MISR and AeroNet Validation of the MATCH Edition 4 Aerosol Dataset

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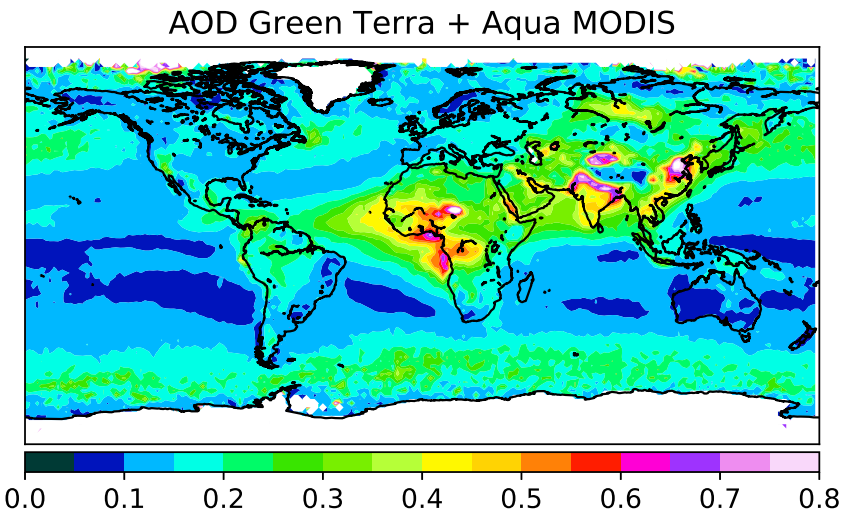
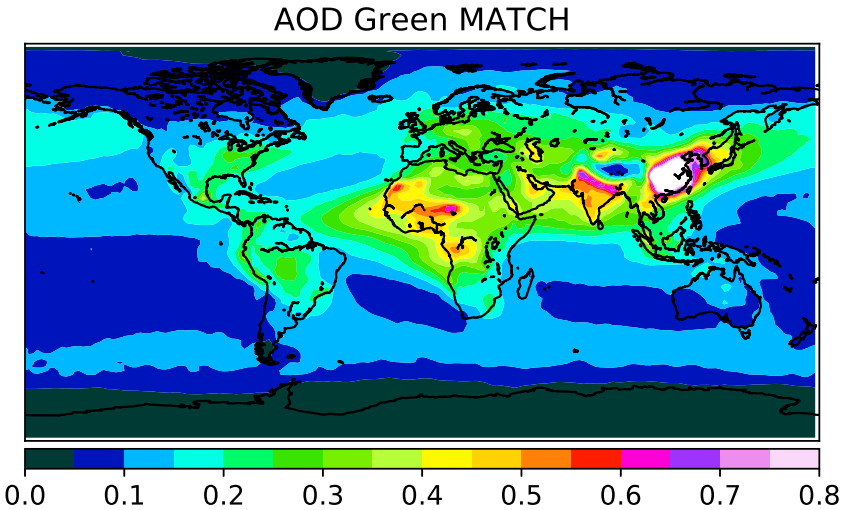
Datasets - MATCH, MISR, and AeroNet

MATCH Model for Atmospheric Transport and Chemistry

- spatial resolution $\sim 2^\circ \times 2^\circ$, hourly output
- Terra and Aqua MODIS Level 2 AOD assimilation at 550 nm, scales aerosol column dry mass, preserves relative concentrations between aerosol types and vertical layers
- both Dark Target (Land and Ocean) and Deep Blue (Land)
- MATCH Edition 4 uses Collection 5.1 through February 2017 and Collection 6 from March 2017
- MATCH Edition 4.1 reprocessing with Collection 6.1 from March 2000
- aerosol inputs for SARB **CERES Surface** Flux calculations
- Dust, Sea-Salt, Sulfate (tropospheric and stratospheric), Organic Carbon and Black Carbon

MATCH and MODIS AOD





- MATCH assimilates MODIS, Terra + Aqua, Dark Target + Deep Blue
- relative weight of MODIS to MATCH is 2 to 1
- MATCH has a diagnostic sea-salt scheme, SSLTOD is a function of near-surface wind speed
- sea-salt is not advected nor is it adjusted in the assimilation increment

MISR Multi-angle Imaging SpectroRadiometer

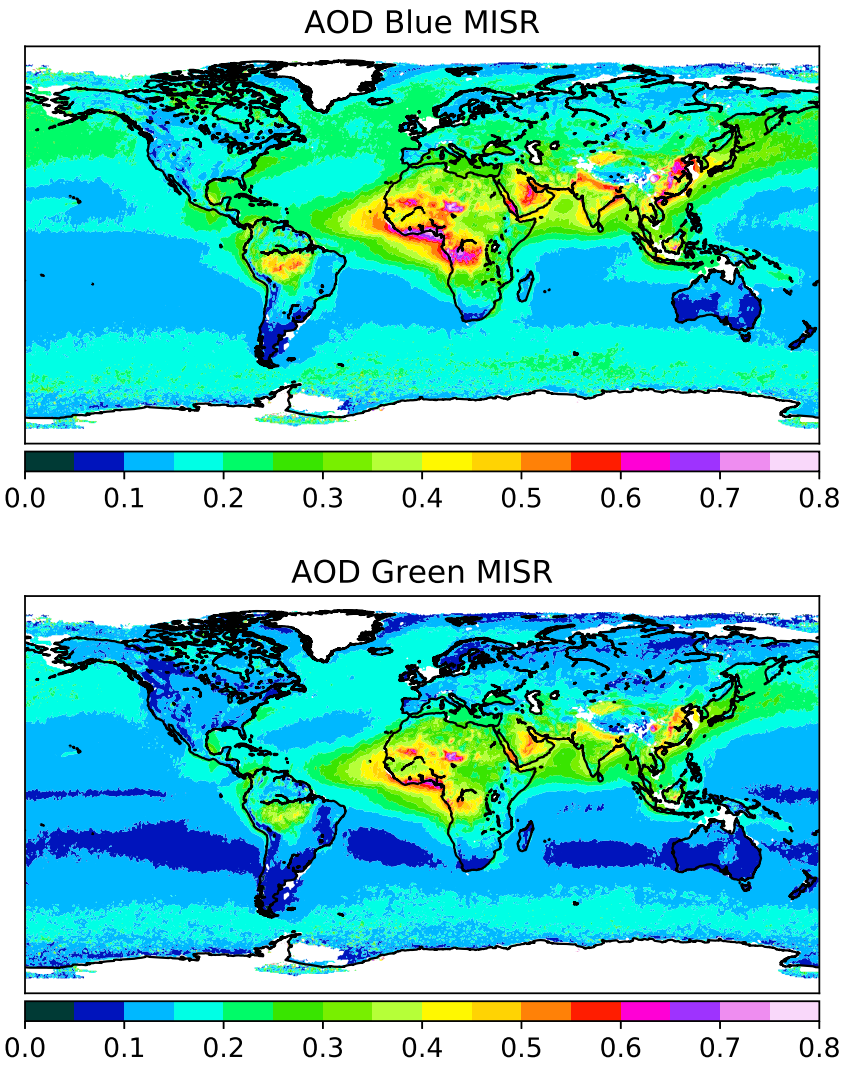
- MISR Level 3 CGAS Component Global Aerosol Product
- spatial resolution $0.5^\circ \times 0.5^\circ$,
- 4 bands
  Blue (443 nm), Green (555 nm), Red (670 nm), NIR (865 nm)

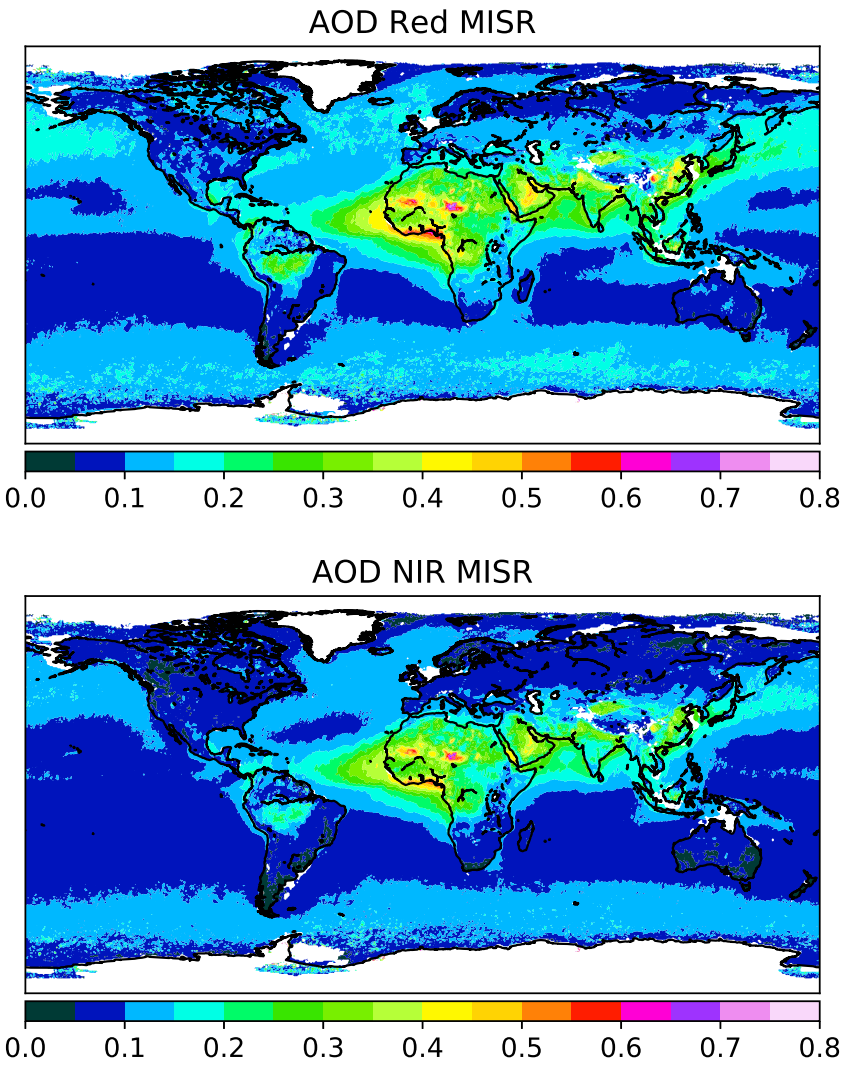
AeroNet

- Version 2 Level 2 quality assured inversion products
- Blue (440 nm), Green (500 nm), Red (670 nm),
  NIR (870 nm and 1020 nm)

MISR AOD Mean March 2000 - February 2016

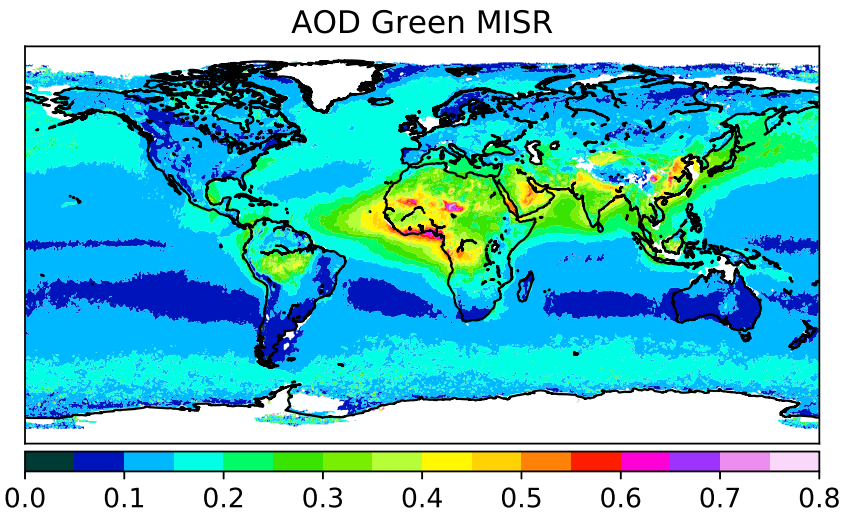
Blue (443 nm), Green (555 nm), Red (670 nm), NIR (865 nm)

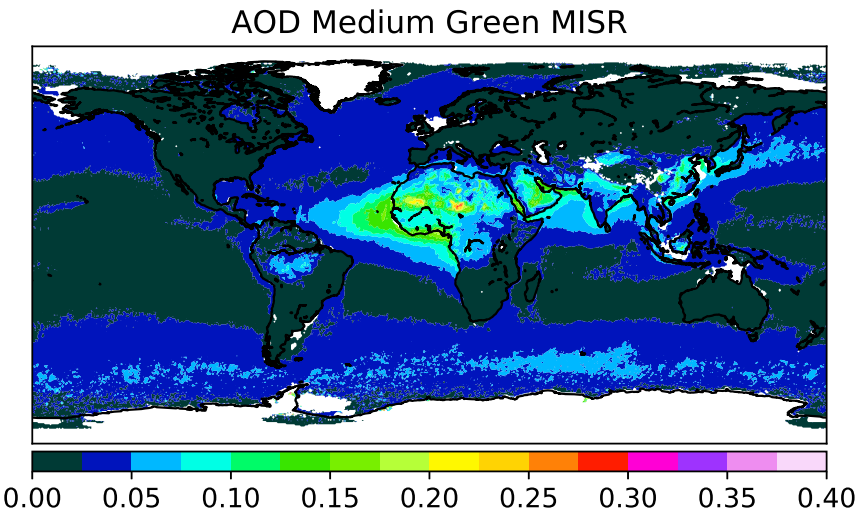


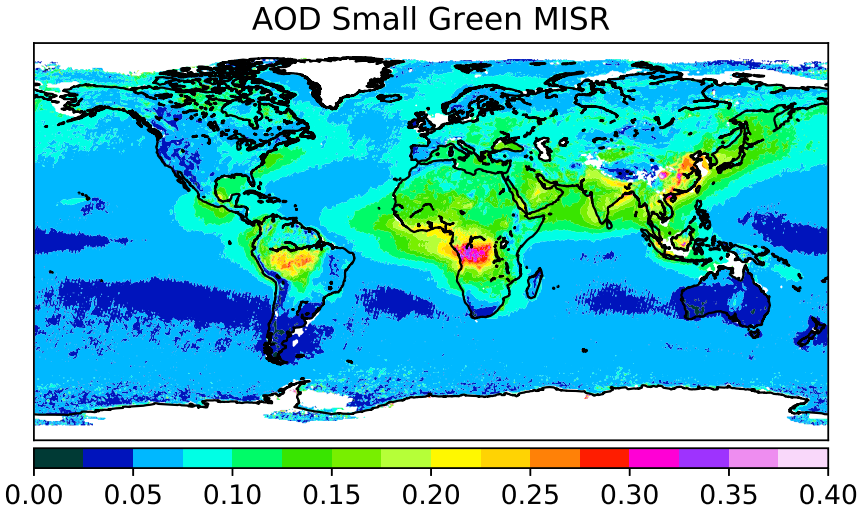


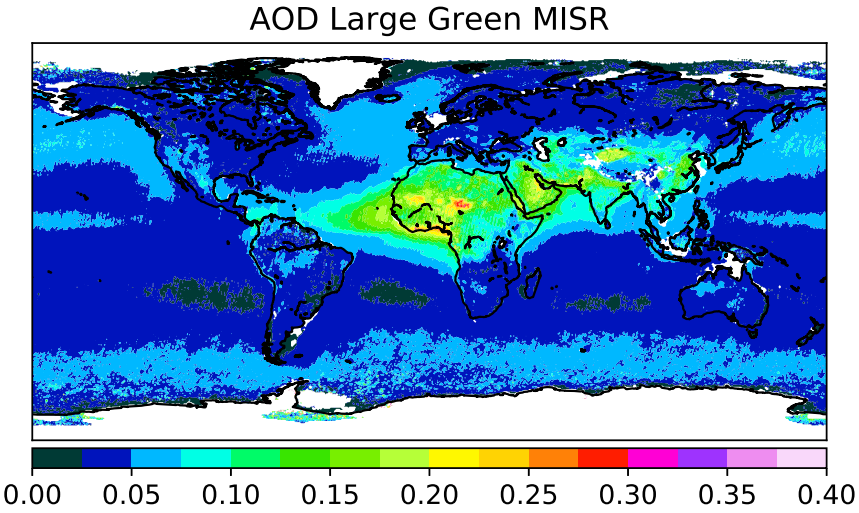
MISR AOD Mean March 2000 - February 2016

Small ($r < 0.35\mu\mathrm{m}$), Medium ($0.35 < r < 0.7\mu\mathrm{m}$), Large ($r > 0.7\mu\mathrm{m}$)









MATCH AOD Mean March 2000 - February 2016

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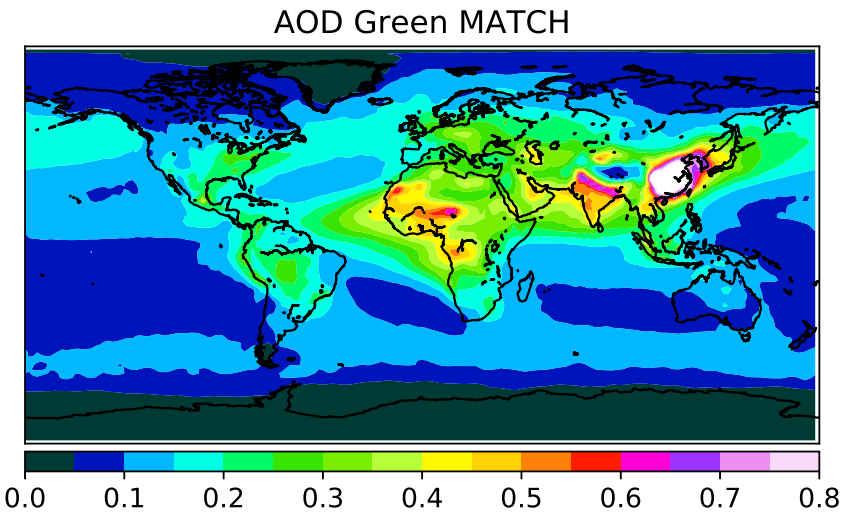
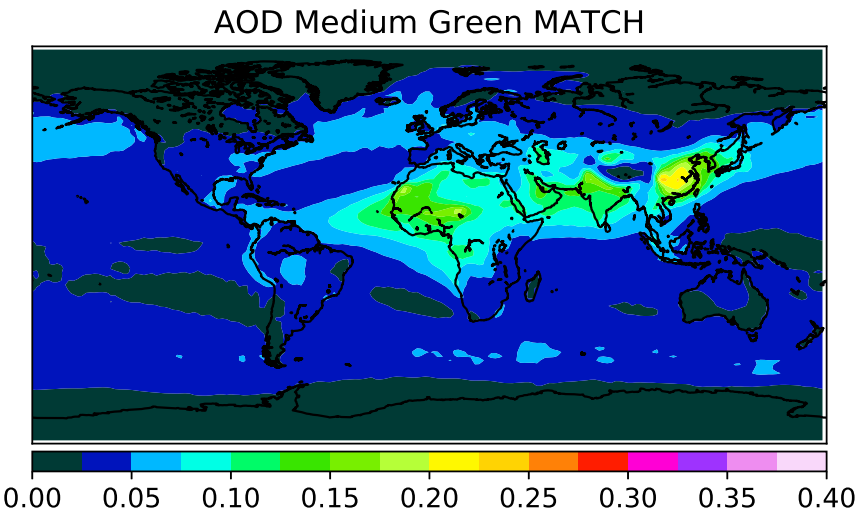
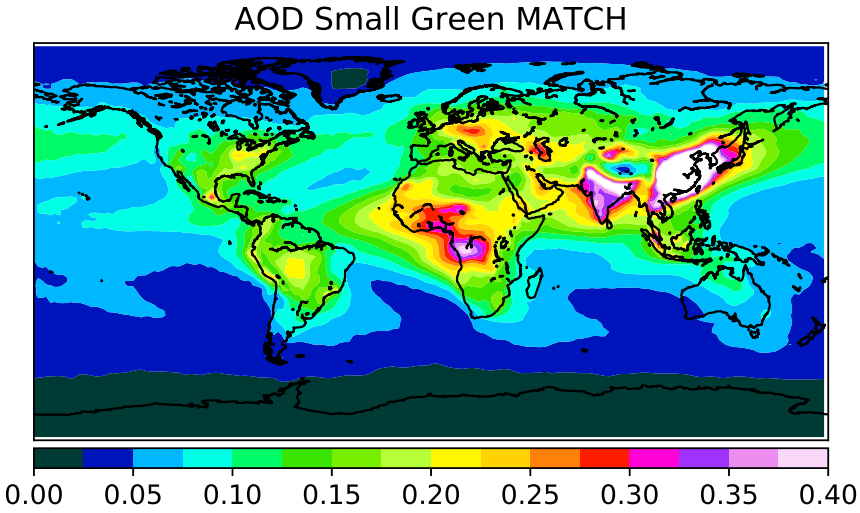
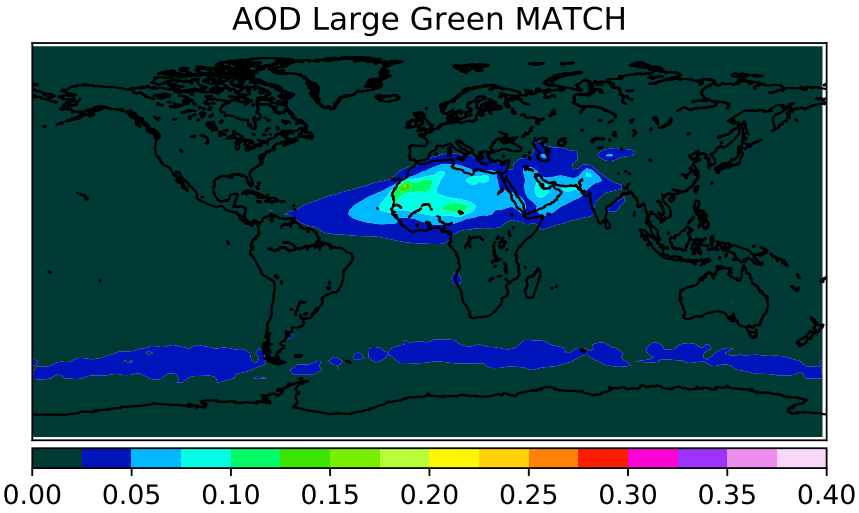
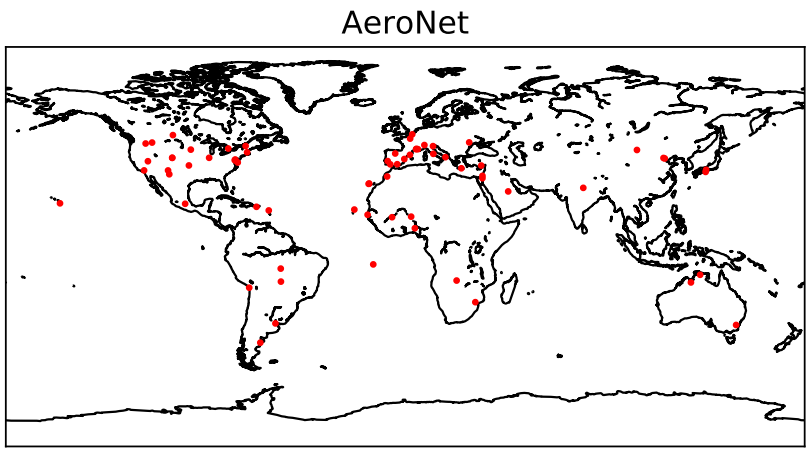


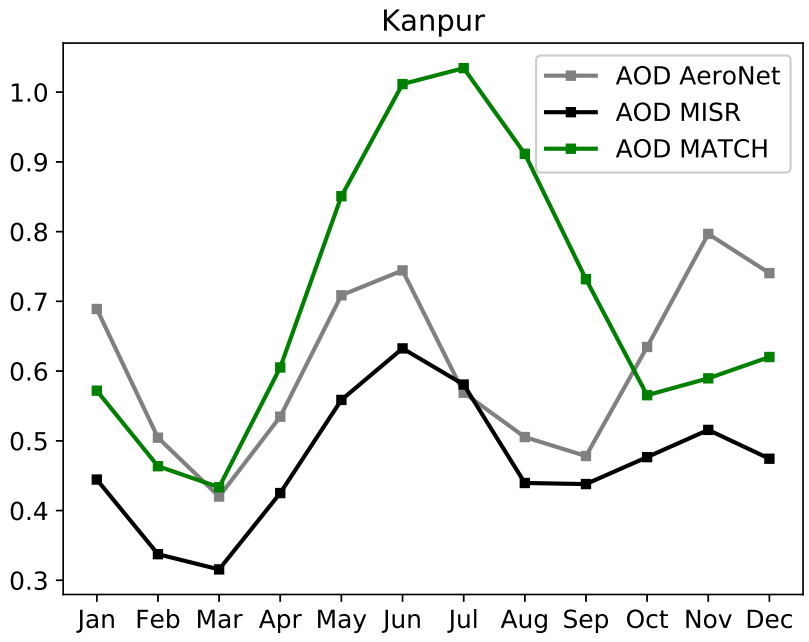




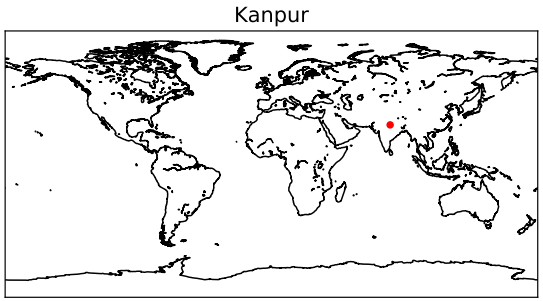


AeroNet India Monthly Climatology March 2000 - February 2016

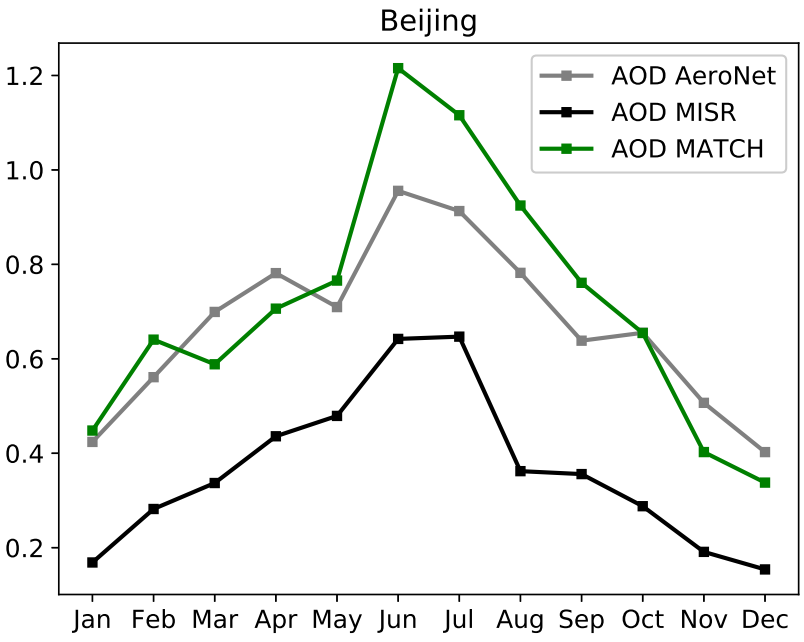


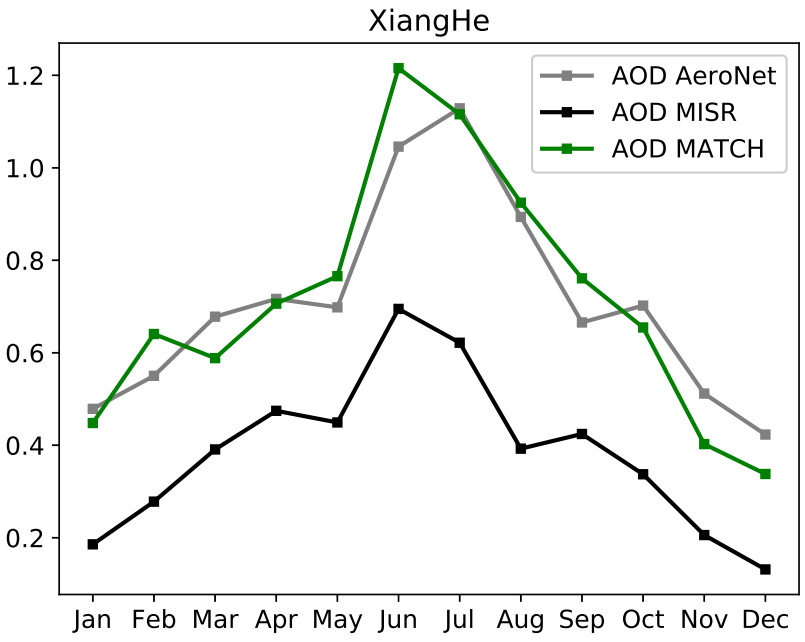


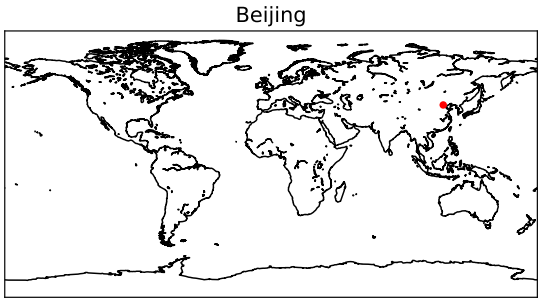
- AeroNet sites with 7 or more data years from March 2000 to February 2016

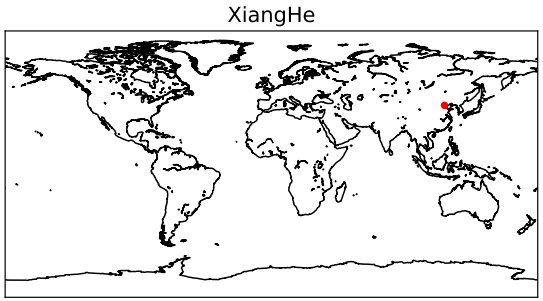


AeroNet China Monthly Climatology March 2000 - February 2016

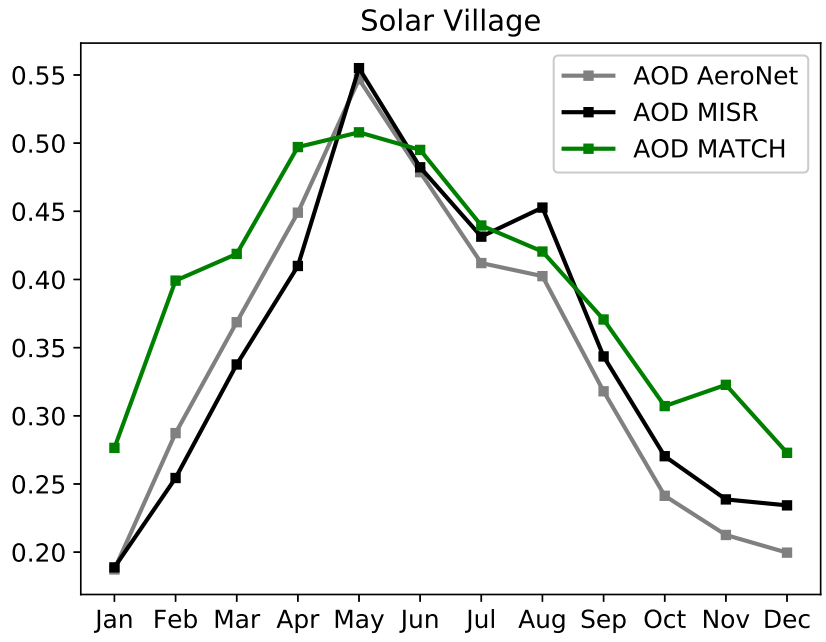


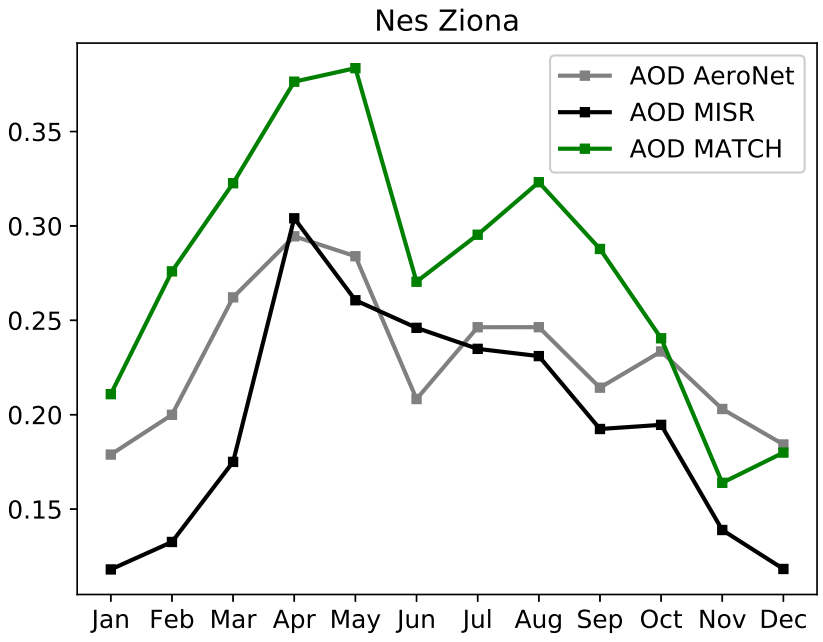


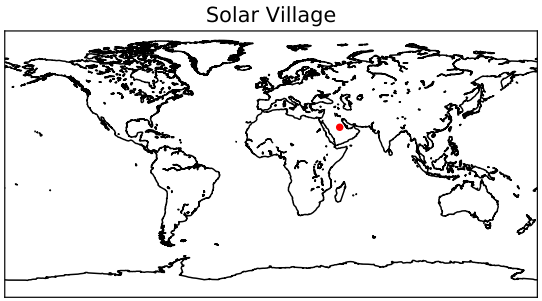


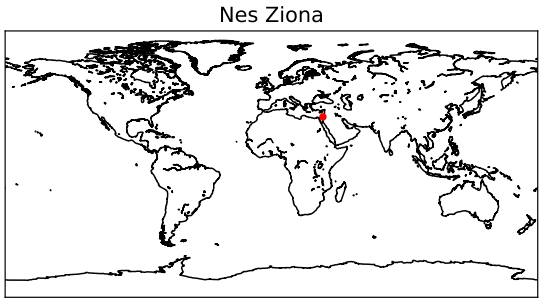


AeroNet Arabian Peninsula Monthly Climatology March 2000 - February 2016

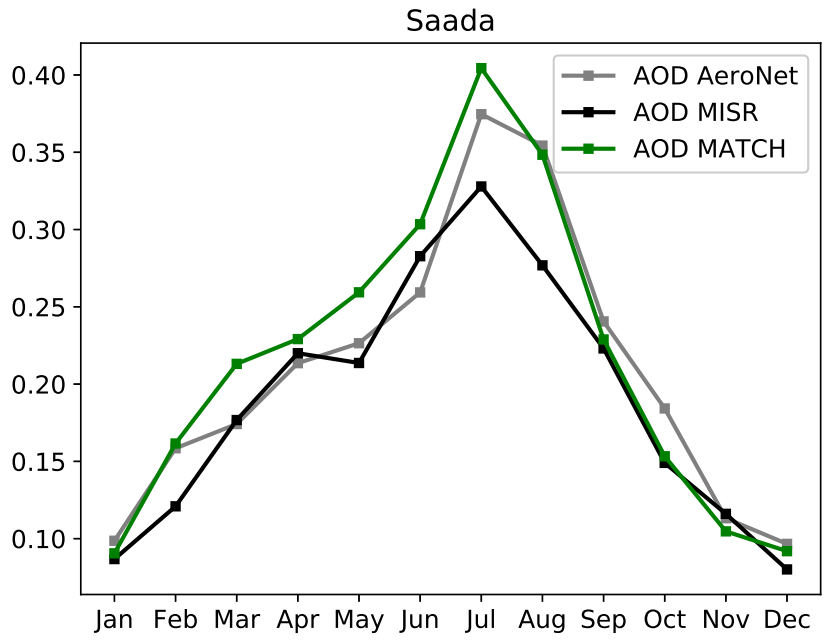


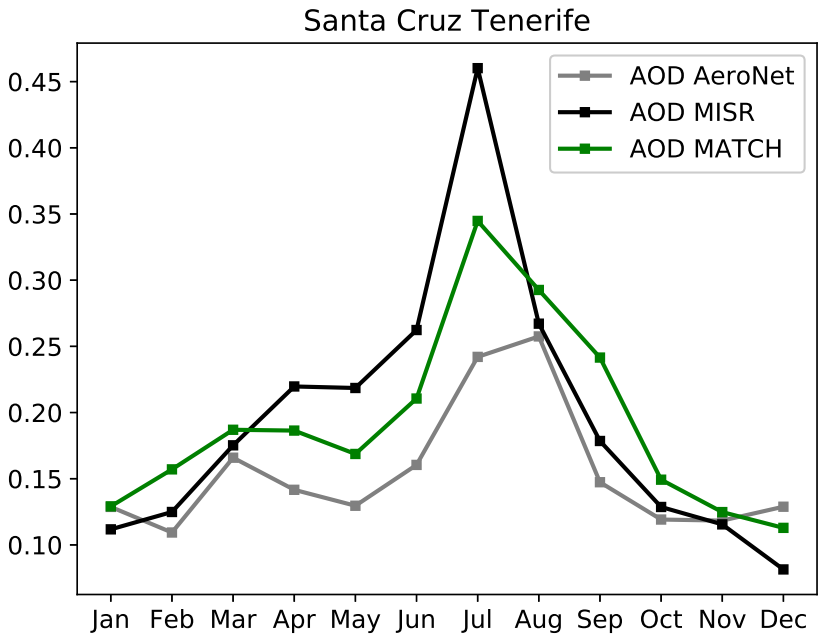


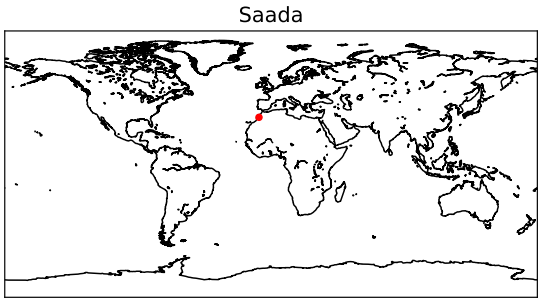


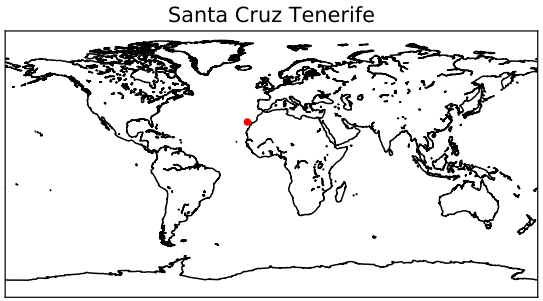


AeroNet Sahara Monthly Climatology March 2000 - February 2016

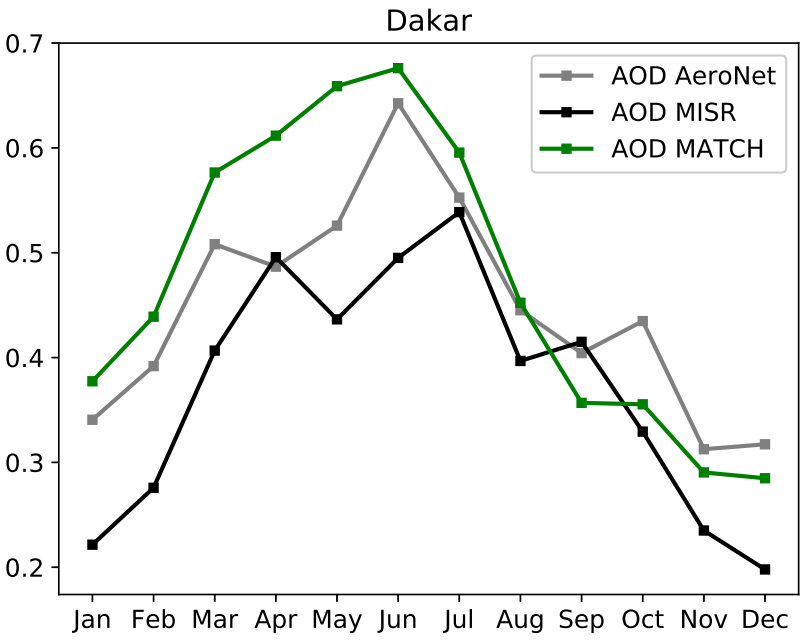


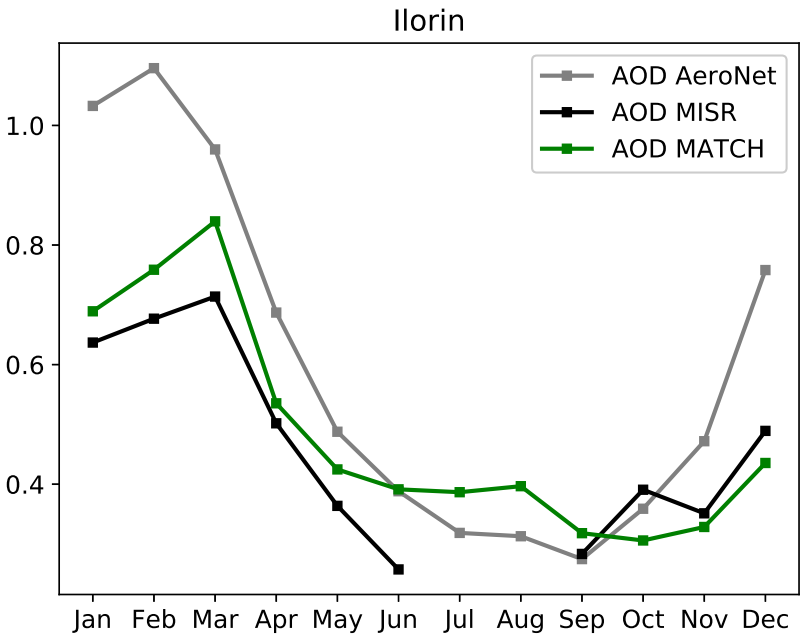


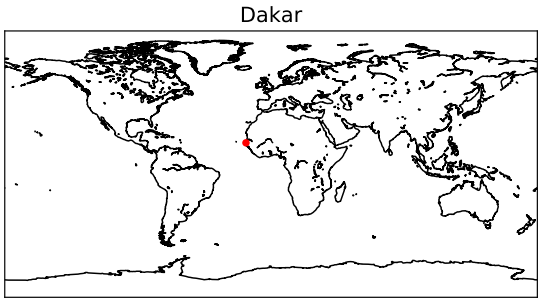


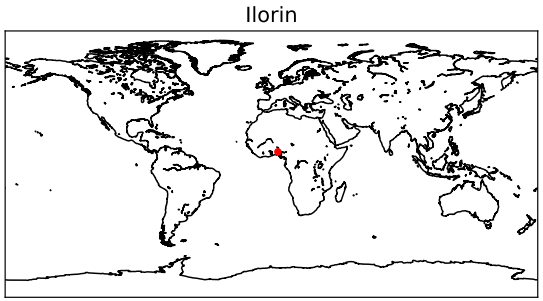


AeroNet Africa Monthly Climatology March 2000 - February 2016

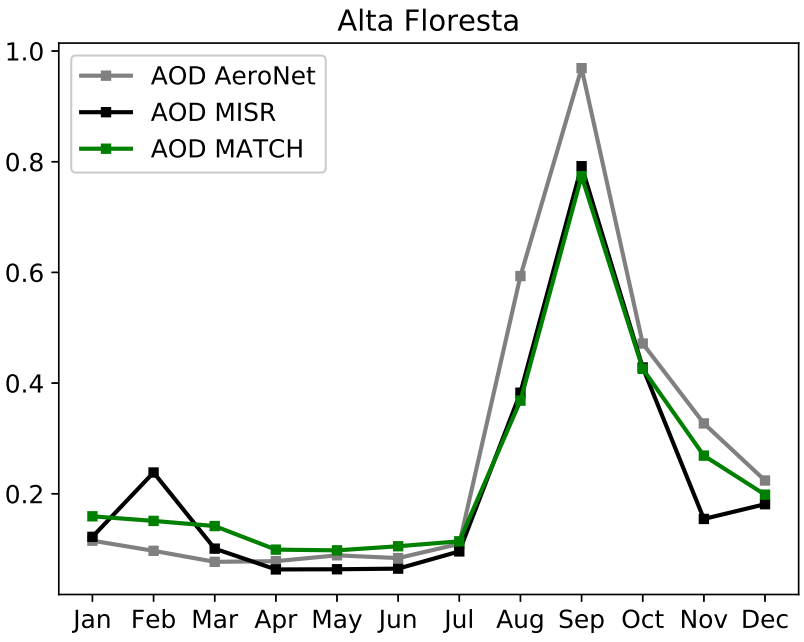


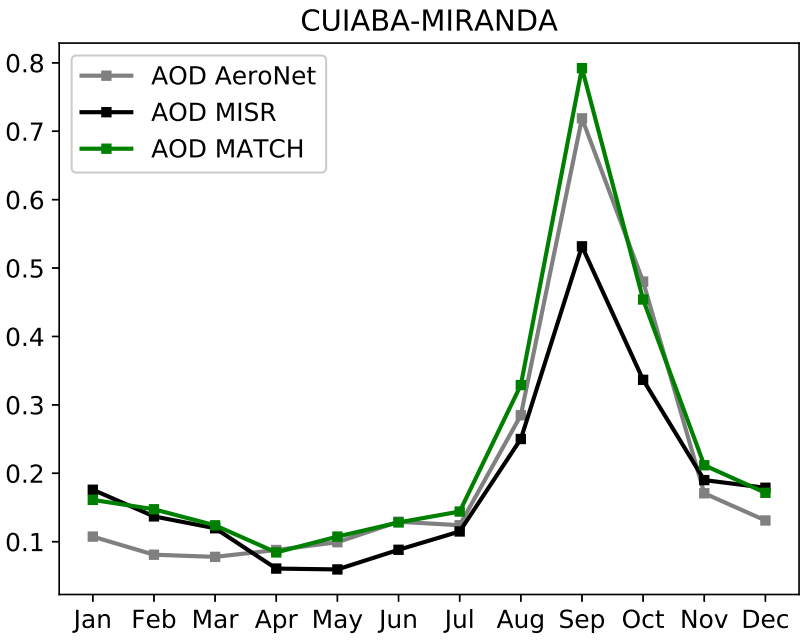


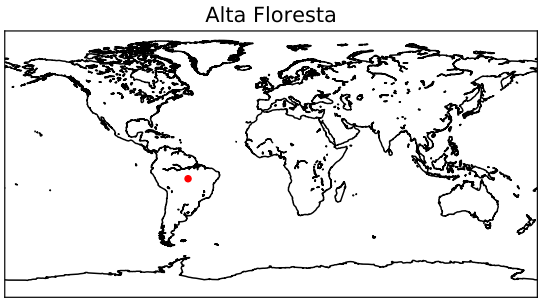


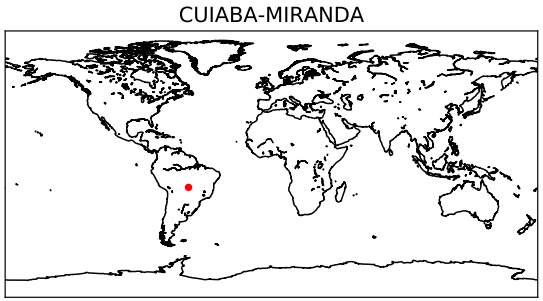


AeroNet Amazon Monthly Climatology March 2000 - February 2016

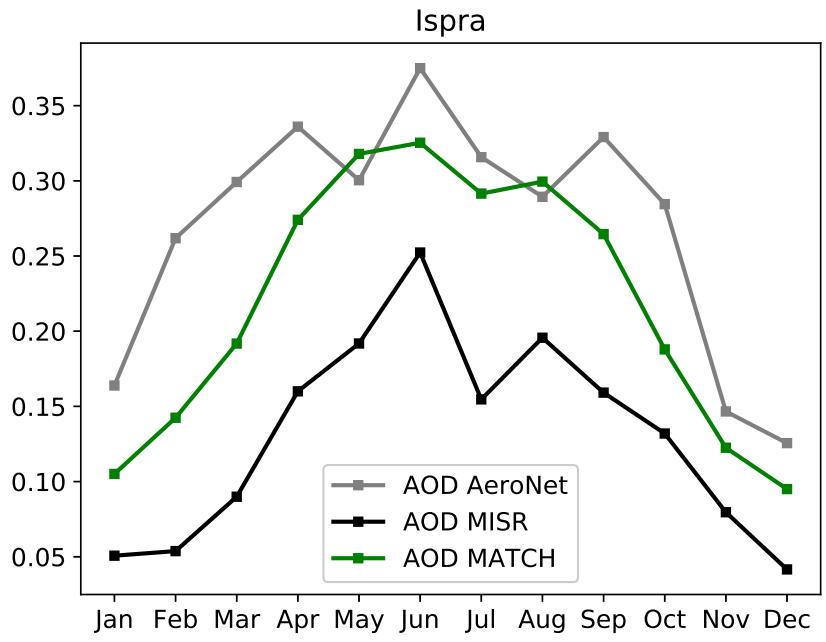


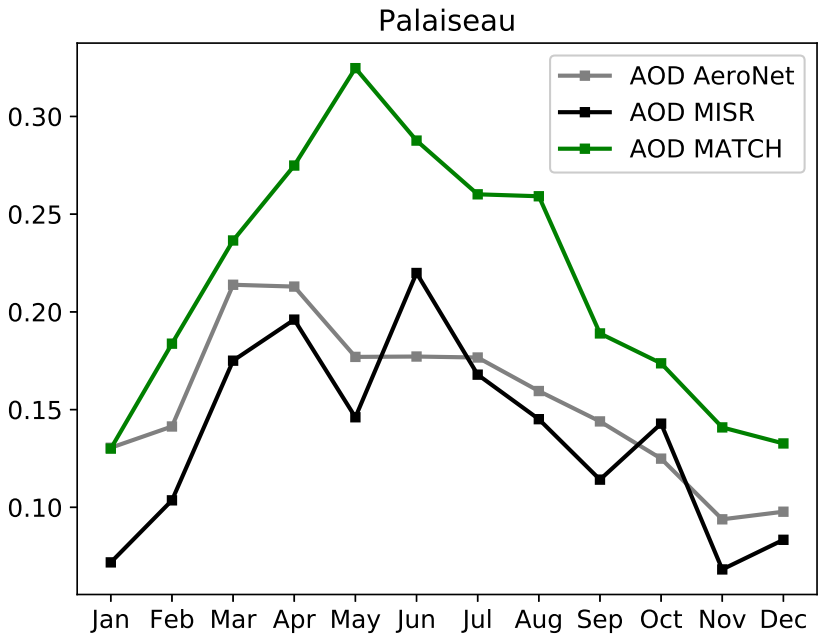


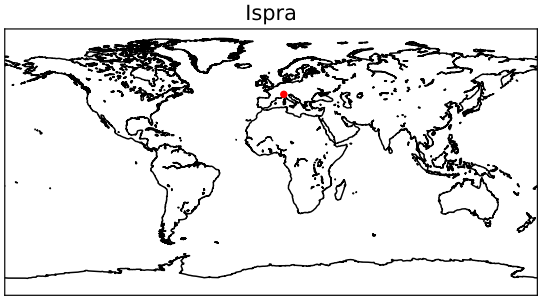


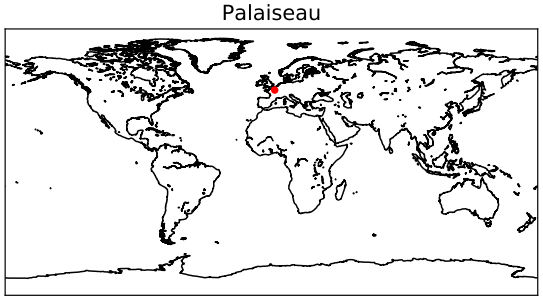


AeroNet China Monthly Climatology March 2000 - February 2016









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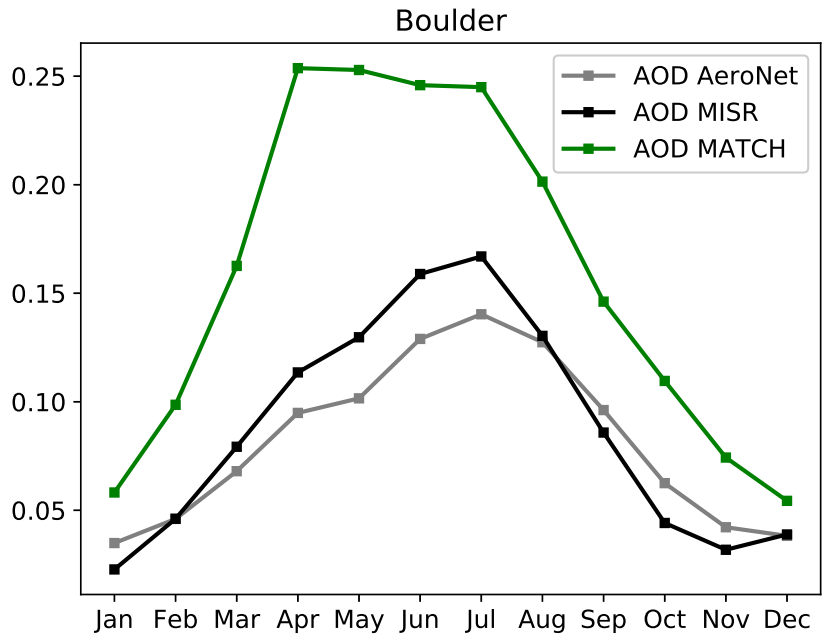

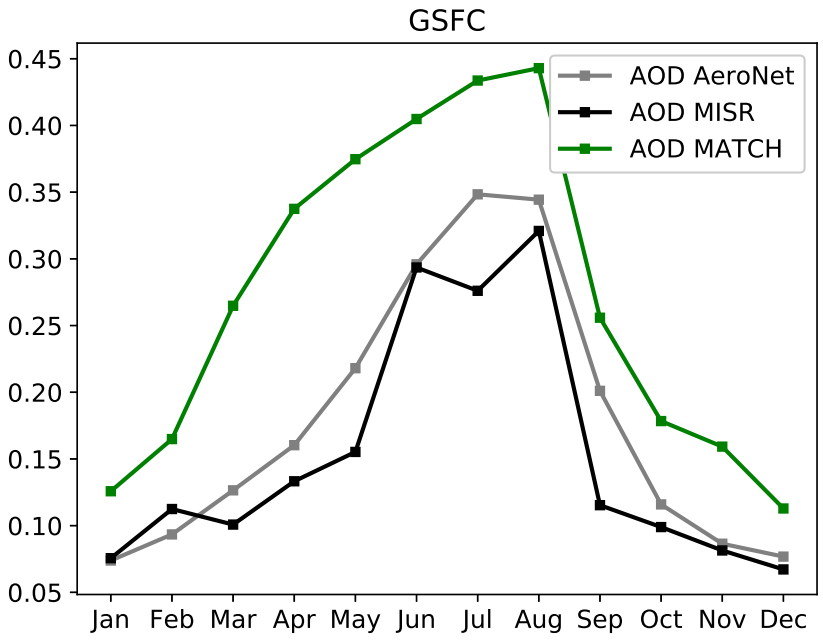

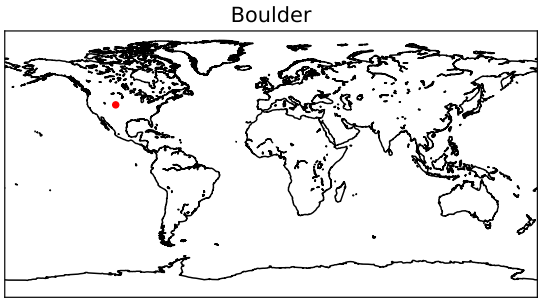

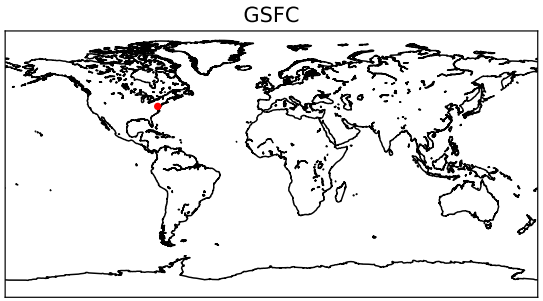

Conclusions

- MATCH AOD is high over Europe and North America relative to both MISR and AeroNet;
  reprocessing with MODIS Collection 6.1 may remedy
- MATCH AOD shows good agreement with MISR and AeroNet over dust dominated regions
  and excellent agreement over biomass burning regions
- MATCH AOD is substantially higher than MISR over the high aerosol regions of Asia,
  but is closer to AeroNet than MISR
- MATCH AOD over oceans is low relative to MISR

Next Steps

- Redo comparisons with MATCH + MODIS 6.1
- Comparisons with MERRA2 AOD (for CERES Edition 5)
- Test runs with VIIRS Deep Blue (Land and **Ocean**)
- Test Jaeglé (2011) diagnostic sea-salt scheme