MAIAC Update
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Status
- MAIAC MODIS C6.1 re-processing to start shortly;
- MAIAC VIIRS is in integration and testing for C2;
- We cross-calibrated SNPP and N20 VIIRS to MODIS Aqua for continuity of CDRs – used in MAIAC;
- MAIAC VIIRS (MOD C7) features Rotated Sin Projection.

MAIAC Products
- Atm.: Cloud/Shadow/Snow Mask, AOD, FMF (over water), CWV\textsubscript{MODIS}, Smoke Plume Injection Height
- Surf.: BRF (M: 0.5, 1km; V: 0.375, 0.75km);
- Surf. Daily Gap-Filled: BRDF, NDVI (1/0.75km); Snow grain size and fraction (1/0.75km); NBAR\textsubscript{MODIS} (0.25km)
- CMG Daily: most of the above + additional VIs

Alaska: Illustration of Projection Change

- Standard MODIS Projection (global Sin)
- MAIAC C2 VIIRS Projection (rotated Sin)

MAIAC MODIS – VIIRS Re-projection tools for users coming soon
We will provide re-projection tools for users.
MAIAC Algorithm Updates vs C6

- Developed new regional aerosol models based on AERONET climatology → improves AOD and AC under smoke and dust conditions;

21x21 km² (50% coverage), 0.47µm

Sept. 2020, Western USA

A single 1km pixel

C6 EE = ±0.05 ±0.1τ_{0.47}

Courtesy: X. Ye, P. Saide (UCLA)

N=409960
R=0.903
RMSE=0.107
MBE=0.012
EE=69.8%

N=423197
R=0.888
RMSE=0.121
MBE=0.022
EE=62.7%
MAIAC Algorithm Updates vs C6

- Relaxed cloud adjacency analysis → increase in AOD and SR coverage
- *From Lyapustin et al. (2021)*: MAIAC C6 has 5-25% more high-quality data than MOD09 annually. This difference will further increase in MAIAC MODIS C6.1 and VIIRS C2;

- Improved snow detection;
- Aerosol retrievals and AC over high sediment (brown) waters;
- Amended RTLS BRDF model to work at high SZA, VZA>60° - important for VIIRS, EPIC, geo ... and at high latitudes (*in preparation*)

**MAIAC VIIRS Calibration (Libya 4)**

( based on Lyapustin et al., AMT, 2014)

1. Perform MAIAC retrievals (CM, AOD, WV, BRDF etc.);
2. Compute TOA reflectance ($R_a$) for a fixed view geometry (VZA=0°, SZA=30°) and evaluate trends in both MODIS Aqua and VIIRS SNPP and N20;
3. Applied spectral conversion factor based on DESIS to account for RSR difference;
4. Apply de-trending and compute VIIRS-MODIS Aqua X-calibration factors
5. Good overall agreement with MCST/VCST and NASA LaRC but more reliable in VIIRS X-calibration to MODIS Aqua (Lyapustin et al. (in preparation))
6. Continuity of MAIAC MODIS and VIIRS Aerosol, surface reflectance (BRF), BRDF, NDVI records.

**MAIAC AOD Before X-Cal (Libya 4)**

**MAIAC AOD After X-Cal**
## 2022 MODIS/VIIRS Atmo. Discipline Virtual Mtg. May 2022

### VIIRS Cross-Calibration to MODIS Aqua

<table>
<thead>
<tr>
<th></th>
<th>Xiong et al., 2000 (in %)</th>
<th>This Study</th>
<th>X-calibration Coefficients</th>
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<td><strong>Band</strong></td>
<td></td>
<td><strong>X</strong></td>
<td><strong>Aqua/NPP</strong></td>
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<tr>
<td>B8/M1</td>
<td>2.1-4.2</td>
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<td>4.7-6.1 (6.4)</td>
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<td>B1/M5</td>
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<td>M8</td>
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<td>M11</td>
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