MODIS Assimilation for SARB

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Model for Atmospheric Transport and Chemistry

Terra/Aqua MODIS
level 3 (daily 1 x 1
gridded) AOD

NCEP/NCAR
reanalysis met fields
6-hourly 1.9 x 1.9
28 levels

→ MATCH → SARB

MATCH supplements MODIS AOD retrievals with information required for radiative transfer
- AOD when missing MODIS retrieval (clouds, bright surface)
- aerosol 4D mass distribution by species
- SARB aerosol optical models give single scattering albedo, asymmetry parameter

MATCH Simulation

March 2000
MODIS Collection IV

May 2002
Terra + Aqua

January 2006
MODIS Collection V

December 2007

→

Processing Plan

MATCH with minor changes

March 2000
MODIS Collection V

December 2007

May 2002
Terra + Aqua

November 2007

MATCH with major changes

November 2007

CAM Community Atmosphere Model 4

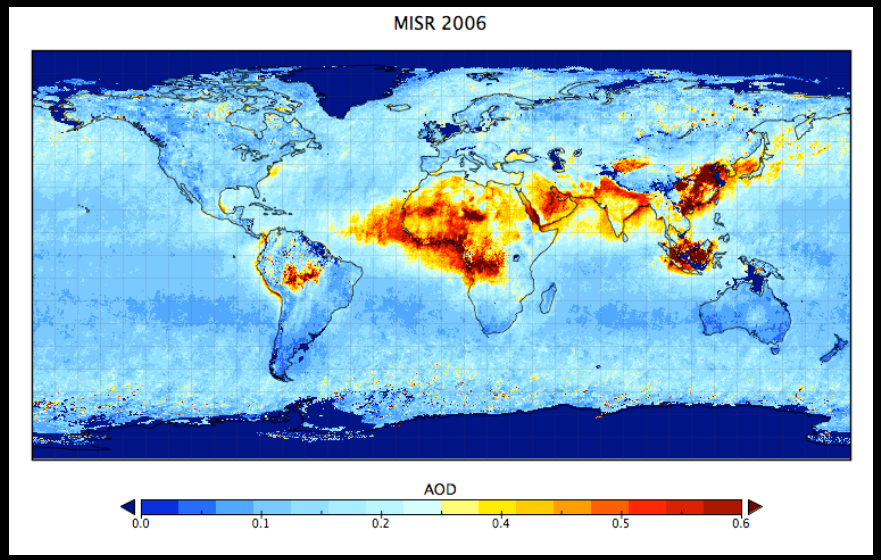
CAM MODIS assimilation (Arellano)

MATCH with minor changes

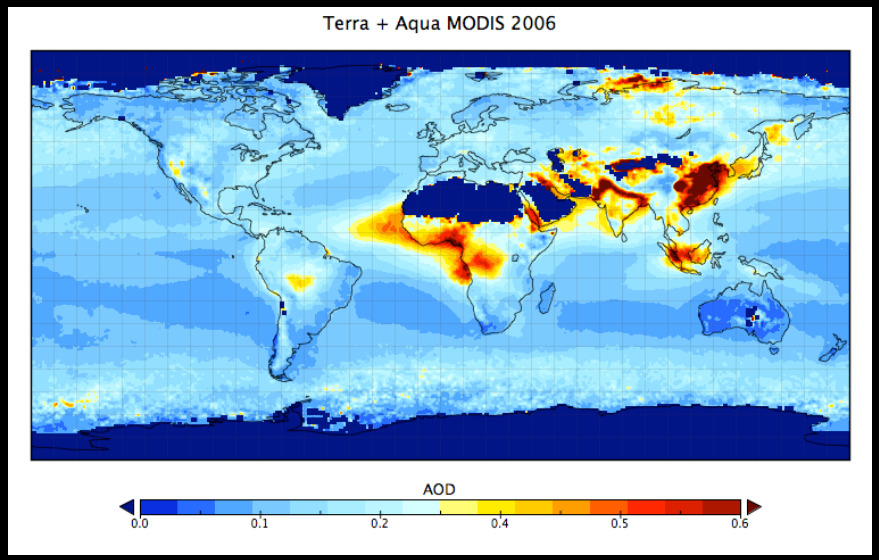
- changes to dust optics
- MODIS Collection V
- met fields switch from NCAR Data Support Section to NOAA CDC Climate Diagnostics Center
- model automation (CDC OPeNDAP server)
- run MATCH with CERES system at ASDC?

MATCH with major changes

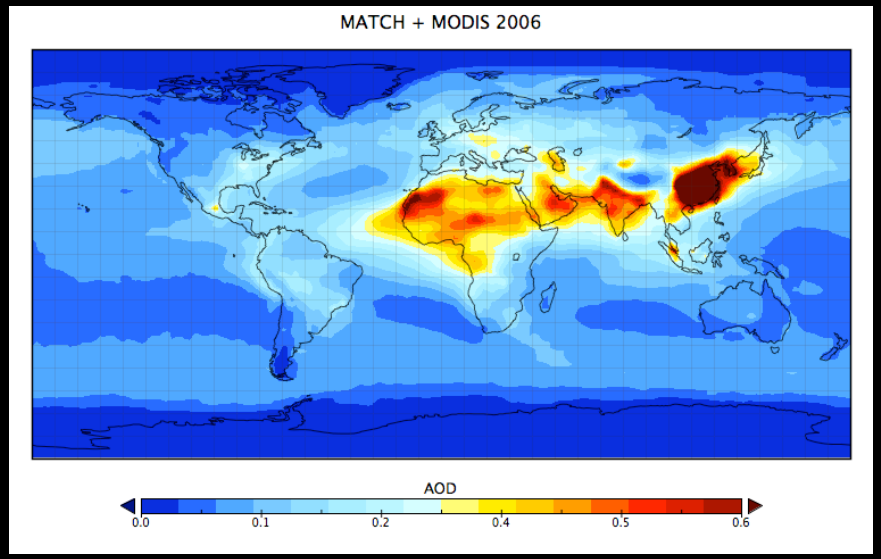
- prognostic sea-salt (Mahowald and Rasch)
- changes to sulfate optics, water uptake
- MODIS fine mode fraction to adjust relative aerosol species
- switch from level 3 to level 2 MODIS



MISR AOD 2006



MODIS AOD 2006



MATCH + MODIS AOD 2006

MATCH v AEROCOM AOD

AOD	MATCH	AEROCOM
SU	0.061	0.034
BC	0.0034	0.004
POM	0.019	0.019
DU	0.030	0.032
SS	0.021	0.030
Total	0.134	0.127

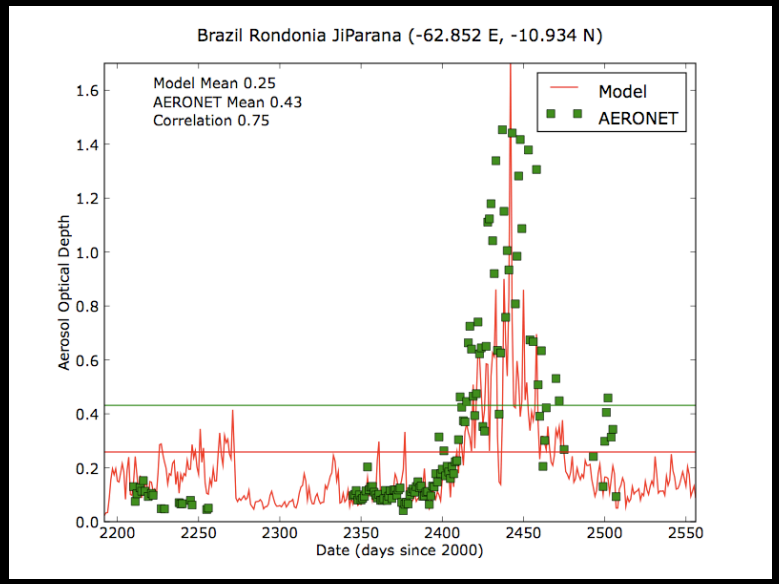
MATCH v AEROCOM Specific Extinction

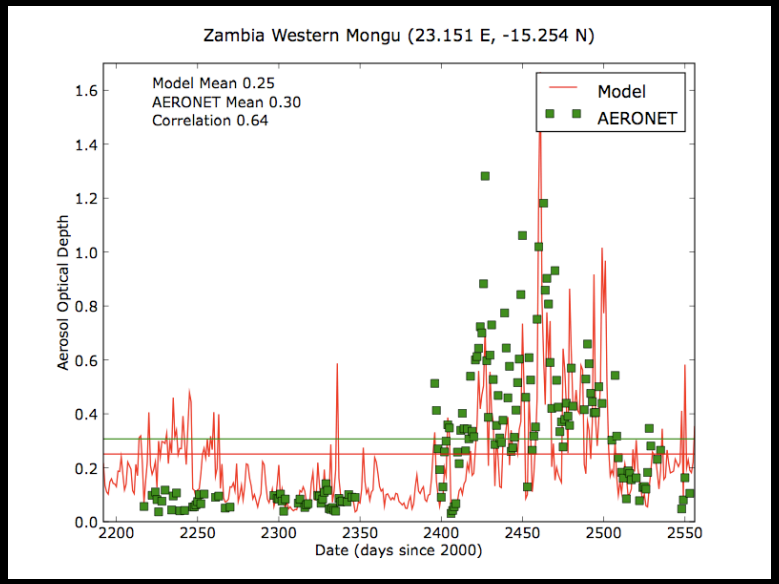
ext m^2 / g	MATCH	AEROCOM
SU	17.8	8.5
BC	9.2	8.9
POM	4.6	5.7
DU	1.07	0.95
SS	1.78	3.0

AOD w correction for spatial sampling

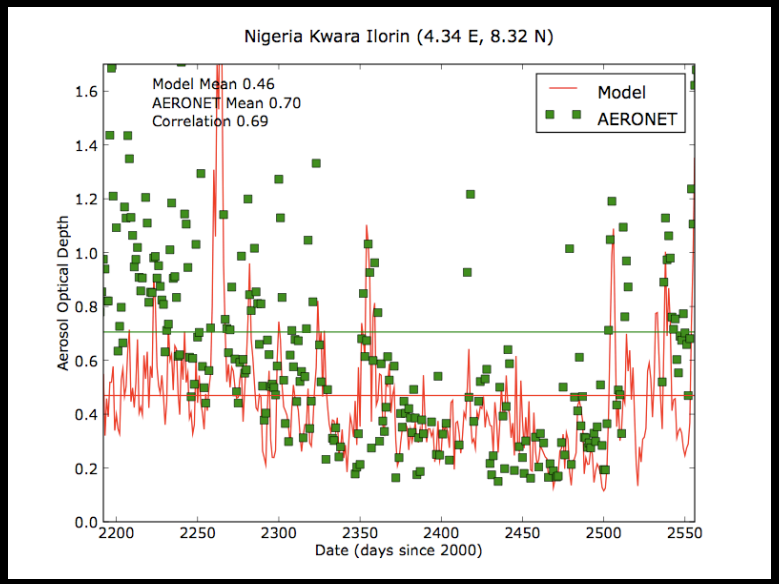
Ocean	MATCH	AEROCOM	MODIS	MISR
50-90 N	0.12	0.11	0.13	0.13
30-50 N	0.17	0.15	0.18	0.24
8-30 N	0.15	0.13	0.18	0.22
8 N-25 S	0.10	0.08	0.13	0.18
25-55 S	0.09	0.10	0.13	0.17
55-90 S	0.07	0.09	0.11	0.14
Land				
50-90 N	0.13	0.11	0.15	0.11
30-50 N	0.26	0.20	0.32	0.21
8-30 N	0.41	0.35	0.45	0.33
8 N-25 S	0.20	0.14	0.25	0.24
25-55 S	0.11	0.09	0.15	0.10

Biomass Burning

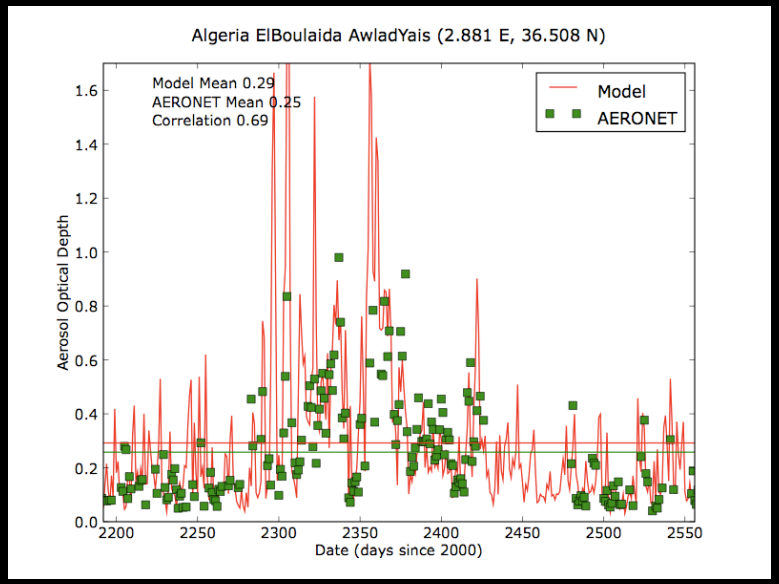


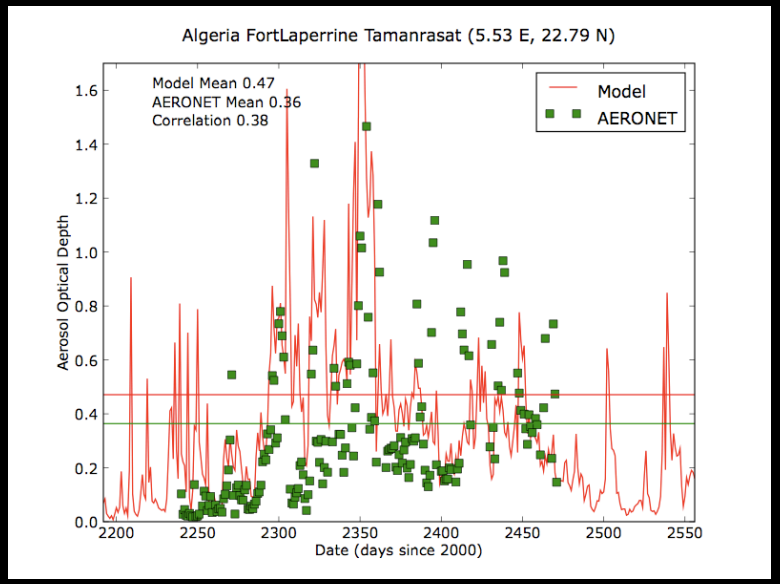


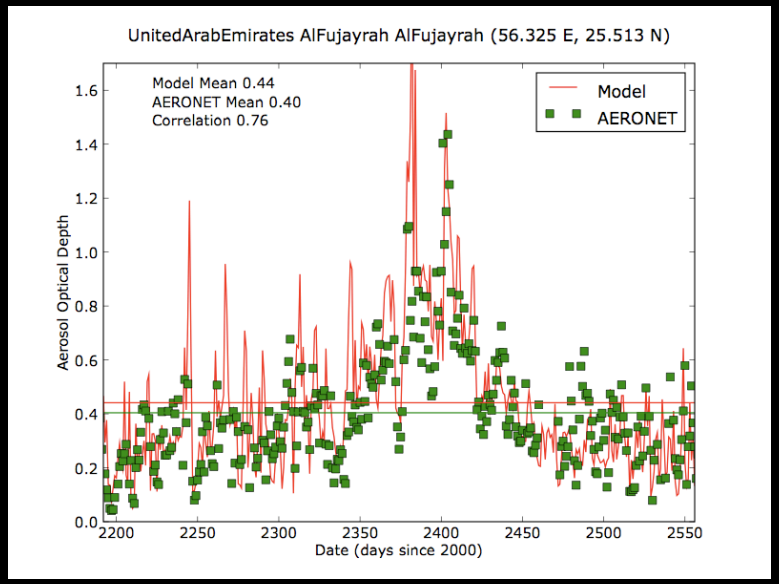
MATCH v
AERONET 2006

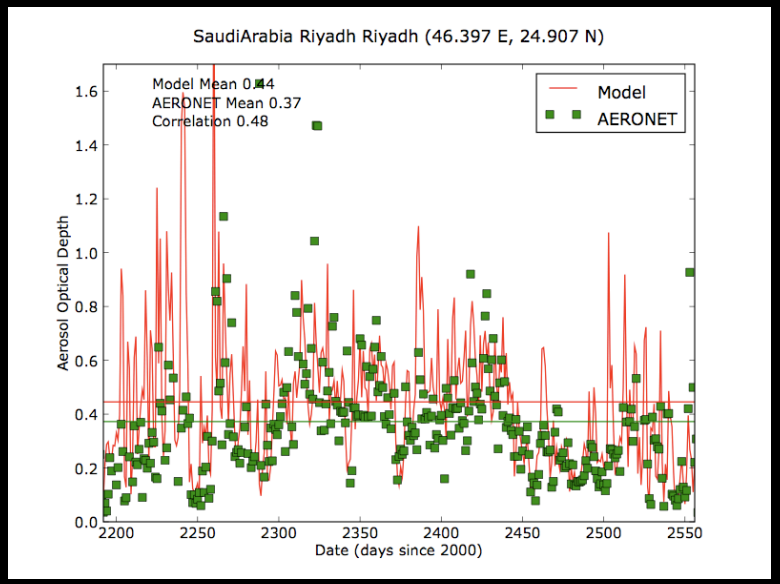


Dust

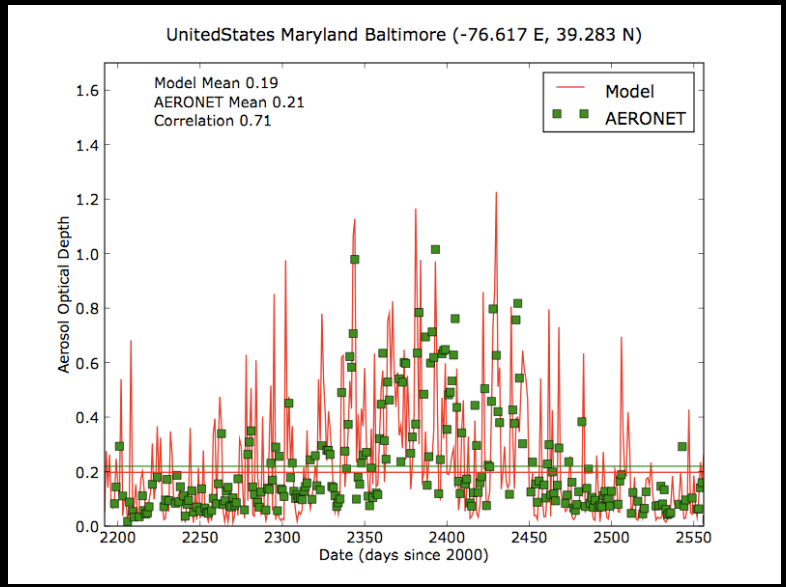

Algeria ElBoulaida AwladYais (2.881 E, 36.508 N)
Model Mean 0.29
AERONET Mean 0.25
Correlation 0.69
Model
AERONET
Aerosol Optical Depth
Date (days since 2000)

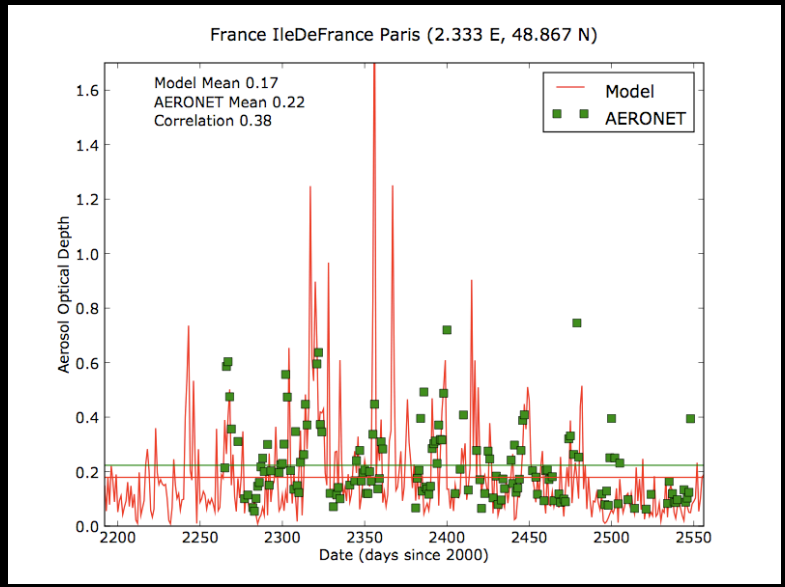

Algeria FortLaperrine Tamanrasat (5.53 E, 22.79 N)
Model Mean 0.47
AERONET Mean 0.36
Correlation 0.38
Model
AERONET
Aerosol Optical Depth
Date (days since 2000)

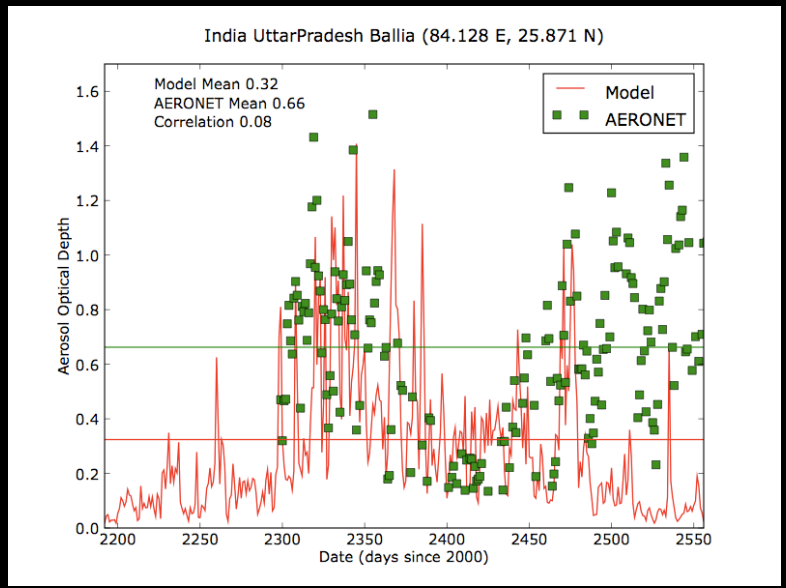

UnitedArabEmirates AlFujayrah AlFujayrah (56.325 E, 25.513 N)
Model Mean 0.44
AERONET Mean 0.40
Correlation 0.76
Model
AERONET
Aerosol Optical Depth
Date (days since 2000)

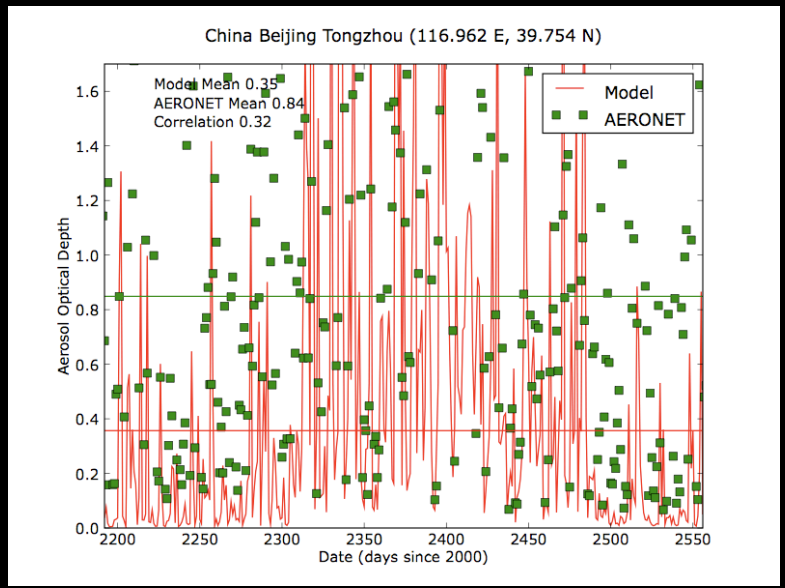

SaudiArabia Riyadh Riyadh (46.397 E, 24.907 N)
Model Mean 0.44
AERONET Mean 0.37
Correlation 0.48
Model
AERONET
Aerosol Optical Depth
Date (days since 2000)

Urban

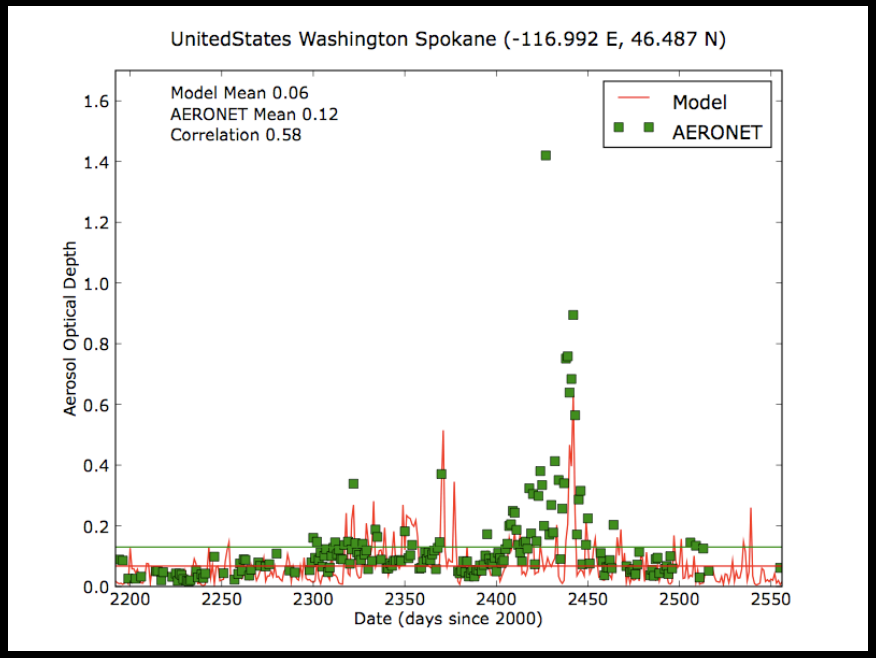

UnitedStates Maryland Baltimore (-76.617 E, 39.283 N)
Model Mean 0.19
AERONET Mean 0.21
Correlation 0.71
Model
AERONET
Aerosol Optical Depth
Date (days since 2000)

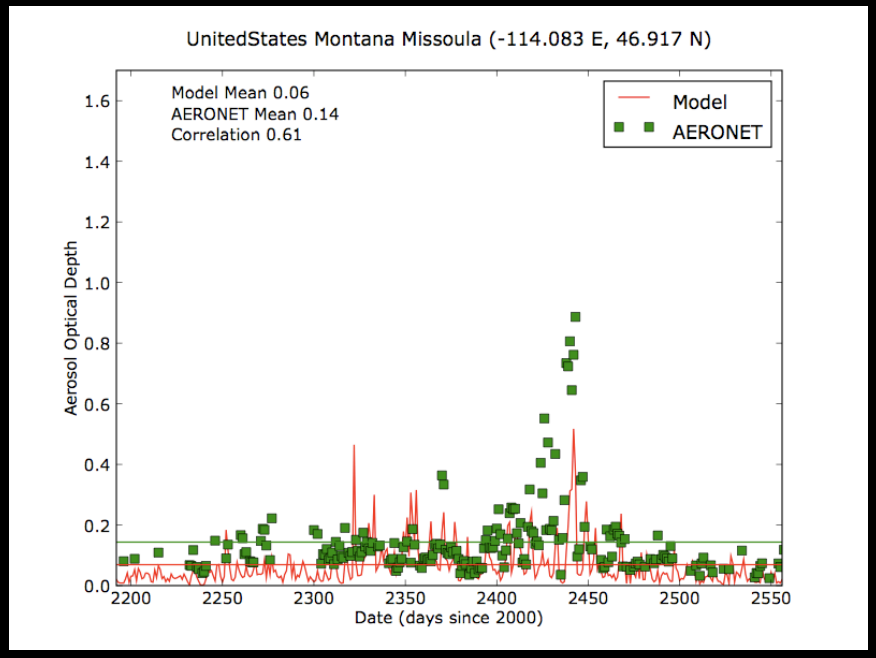

France IleDeFrance Paris (2.333 E, 48.867 N)
Model Mean 0.17
AERONET Mean 0.22
Correlation 0.38
Model
AERONET
Aerosol Optical Depth
Date (days since 2000)

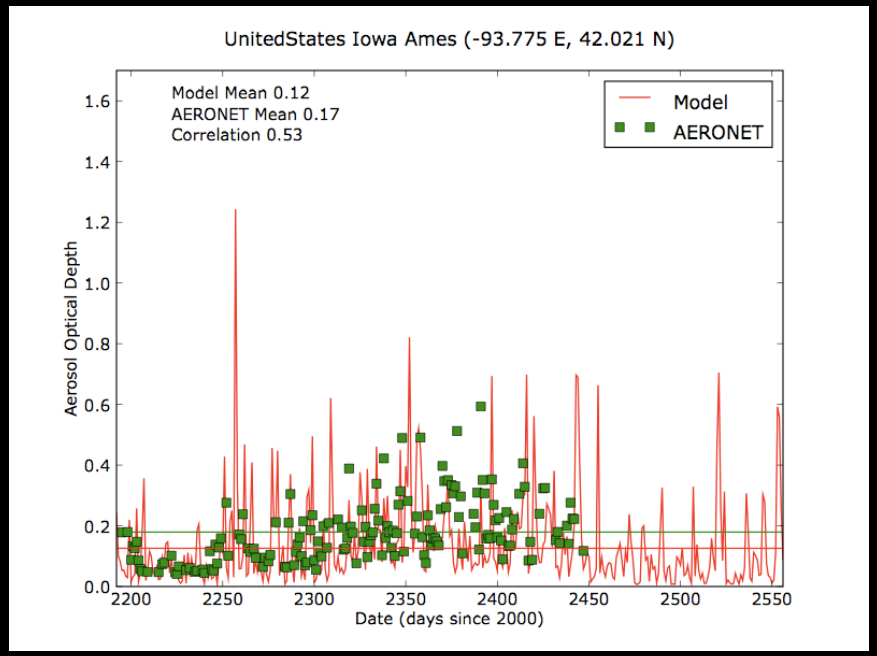

India UttarPradesh Ballia (84.128 E, 25.871 N)
Model Mean 0.32
AERONET Mean 0.66
Correlation 0.08
Model
AERONET
Aerosol Optical Depth
Date (days since 2000)

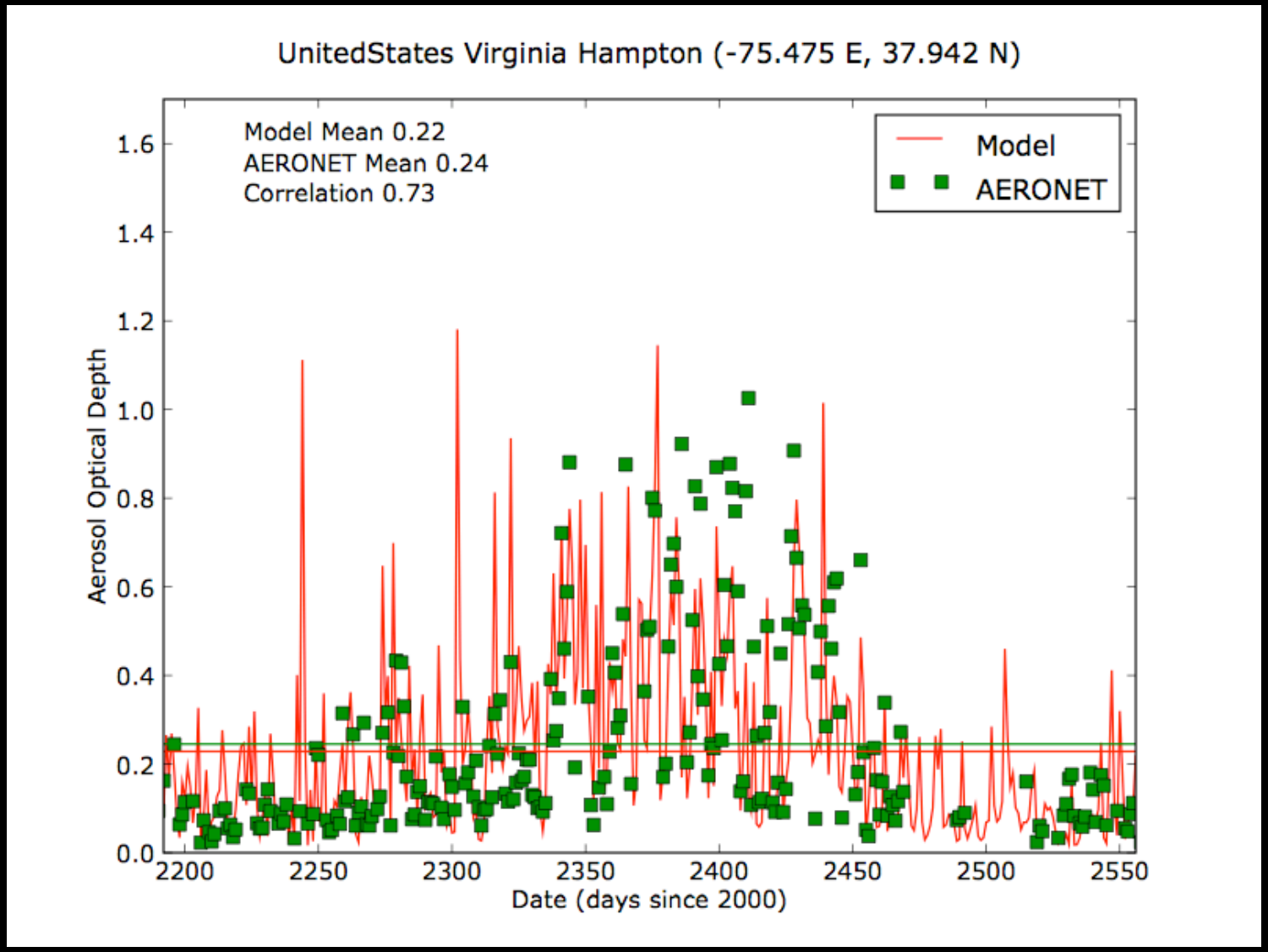

China Beijing Tongzhou (116.962 E, 39.754 N)
Model Mean 0.35
AERONET Mean 0.84
Correlation 0.32
Model
AERONET
Aerosol Optical Depth
Date (days since 2000)

Rural


UnitedStates Washington Spokane (-116.992 E, 46.487 N)
Model Mean 0.06
AERONET Mean 0.12
Correlation 0.58
Model
AERONET
Aerosol Optical Depth
Date (days since 2000)


UnitedStates Montana Missoula (-114.083 E, 46.917 N)
Model Mean 0.06
AERONET Mean 0.14
Correlation 0.61
Model
AERONET
Aerosol Optical Depth
Date (days since 2000)


UnitedStates Iowa Ames (-93.775 E, 42.021 N)
Model Mean 0.12
AERONET Mean 0.17
Correlation 0.53
Model
AERONET
Aerosol Optical Depth
Date (days since 2000)


UnitedStates Virginia Hampton (-75.475 E, 37.942 N)
Model Mean 0.22
AERONET Mean 0.24
Correlation 0.73
Model
AERONET
Aerosol Optical Depth
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
2200
2250
2300
2350
2400
2450
2500
2550
Date (days since 2000)