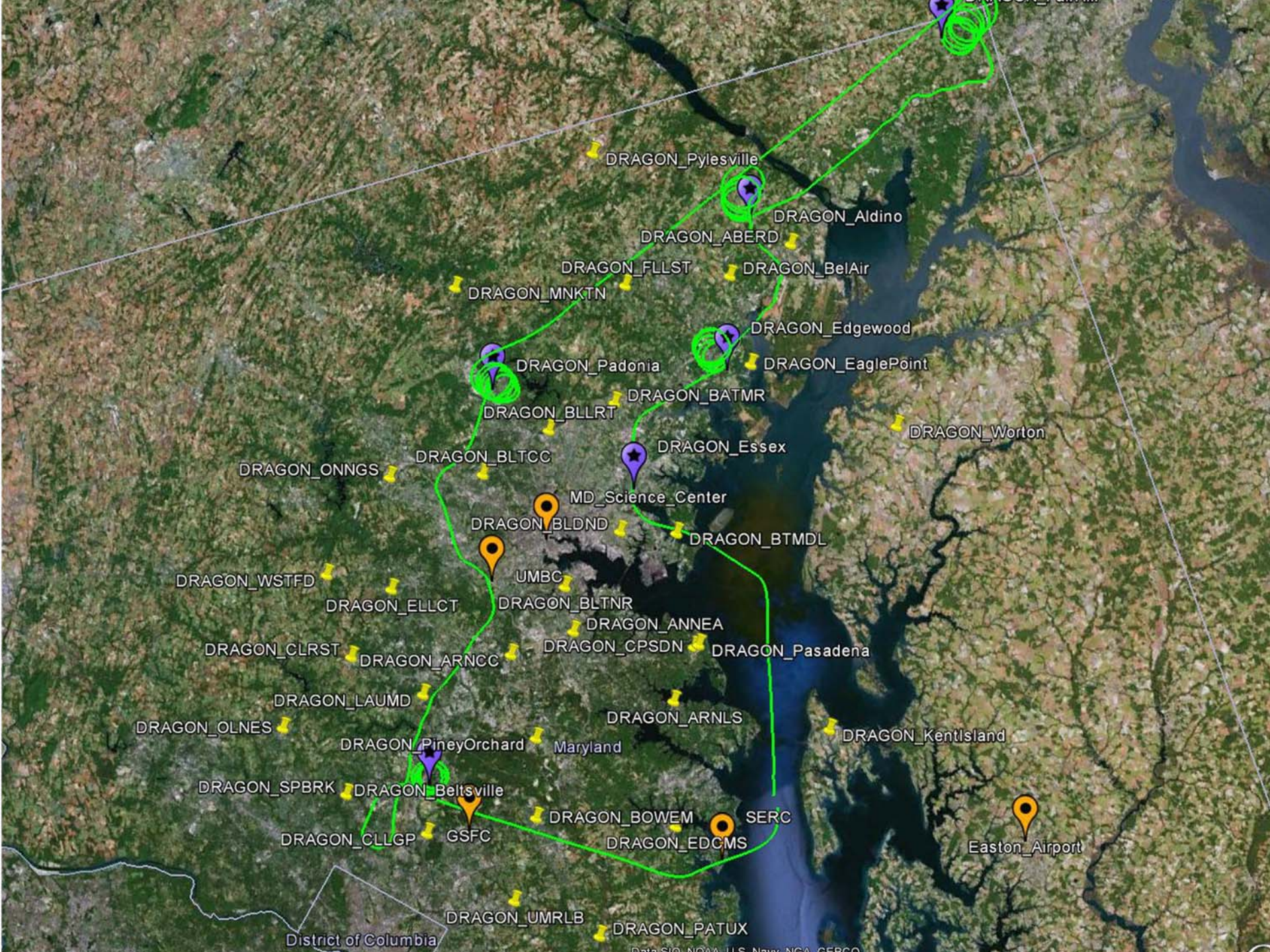
AERONET - DRAGON

Summary for Science Team Mtg

Feb. 14-16

Objectives/assessments

- Compare AERONET RS and *in situ* aerosol properties for various aerosol types
- Spatially oversample to accurately characterize aerosol properties
- AOD ±0.01 to 0.02
- SSA ±0.03


DRAGON_Pylesville
DRAGON_Aldino
DRAGON_ABERD
DRAGON_FLLST
DRAGON_BelAir
DRAGON_MNKTN
DRAGON_Edgewood
DRAGON_Padonia
DRAGON_EaglePoint
DRAGON_BATMR
DRAGON_BLLRT
DRAGON_Worton
DRAGON_Essex
DRAGON_BLTCC
DRAGON_ONNGS
MD_Science_Center
DRAGON_BLDND
DRAGON_BTMDL
UMBC
DRAGON_WSTFD
DRAGON_ELLCT
DRAGON_BLTNR
DRAGON_ANNEA
DRAGON_CLRST
DRAGON_ARNCC
DRAGON_CPSDN
DRAGON_Pasadena
DRAGON_LAUMD
DRAGON_ARNLS
DRAGON_OLNES
DRAGON_KentIsland
DRAGON_PineyOrchard
Maryland
DRAGON_SPBRK
DRAGON_Beltsville
DRAGON_BOWEM
SERC
DRAGON_CLLGP
GSFC
DRAGON_EDCMS
Easton_Airport
DRAGON_UMRLB
DRAGON_PATUX
District of Columbia

Data Quality & Site Summary

- 44 Sites Max and all calibrated as of Oct, 2011
- 41 Quality Assured (Level 2) as of Nov, 28, 2011
- Five Core sites (excluding Padonia) QA'd
- DRAGON June 15 –Aug 15
- DRAGON-DISCOVER AQ-July 30-44 stations

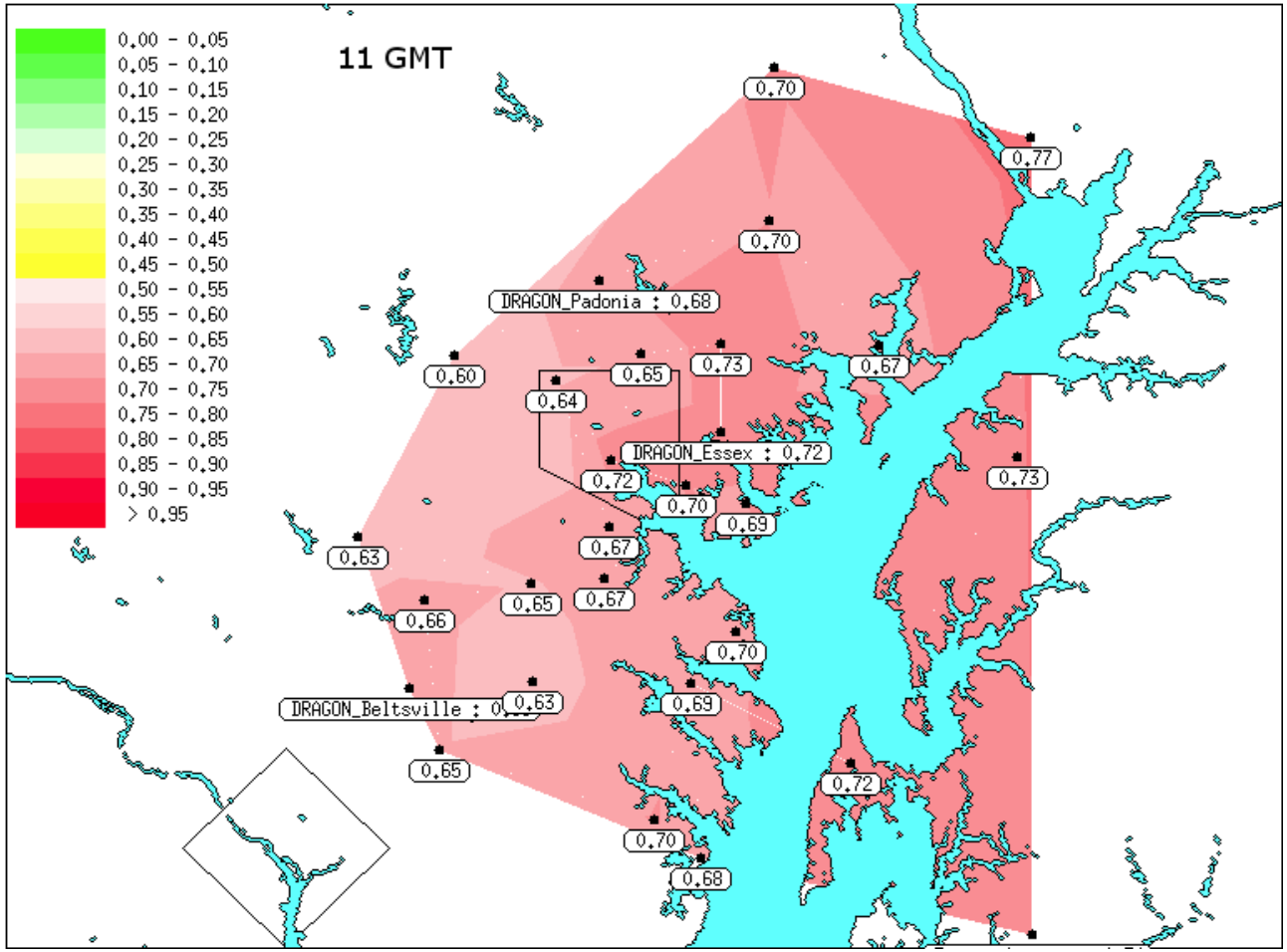
DRAGON DATA Access

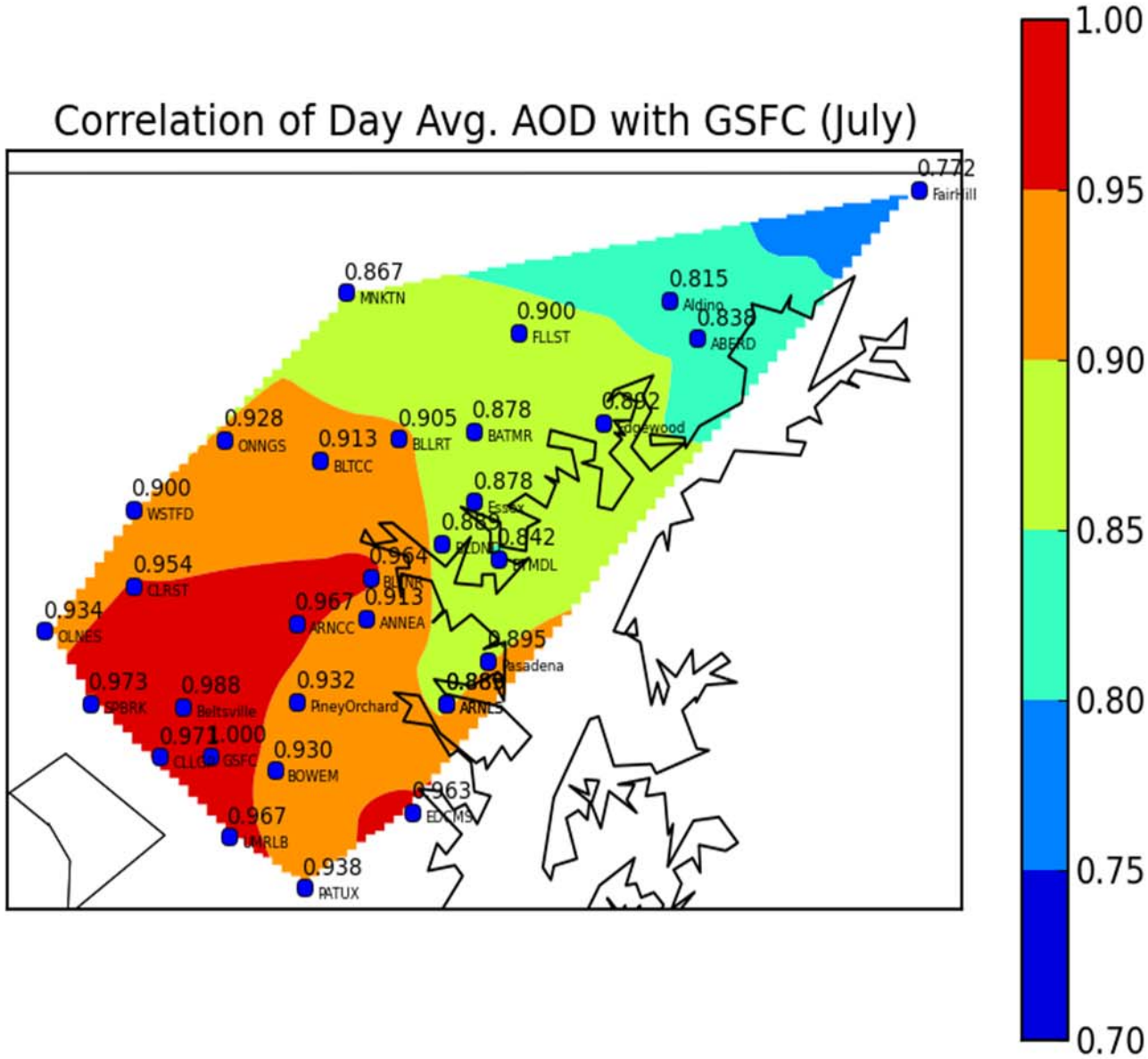
- AERONET web site: http://aeronet.gsfc.nasa.gov/
- DRAGON:http://aeronet.gsfc.nasa.gov/new_web/dragon.html.
- Global download:
- ‘Level 1’ no cloud screening
- ‘Level 1.5 w/ cloud screening
- QA: ‘Level 2’
  - AOD related parameters for full range of AOD
  - SDA: fine and coarse AOD
  - SSA, Complex index for AOD > 0.4 at 440 nm

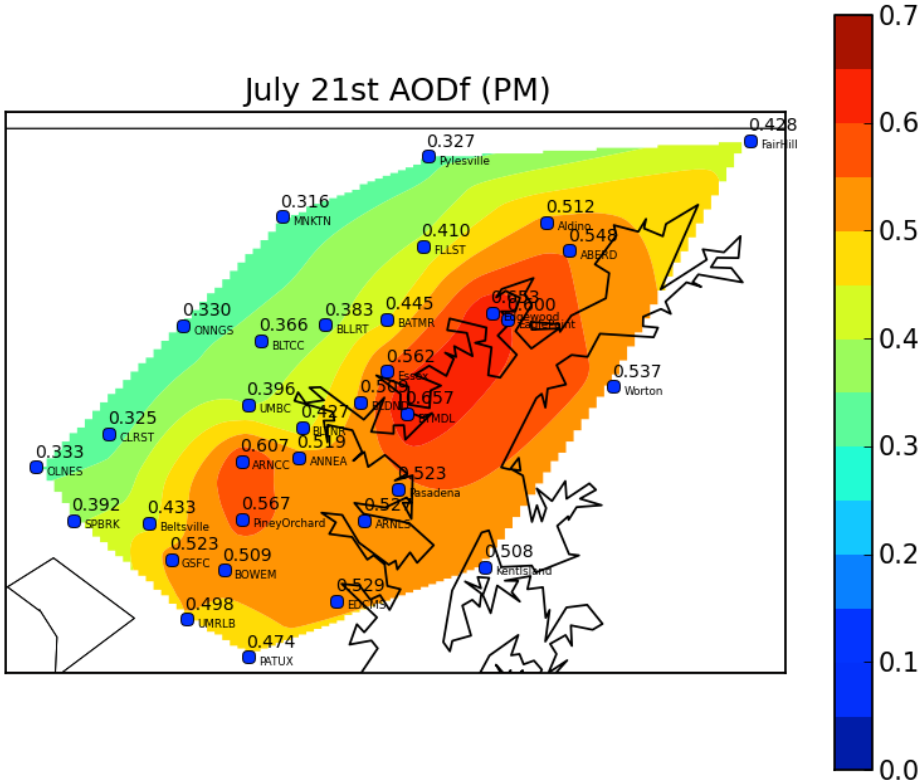
Mobile lidar and Sun Photometer

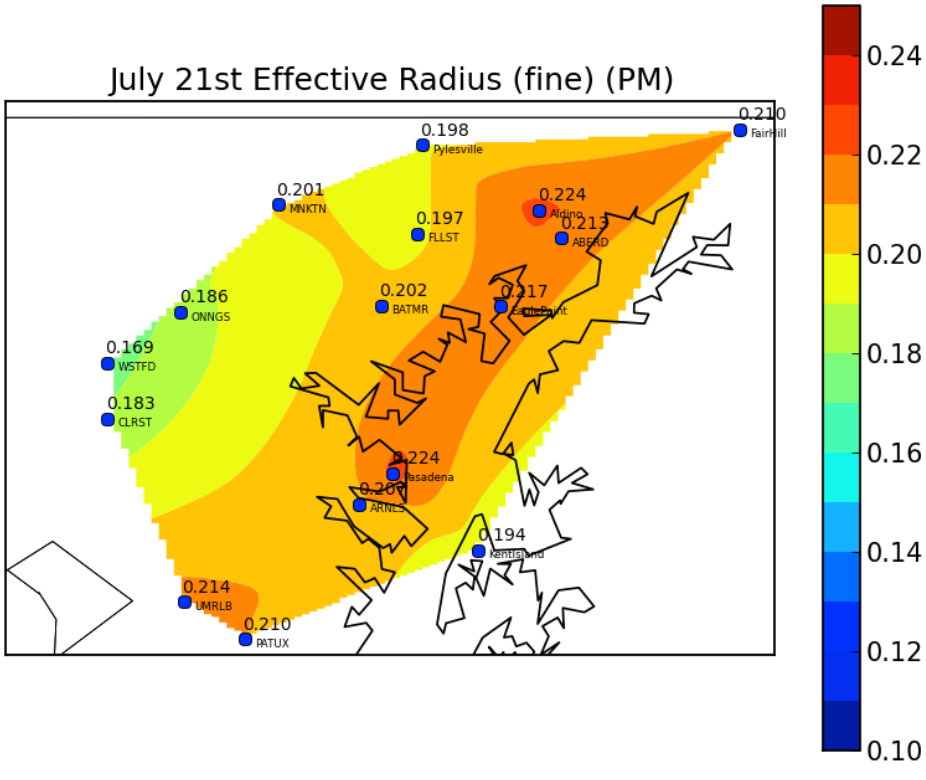
- Nominally GSFC to Fairhill (June 30, July 1, 2, 5, 6, 7, 8, 10, 11, 14, 16, 17, 18, 19, 20, 21, 22)
- Quicklooks under AERONET D-AQ webpage
- Overlap correction applied, not yet QA'd
- PI Philippe Goloub, LOA, Lille, FR <Philippe.Goloub@univ-lille1.fr>
- Data access from Lille and later via Berkoff

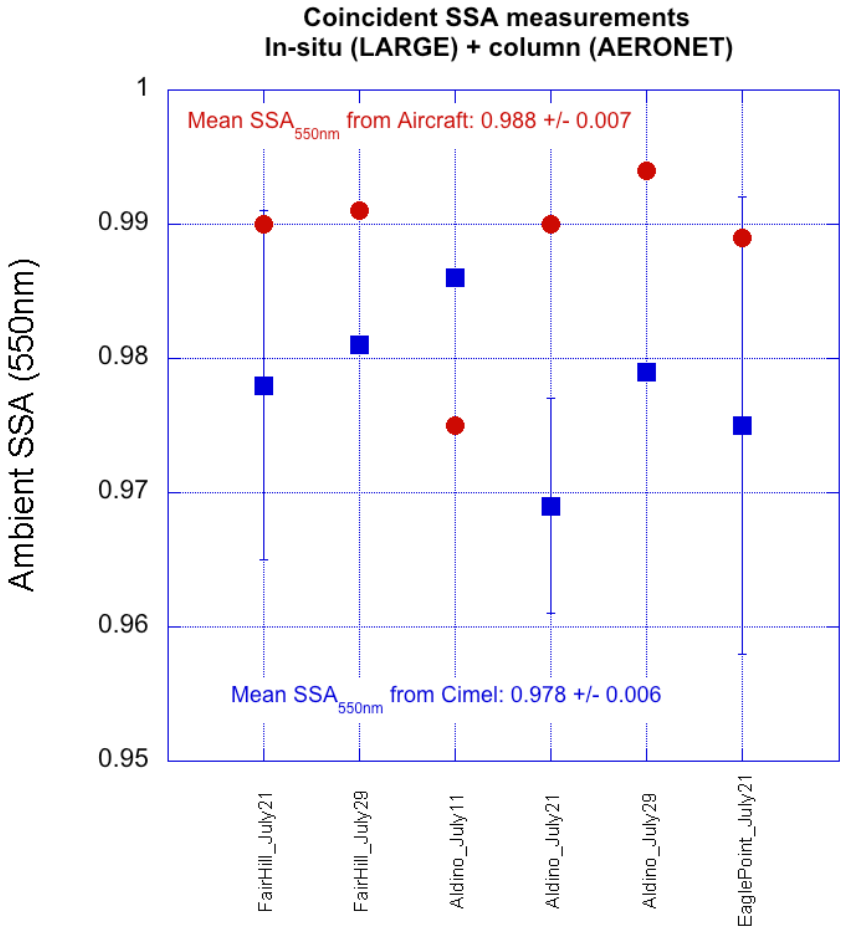
Hourly AOD (500 nm) July 21

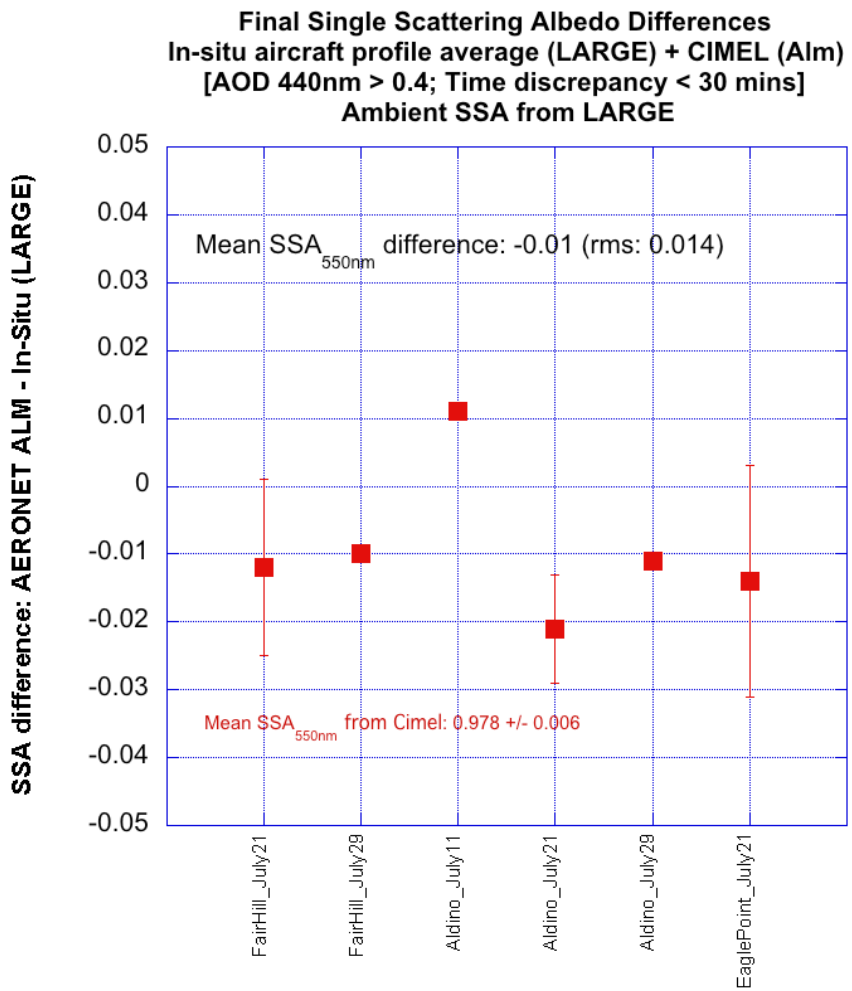


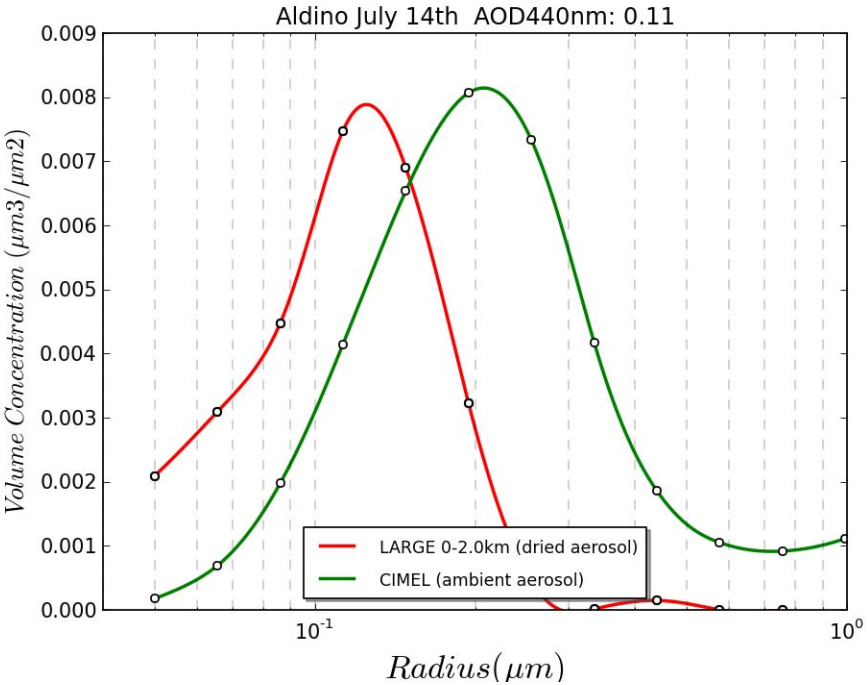

Correlation of Day Avg. AOD with GSFC (July)
0.772
FairHill
0.867
MNKTN
0.815
Aldino
0.900
FLLST
0.838
ABERD
0.928
ONNGS
0.913
BLTCC
0.905
BLLRT
0.878
BATMR
0.892
Edgewood
0.900
WSTFD
0.878
Essex
0.889
0.842
0.954
CLRST
0.964
0.934
OLNES
0.967
ARNCC
0.913
ANNEA
0.895
Pasadena
0.973
0.988
Beltsville
0.932
PineyOrchard
0.971
1.000
GSFC
0.930
BOWEM
0.963
0.967
0.938
PATUX
1.00
0.95
0.90
0.85
0.80
0.75
0.70

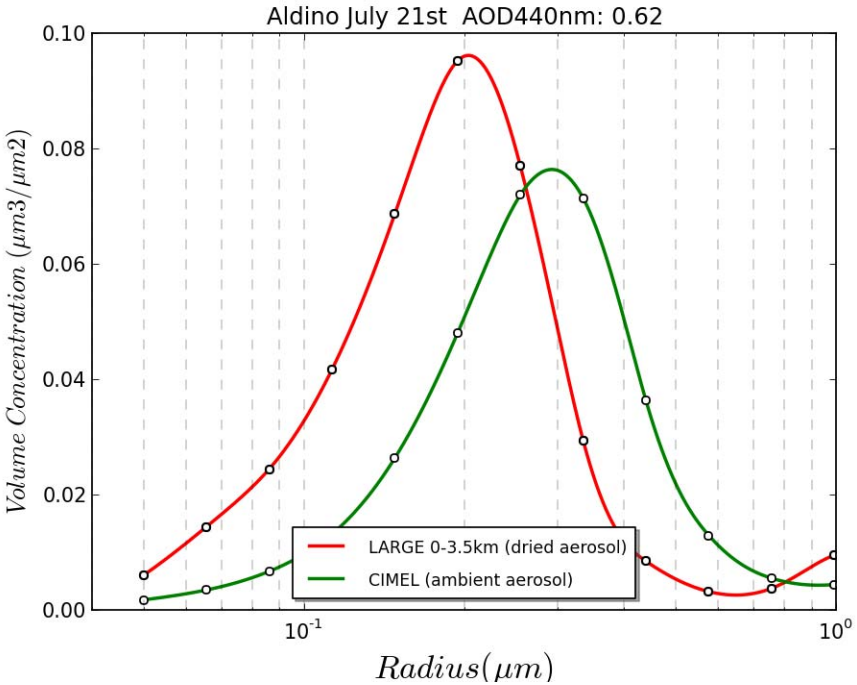

July 21st AODf (PM)
0.428
FairHill
0.327
Pylesville
0.316
MNKTN
0.512
Aldino
0.410
FLLST
0.548
ABERD
0.330
ONNGS
0.366
BLTCC
0.383
BLLRT
0.445
BATMR
0.562
Essex
0.537
Worton
0.396
UMBC
0.325
CLRST
0.333
OLNES
0.607
ARNCC
0.519
ANNEA
0.523
Pasadena
0.392
SPBRK
0.433
Beltsville
0.567
PineyOrchard
0.523
GSFC
0.509
BOWEM
0.508
Kentisland
0.529
0.498
UMRLB
0.474
PATUX
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0


July 21st Effective Radius (fine) (PM)
0.210
FairHill
0.198
Pylesville
0.201
MNKTN
0.224
Aldino
0.197
FLLST
0.213
ABERD
0.186
ONNGS
0.202
BATMR
0.217
0.169
WSTFD
0.183
CLRST
0.224
Pasadena
0.194
Kentisland
0.214
UMRLB
0.210
PATUX
0.24
0.22
0.20
0.18
0.16
0.14
0.12
0.10

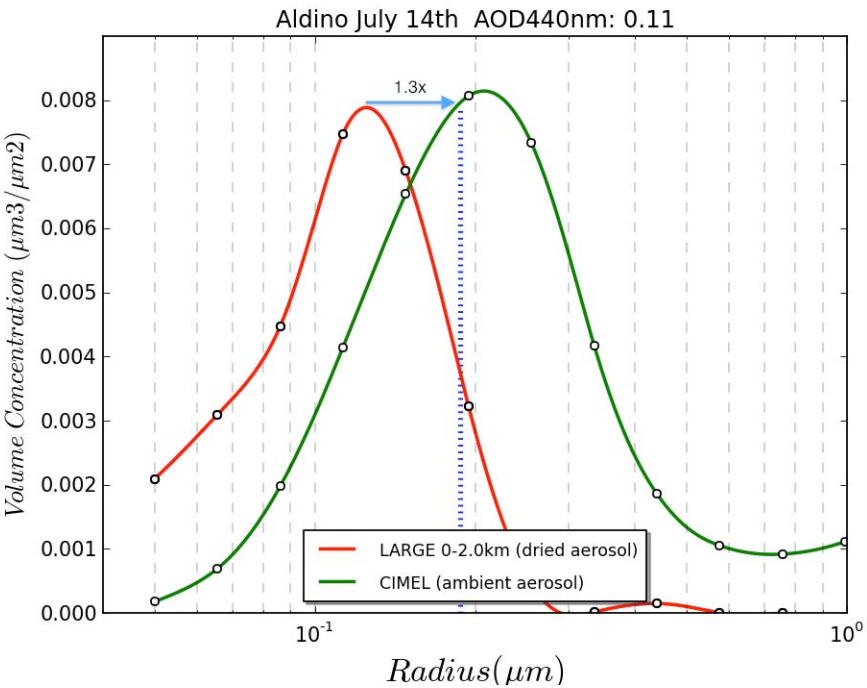

Coincident SSA measurements
In-situ (LARGE) + column (AERONET)
Ambient SSA (550nm)
Mean SSA550nm from Aircraft: 0.988 +/- 0.007
Mean SSA550nm from Cimel: 0.978 +/- 0.006
1
0.99
0.98
0.97
0.96
0.95
FairHill_July21
FairHill_July29
Aldino_July11
Aldino_July21
Aldino_July29
EaglePoint_July21

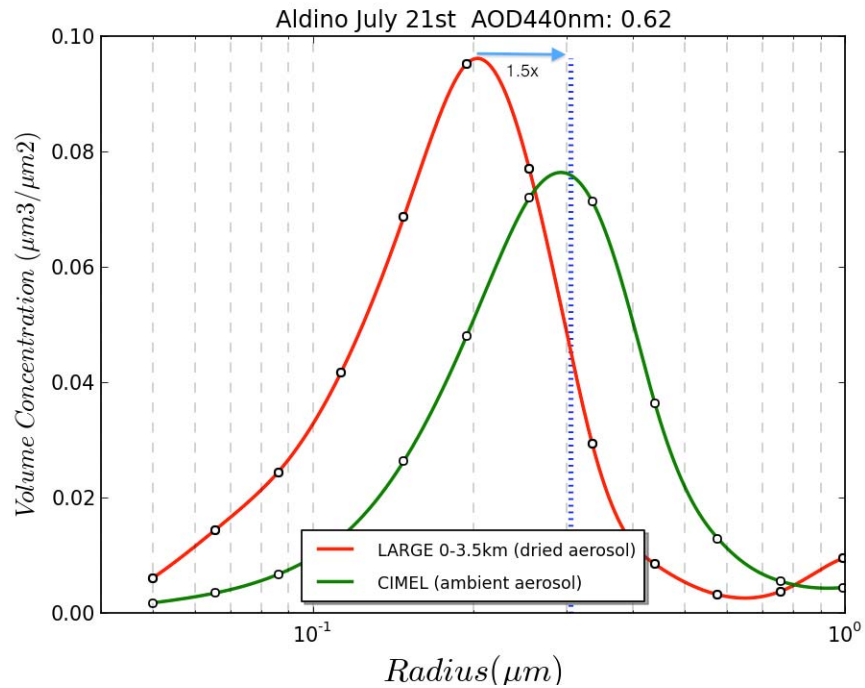

Final Single Scattering Albedo Differences
In-situ aircraft profile average (LARGE) + CIMEL (Alm)
[AOD 440nm > 0.4; Time discrepancy < 30 mins]
Ambient SSA from LARGE
SSA difference: AERONET ALM - In-Situ (LARGE)
Mean SSA550nm difference: -0.01 (rms: 0.014)
Mean SSA550nm from Cimel: 0.978 +/- 0.006
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05
FairHill_July21
FairHill_July29
Aldino_July11
Aldino_July21
Aldino_July29
EaglePoint_July21

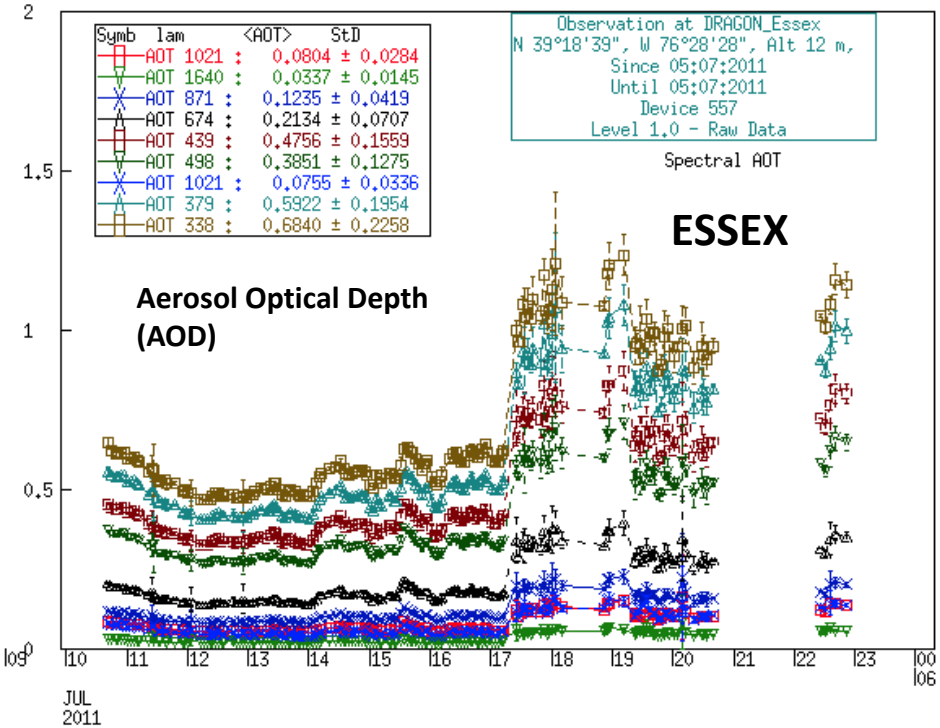

Aldino July 14th AOD440nm: 0.11
Volume Concentration ($\mu m3/\mu m2$)
Radius(μm)
LARGE 0-2.0km (dried aerosol)
CIMEL (ambient aerosol)
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
10^{-1}
10^{0}

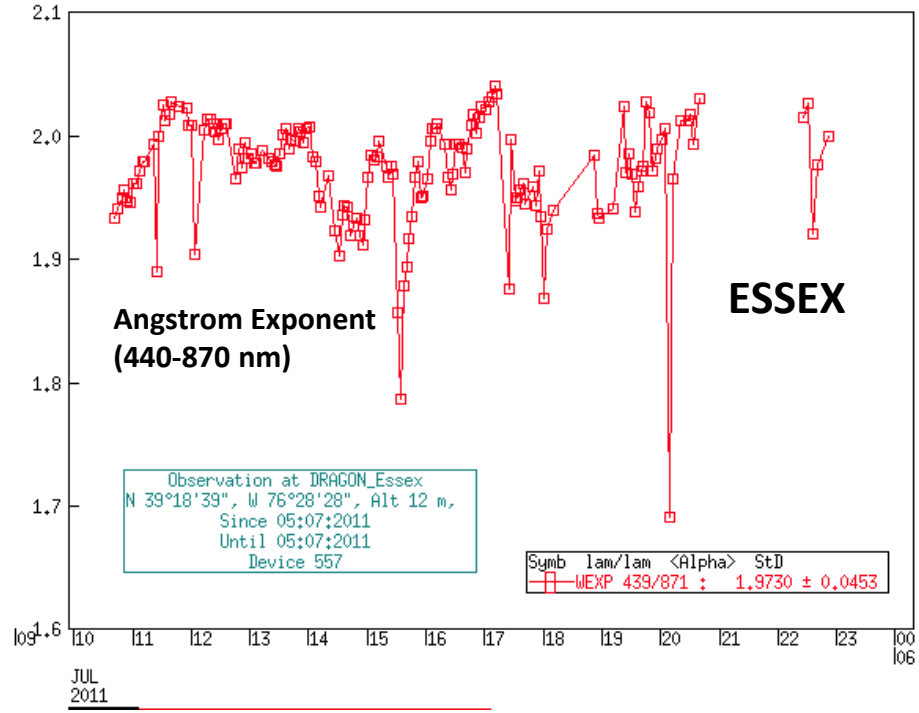

Aldino July 21st AOD440nm: 0.62
Volume Concentration ($\mu m3/\mu m2$)
Radius(μm)
LARGE 0-3.5km (dried aerosol)
CIMEL (ambient aerosol)
0.10
0.08
0.06
0.04
0.02
0.00
10^{-1}
10^{0}

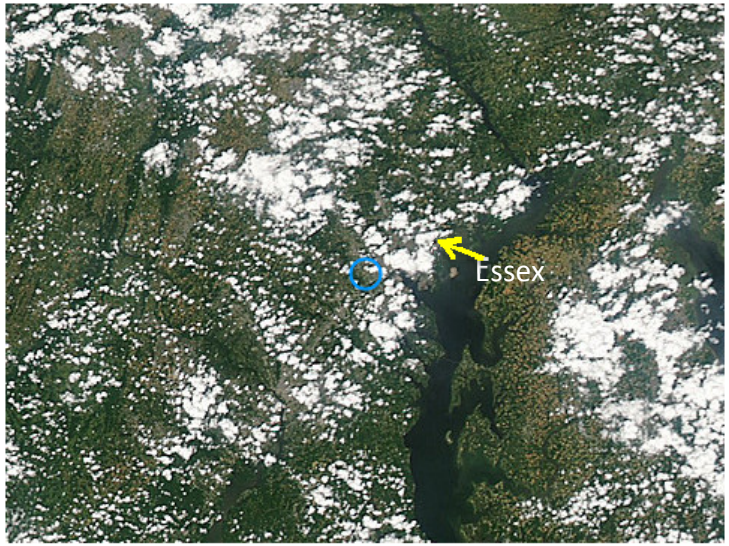
Humidification







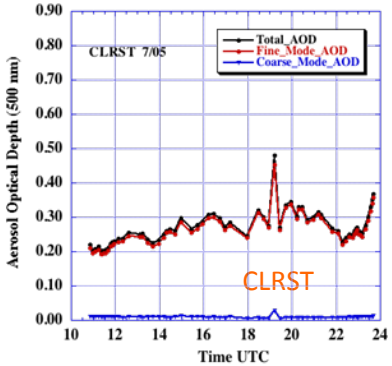


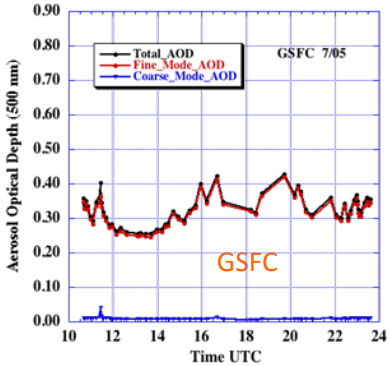


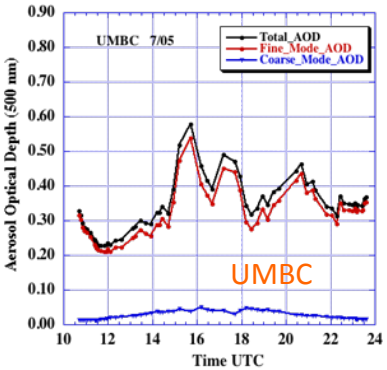
MODIS Images: 2000m 1000m 500m 250m

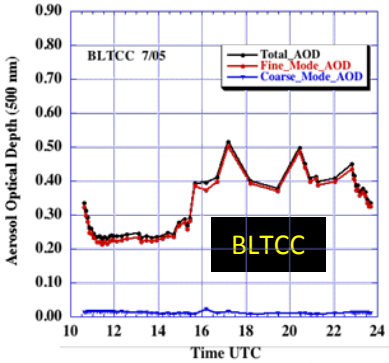
AQUA-MODIS Granule Overpass Times:
16:50, 18:30 UTC

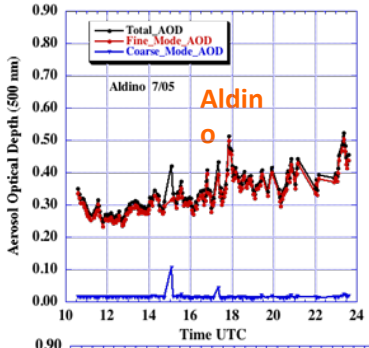
Large jump in AOD (~0.3 at 440 nm) at the DRAGON Essex site occurred just after solar noon on July 5. However, the Angstrom exponent (440-870 nm) remains very high (>1.9) suggesting possible new particle formation in the cloud environment since a particularly dense cluster of clouds is seen in the vicinity of the Essex site. Also note the larger variance of AOD (1 min intervals) in the afternoon versus morning indicating relatively high frequency variation in columnar aerosol.



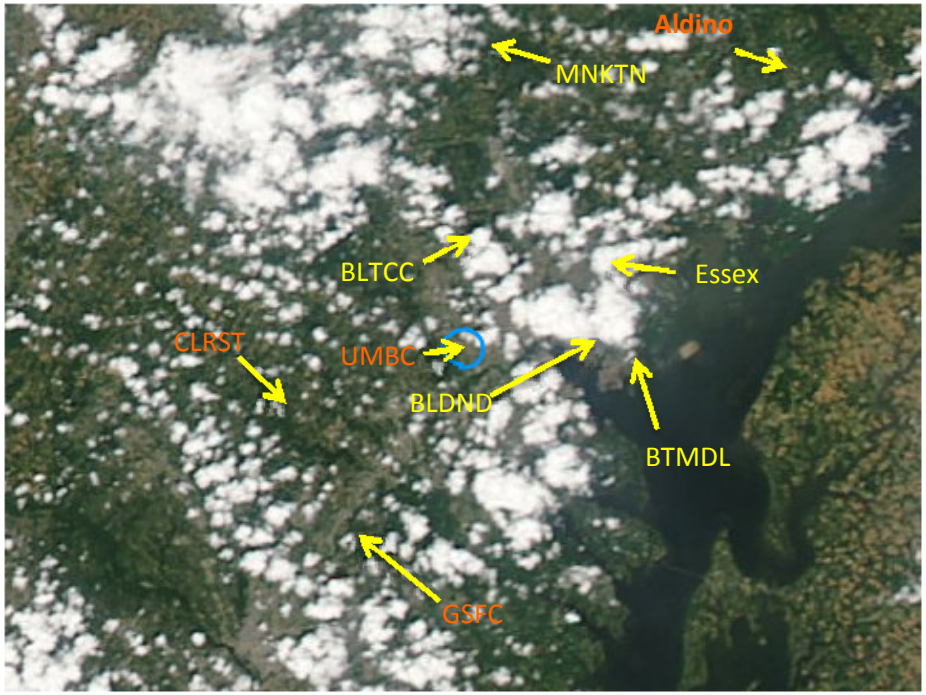






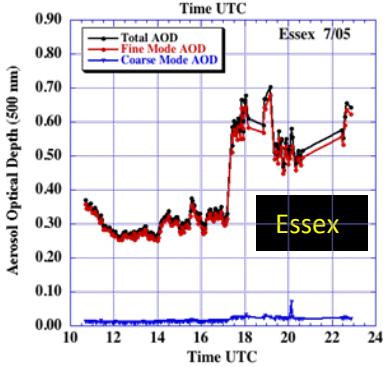


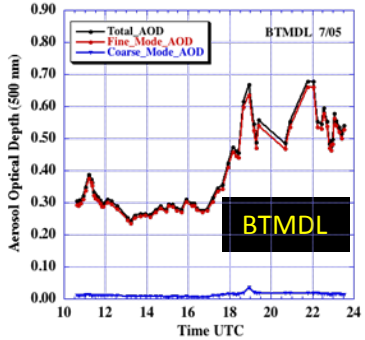
Composite AQUA-MODIS Image on JUL 5 of 2011; Centered on UMBC

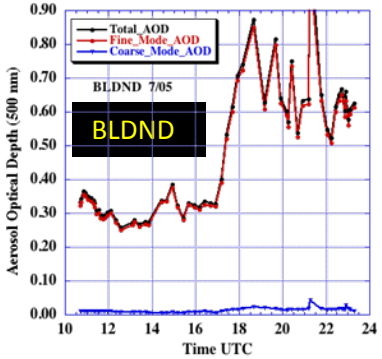


MODIS Images: 2000m 1000m 500m 250m

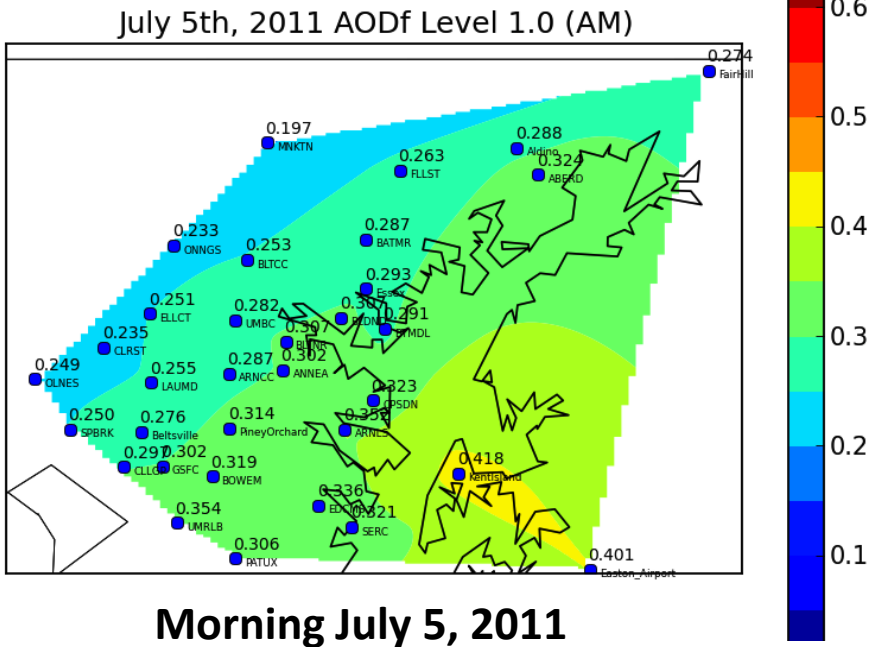
AQUA-MODIS Granule Overpass Times:
16:50, 18:30 UTC



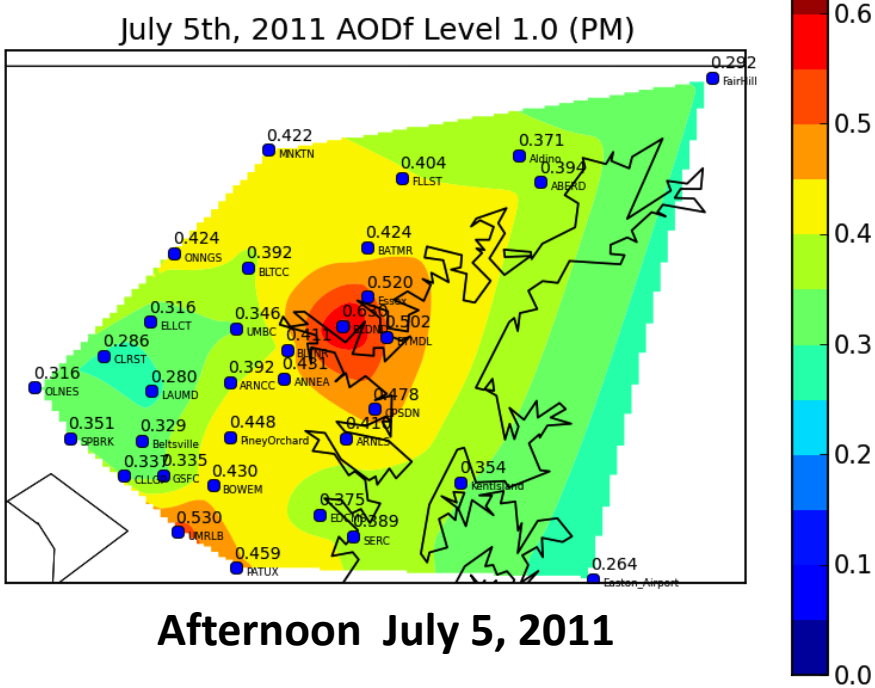




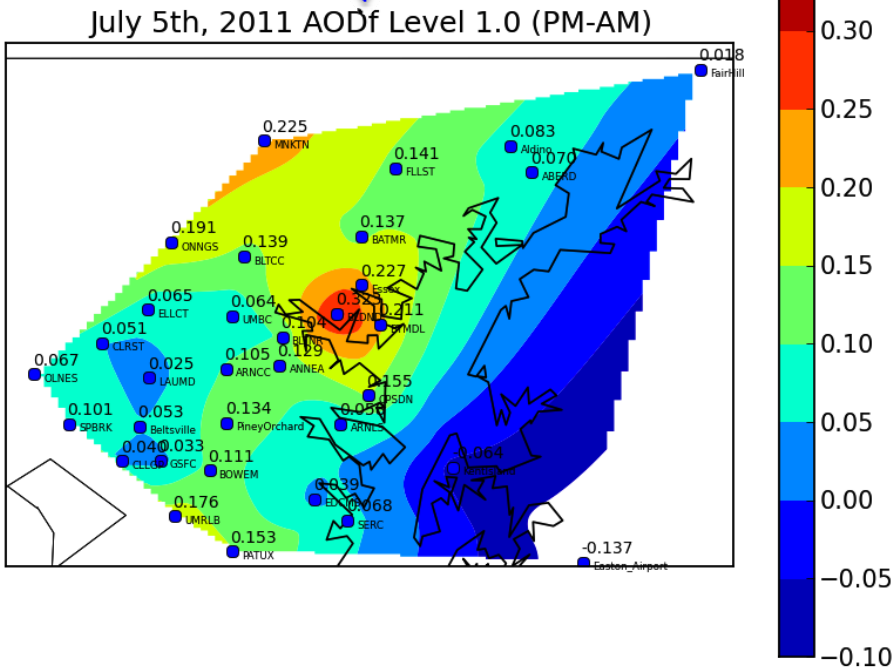
Morning versus Afternoon Difference – July 5, 2011



Morning July 5, 2011

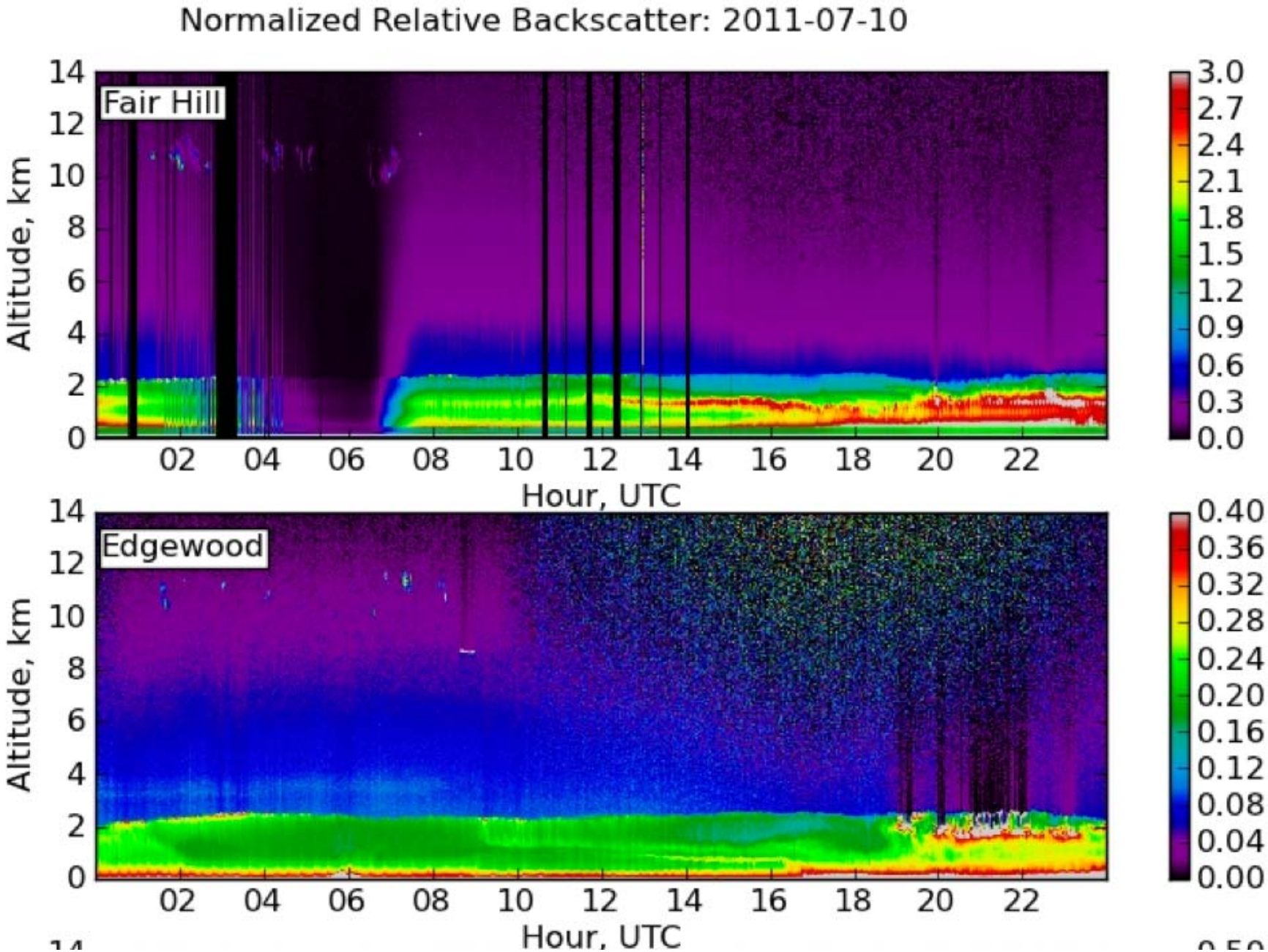


Afternoon July 5, 2011

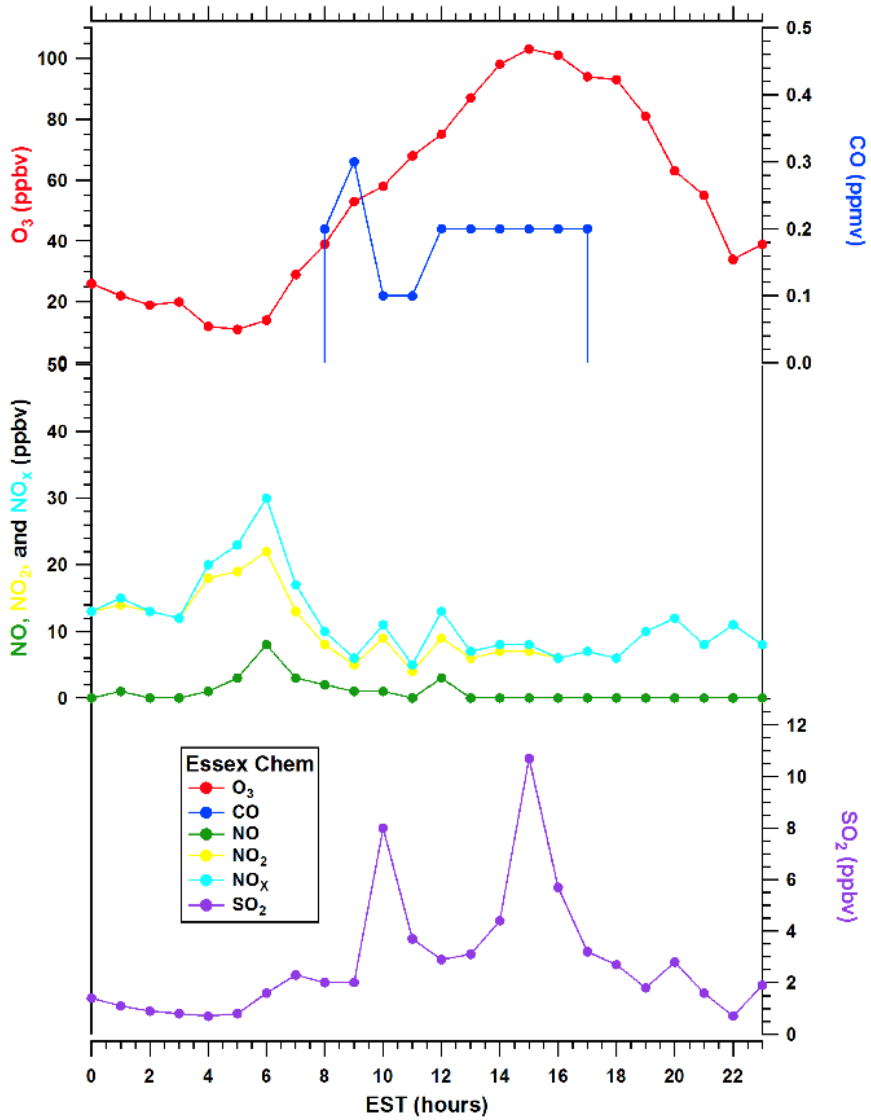


DRAGON Summary

- Sites Calibrated & QA
- Global Data Access via AERONET website
- Preliminary comparisons to LARGE
- Collaborations:
  - w/ Sat. and model Validations
  - Airborne: LARGE, UMD, HSRL
  - Horizontal variability, diurnal variability
  - Relate to ground based in situ measurements MDE/supersites
  - Surface lidar comparisons
- Schafer and Eck Posters

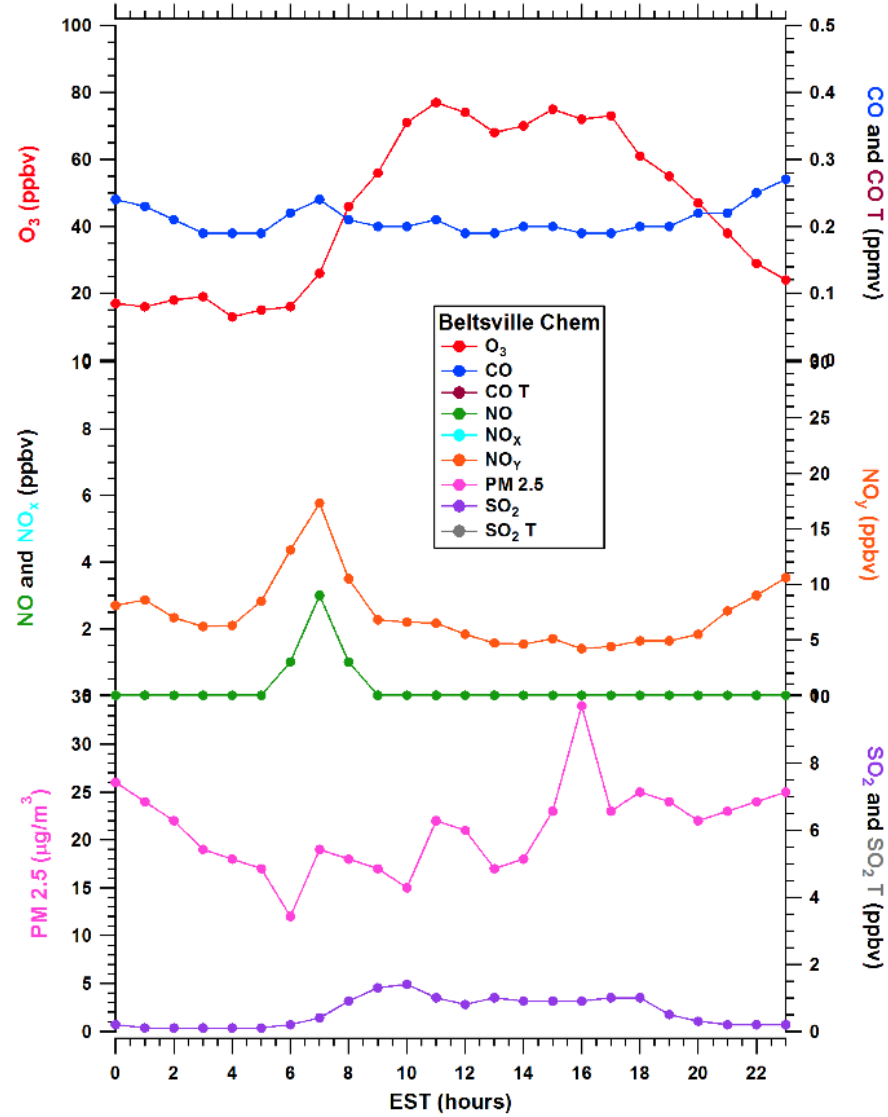

Normalized Relative Backscatter: 2011-07-10
Fair Hill
Altitude, km
Hour, UTC
Edgewood
Altitude, km
Hour, UTC

2011-07-05 MDE Ground Site Data Quick Look



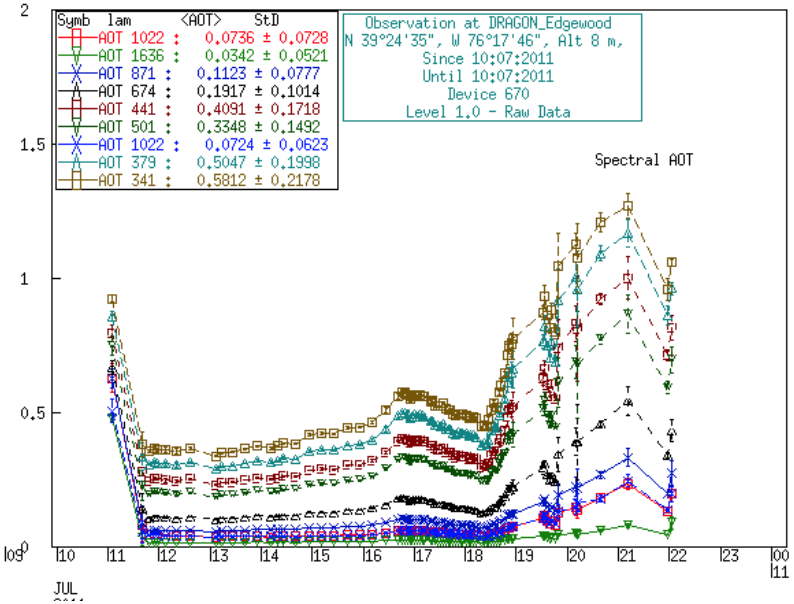
All data are preliminary and subject to change

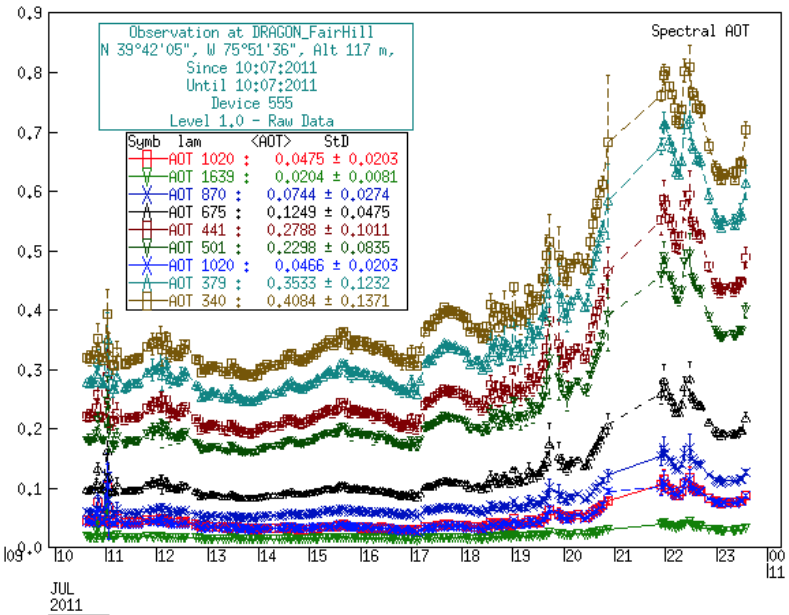
2011-07-05 MDE Ground Site Data Quick Look

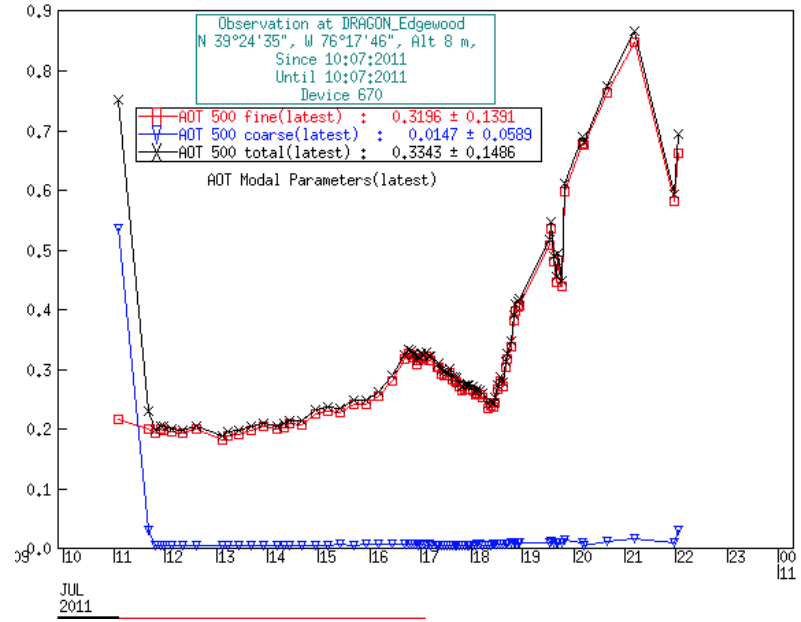


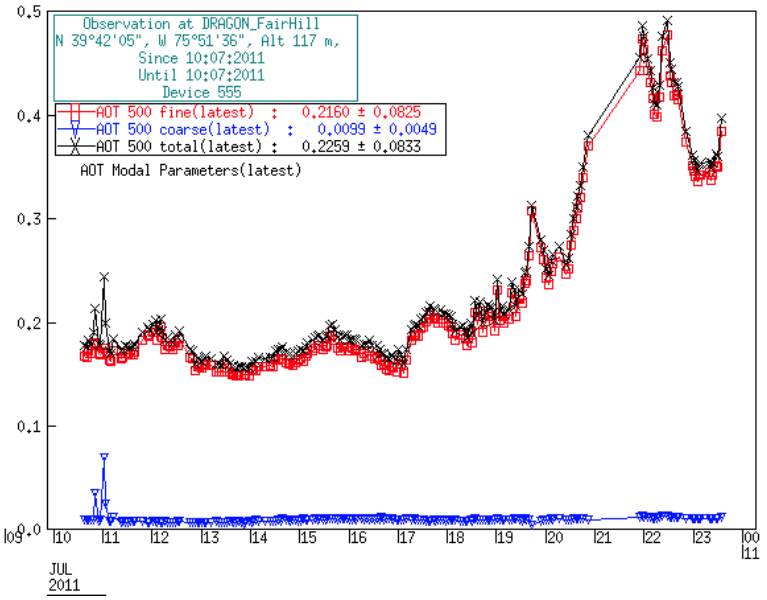
All data are preliminary and subject to change

MPL Lidar profiles (next slide) on July 10, 2011 (5 days later than previous case) show enhanced signal at the time of the increased fine mode AOD from AERONET coincident with cumulus cloud development at these 2 sites

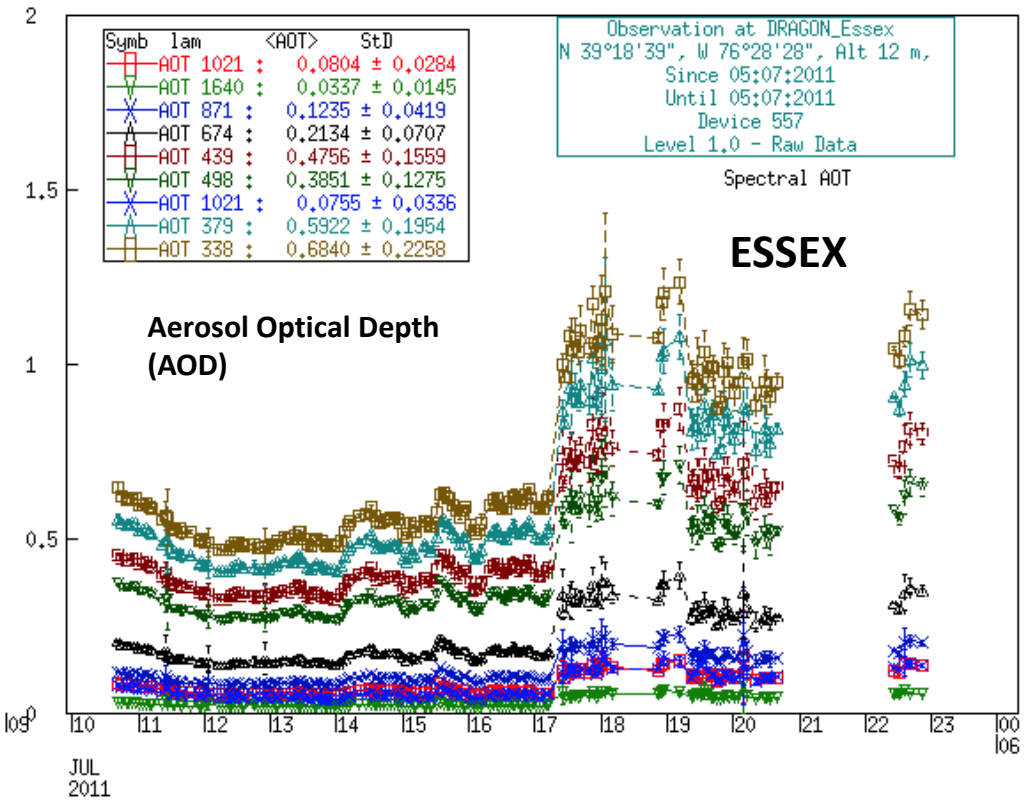


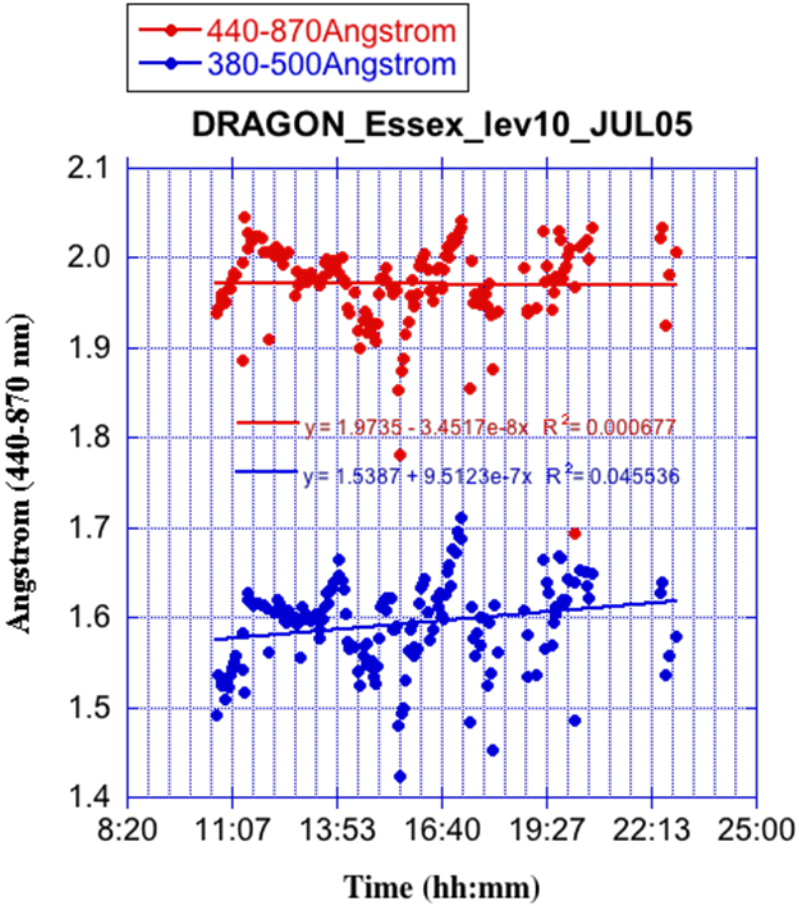




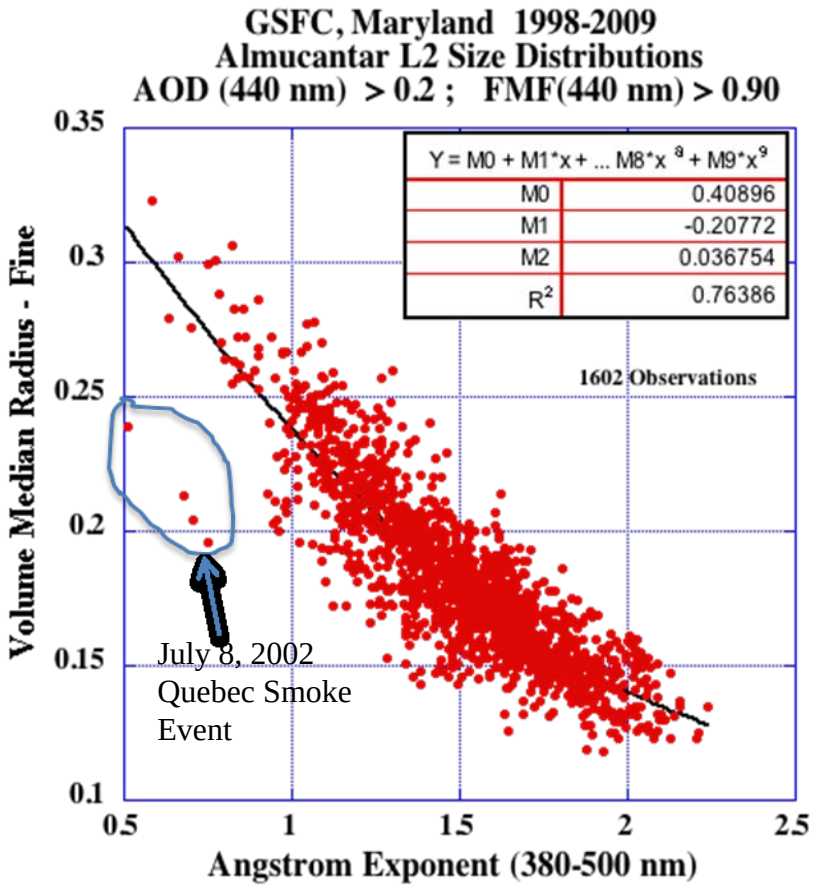


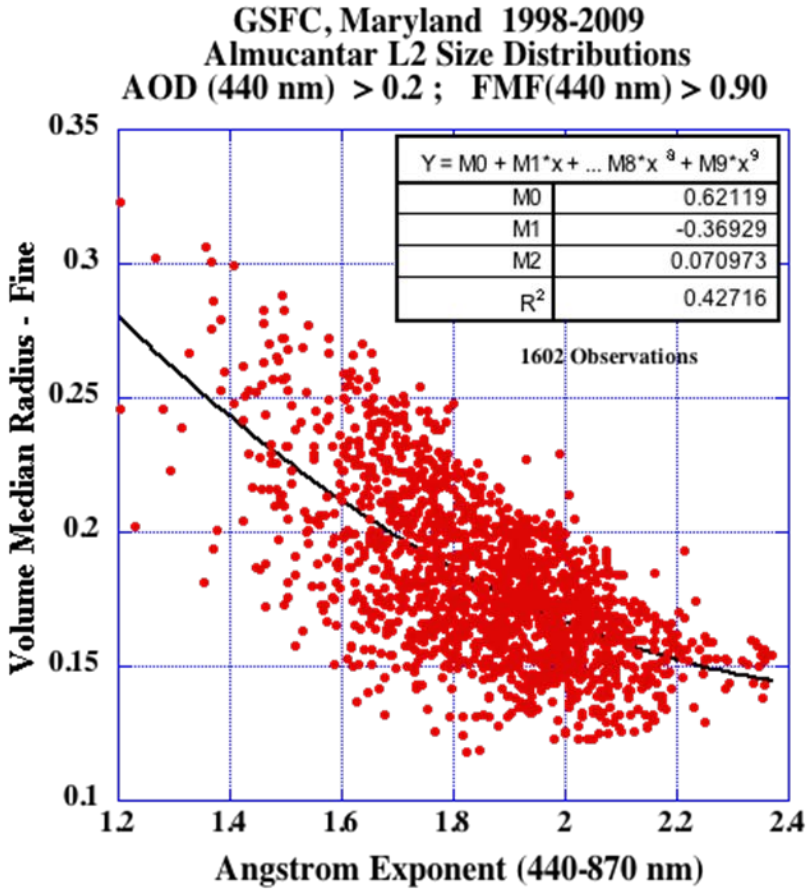
The lack of a trend in Angstrom exponents suggests minimal cloud contamination and also little cloud processing of accumulation mode aerosol as this would result in larger radius particles which would decrease the 380-500 nm Angstrom Exponent

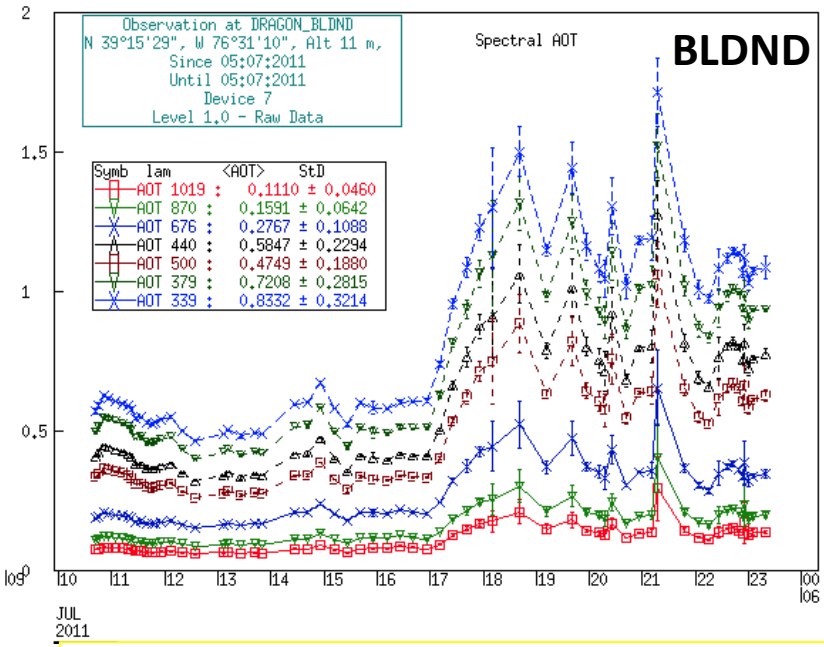


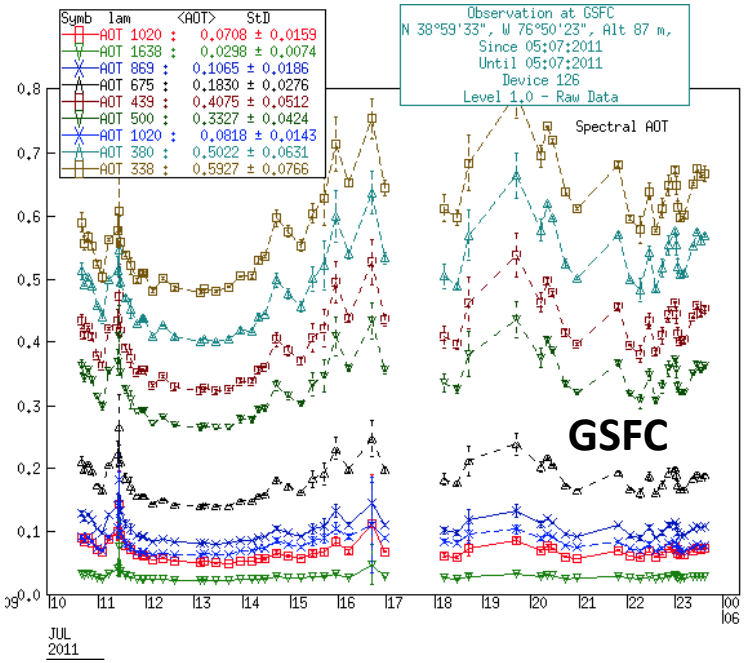


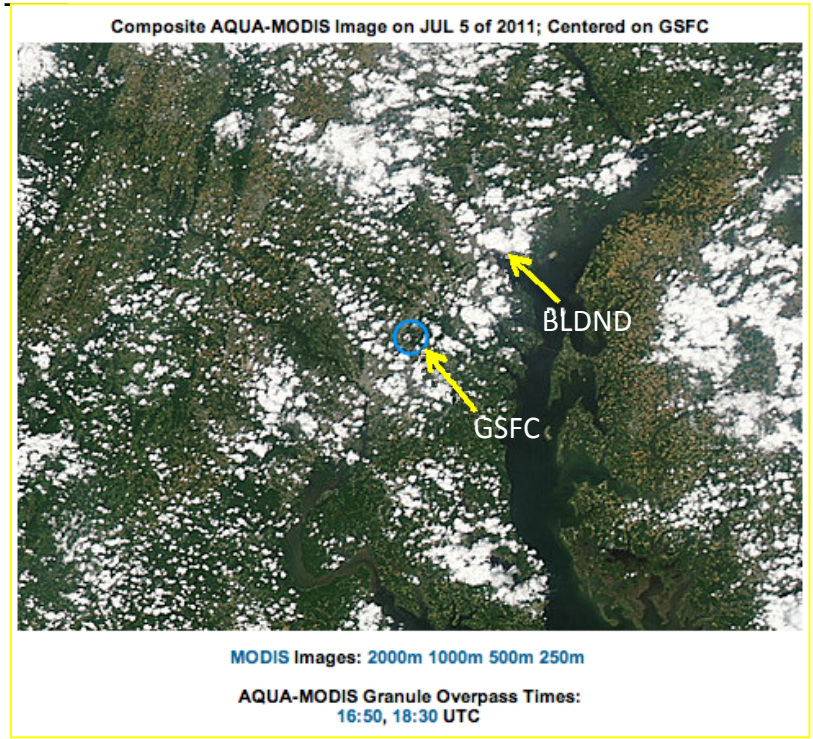
Short wavelengths Angstrom Exponent (380-500 nm) is much more sensitive to fine mode particle size than longer wavelength range AE (440-870 nm)



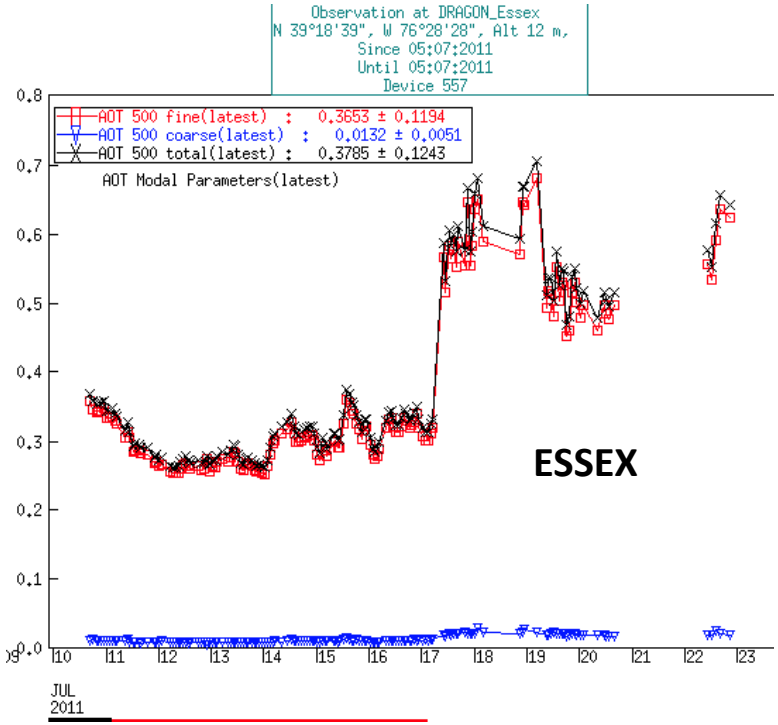


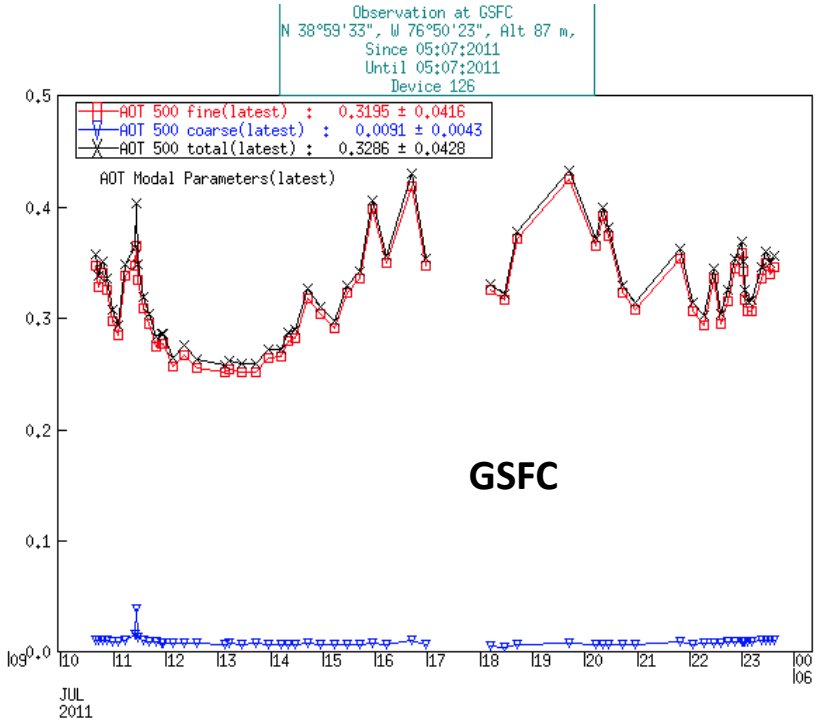






The DRAGON_BLDND site near to Essex also showed a very similar large increase in AOD in the afternoon with greater temporal variance, and with Angstrom exponent remaining very high (mostly ~1.85-2.05). However, at the GSFC site the AOD does not increase significantly in the afternoon (note different vertical scales) although Angstrom exp. remains very high (~2.0-2.1), and there are much fewer and smaller clouds in the vicinity of the GSFC site.

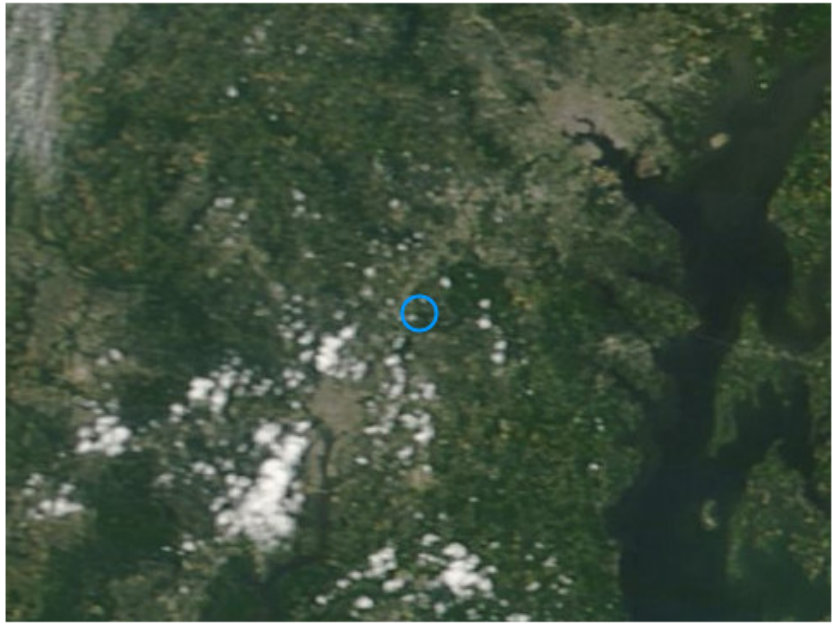




Norm O'Neill's Spectral Deconvolution Algorithm (SDA) utilizes the spectral AOD from 380 to 870 nm and assumptions about coarse mode linear and 2nd order fits of ln AOD versus ln λ, to provide estimates of Fine and Coarse mode AOD at 500 nm.

The coarse mode AOD at the Essex and GSFC sites are all ~0.01-0.025 nearly all day suggesting that almost all of the variability in total AOD (this is Level 1.0 data, not cloud screened) is due to fine mode pollution aerosol.

Composite TERRA-MODIS Image on JUL 10 of 2011; Centered on GSFC



MODIS Images: 2000m 1000m 500m 250m

TERRA-MODIS Granule Overpass Times:
15:30, 17

Composite AQUA-MODIS Image on JUL 10 of 2011; Centered on GSFC

MODIS Images: 2000m 1000m 500m 250m

AQUA-MODIS Granule Overpass Times:
17:10, 18:45, 18:50 UTC