ :	$B_{abs}$ :	SSA:
405 nm:	44.5 ± 18.0,	2.7 ± 1.6,	0.88 ± 0.05
532 nm:	32.1 ± 12.1,	2.7 ± 1.1,	0.78 ± 0.14
781 nm:	11.4 ± 5.8,	1.3 ± 0.48,	0.85 ± 0.05



## Conclusions

- Jan. '13 Instrument Upgrade to SGP PASS-3 resulted in an improvement to the Absn. uncertainty by factors of **5.8, 3.8, 1.3**.
- SGP PASS-3 compares well with Nephelometer Scattering and trends with PSAP Absorption x0.4.
- MAOS measurements from PACE and TCAP I/II indicate low pollution locations.
- AAE of 1.0 at SGP\* indicates BC as the dominant absorber, in contrast to PACE (AAE=2.1), which implicates the presence of other absorbing species, e.g. brown carbon.

## Future Work

- Further and improved comparisons with co-located instrumentation at all AOS sites
- Next MAOS deployment: Brazil (GoAMAZON 2014)
- Continued mentor monitoring of instruments and measurements to ensure long term stability and data quality.

## References

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- Flowers, B.F. et al., ACP, 10,10387-98, 2010.
- Lack, D.A., et al. AS&T, 40, 697-708, 2006.
- Lack, D.A. et al. PNAS, 109, 14802-14807, 2012.
- Data were obtained from the Atmospheric Radiation Measurement (ARM) Program sponsored by the U.S. Department of Energy, Office of Science, Office of Biological and Environmental Research, Climate and Environmental Sciences Division.

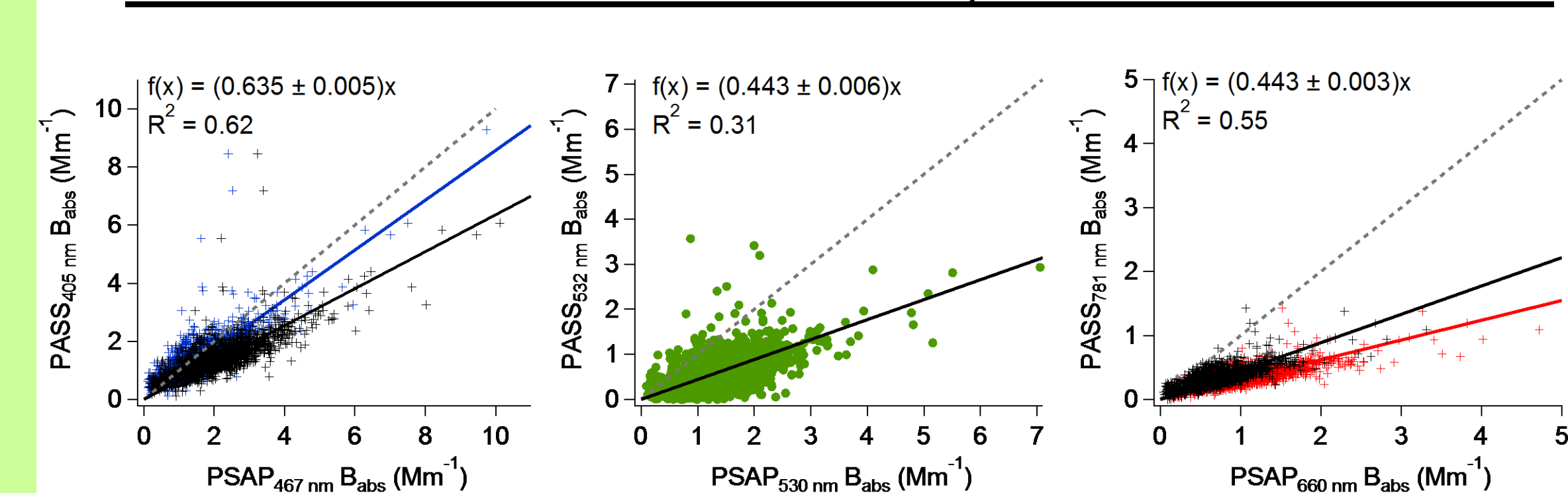
## Mobile AOS (MAOS)

### Pajarito Aerosol Coupling to Ecosystems (PACE: Los Alamos, NM)

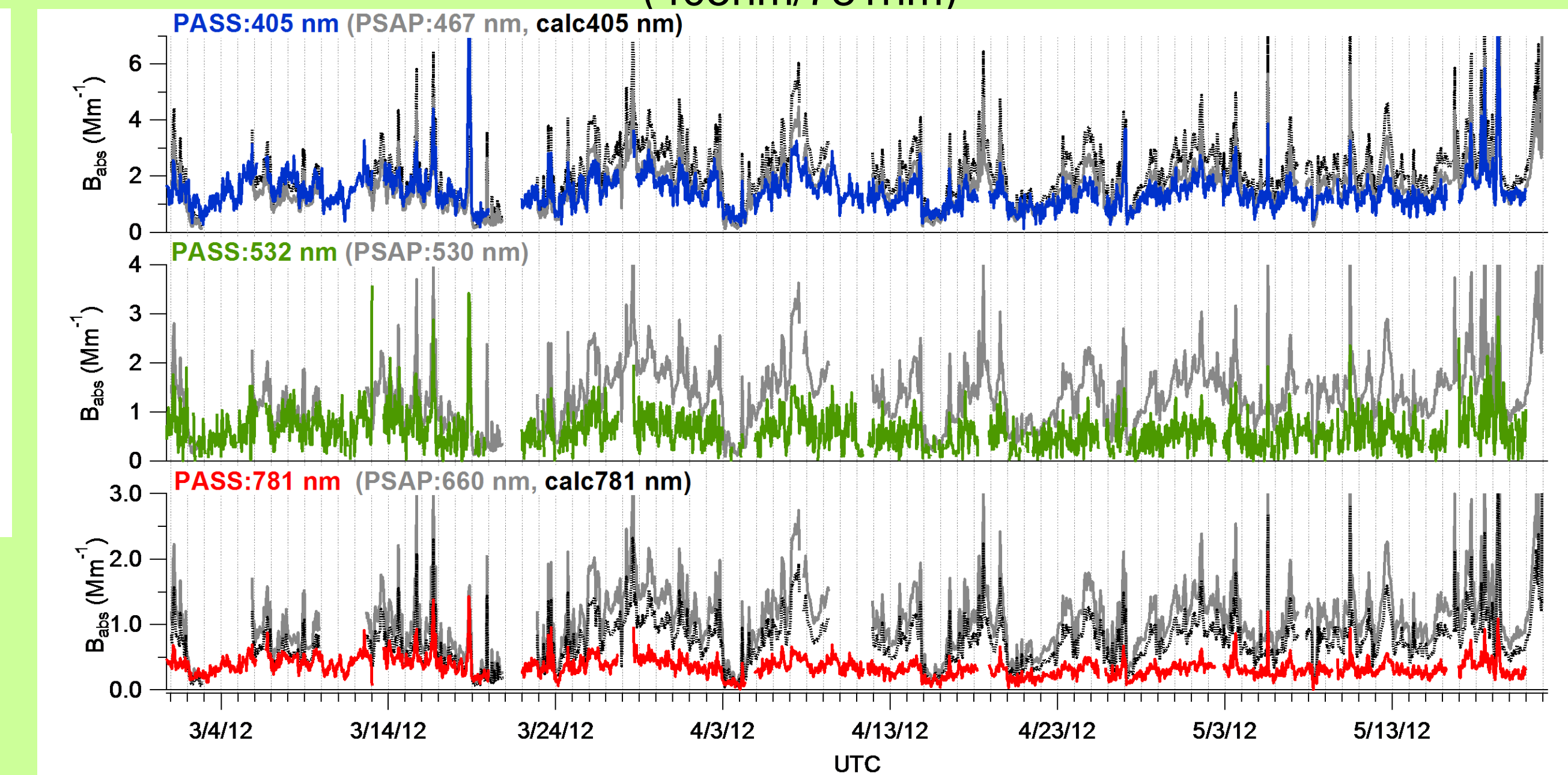
Winter Pine and Juniper Forest

- Average  $B_{sca}$ ,  $B_{abs}$ , SSA:
- 11.5 ± 7.6, 1.3 ± 0.7, 0.87 ± 0.07**
- 8.1 ± 5.4, 0.6 ± 0.4, 0.91 ± 0.07**
- 5.0 ± 4.0, 0.3 ± 0.2, 0.90 ± 0.09**
- $AAE_{(405nm/781nm)} = 2.1 ± 0.6$
- $SAE_{(405nm/781nm)} = 1.4 ± 0.6$
- $EAE_{(405nm/781nm)} = 1.4 ± 0.5$

PASS vs PSAP: AAE=2.1, PSAP ~2x PASS



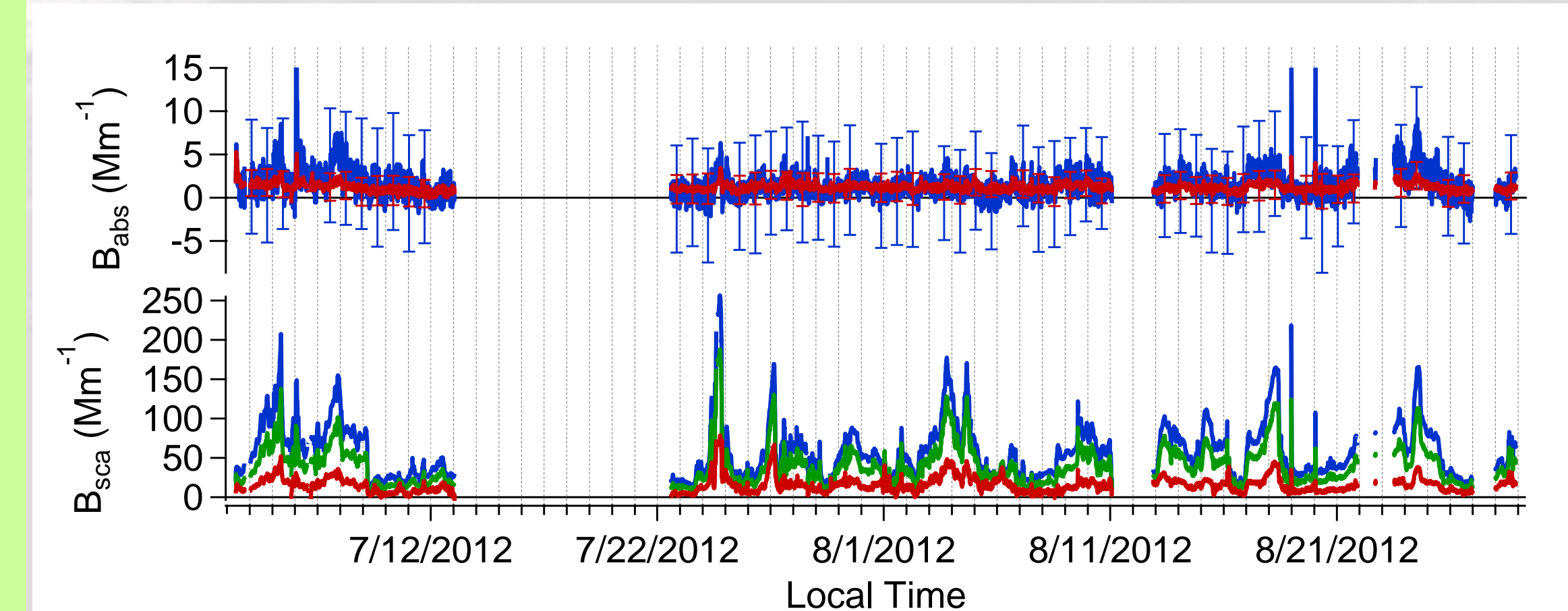
- First order comparison shows that PASS3 and PSAP (S. Springston, BNL) trend together
- PSAP ~2x PASS requires further comparison



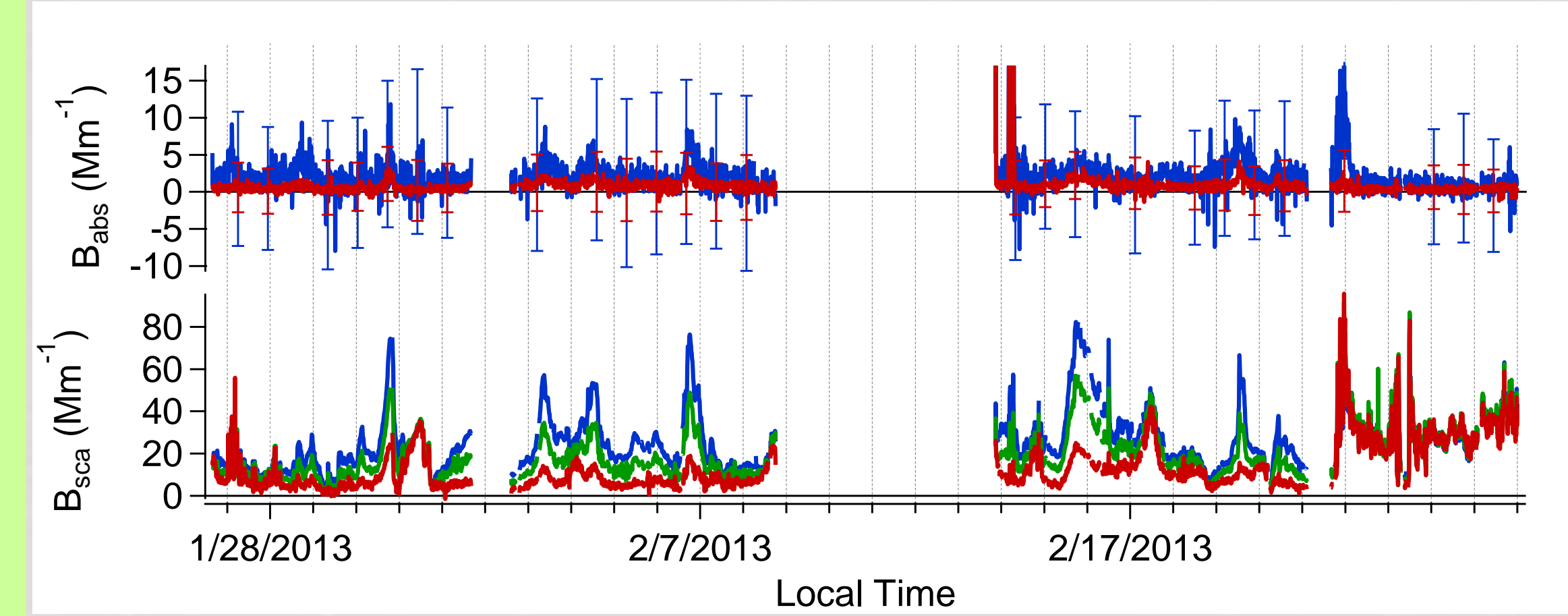
• PACE: <http://www.arm.gov/campaigns/osc2011pace>

### Two-Column Aerosol Project (TCAP I/II @ Cape Cod, MA)

• TCAP I: Summer 2012



• TCAP II: Winter 2013



- Absorption is low during both IOP's:
  - TCAP I: **1.6, 1.2 Mm<sup>-1</sup>**
  - TCAP II: **2.1, 0.81 Mm<sup>-1</sup>**
- 532 nm Babs high uncertainty (~10-20 Mm<sup>-1</sup>)

noaos datasets: <http://dx.doi.org/10.5439/1025259>