Cloud Mask and Cloud-Top/Optical Properties: MODIS Standard & MODIS/VIIRS Continuity Products

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Multiple Ongoing Efforts

- Trending analysis of MOD/MYD06 C6.1 (Standard) and CLDPROP v1.1 (Continuity)
  - Evaluating algorithm and sensor consistency
  - Evaluating approaches for sensor data record “stitching”
- Science tests for CLDMSK/CLDPROP v2 and MODIS Standard C7 algorithm updates
- Engagement in community efforts:
  - Contributed to GEWEX cloud assessment (CLDMSK/CLDPROP and MODIS Standard)
  - Developed/released new COSP datasets for model evaluation (CLDMSK/CLDPROP; MODIS Standard in prep)
  - Maintain Atmosphere Discipline website (https://atmosphere-imager.gsfc.nasa.gov/)

Objectives:

- To continue maintaining the C6.1 MODIS standard cloud optical property products and to prepare and implement key advancements for C7 reprocessing
- To continue advancing the common CLDPROP algorithm designed to provide continuity between EOS MODIS and the VIIRS imagers on SNPP and NOAA-20+
- To coordinate the LEO continuity efforts with parallel advanced Geostationary imager algorithm efforts to achieve an internally consistent NASA Program of Record for clouds that is expected to support upcoming Designated Observables missions (e.g., AOS)
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MODIS Standard C6.1 reprocessing occurred in 2017, forward processing ongoing

MODIS/VIIRS
Continuity processing history (at right)

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Description</th>
<th>Latest Version</th>
<th>Sensor</th>
<th>Public Release Date (latest version)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLDMSK_L2</td>
<td>Cloud Mask</td>
<td>v1.0</td>
<td>VIIRS SNPP</td>
<td>3/2019</td>
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<tr>
<td></td>
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<td>VIIRS NOAA-20</td>
<td>1/2021</td>
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<td></td>
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<td>MODIS Aqua</td>
<td>3/2019</td>
</tr>
<tr>
<td>CLDPROP_L2</td>
<td>Cloud-Top, Optical, and Microphysical Properties</td>
<td>v1.1</td>
<td>VIIRS SNPP</td>
<td>11/2019</td>
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<td></td>
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<td>VIIRS NOAA-20</td>
<td>4/2021</td>
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<td>MODIS Aqua</td>
<td>11/2019</td>
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<tr>
<td>CLDPROP_L3</td>
<td>Daily, Monthly Gridded Aggregations</td>
<td>v1.1</td>
<td>VIIRS SNPP</td>
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<td>VIIRS NOAA-20</td>
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</tbody>
</table>

Known Issues or Concerns
https://atmosphere-imager.gsfc.nasa.gov/continuity/issues

Recent/Relevant Publications
Trending Analysis

Approach

Merging MODIS/VIIRS Data Records

Approach at right: Compute mean VIIRS – MODIS difference over 2013, subtract from VIIRS

Example: Daytime Low Cloud Fraction (CTP ≥ 800mb) Example

Inter-Algorithm (Same Sensor) Trends: CLDPROP_L3 MODIS Aqua = MYD08

Inter-Sensor (Same Algorithm) Trends: Aqua MODIS = SNPP VIIRS

MODIS/VIIRS Atmo. Discipline Virtual Mtg. May 2022
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Key Updates for CLDMSK/CLDPROP v2:

New cloud-top properties algorithm (IROE) that also provides day/night ice cloud optical properties and enables leveraging AIRS and CrIS sounder absorption channels.

Pixel-level SW and LW broadband radiative flux calculations (TOA, sfc) using cloud property retrievals as input.

Other Science Updates:

• Machine learning algorithm for cloud thermodynamic phase classification (liquid, ice) based on Random Forest approach (Wang et al., 2020)
• Leverage high-resolution VIIRS I-bands for sub-pixel information
• Complementary thin cirrus optical thickness retrievals using 1.38µm water vapor absorption channel (Meyer & Platnick, 2010)
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Key Updates for MODIS Standard C7:

- Same science updates as for CLDMSK/CLDPROP v2 (IROE, flux, etc. on previous slide)
- Will also leverage key continuity algorithms/code to ease maintenance
  - CLDMSK code base for MOD/MYD35 (all MOD/MYD35 tests and thresholds retained) – same code that is used for parallel imager efforts (e.g., GEO)
  - Yori algorithm developed by A-SIPS to replace current MOD/MYD08 algorithm for L3 gridded aggregations
    - Provides scalar/multi-dimensional statistics consistent with current MOD/MYD08
    - But with some consequences:
      - Separate L3 daily and monthly product files for each L2 Atmosphere science product (e.g., cloud, aerosol, etc.)
      - Same internal variable formatting as CLDPROP_L3
- File format change to netCDF-4 for all Atmosphere products
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Atmosphere Discipline Team Imager Products Website

Introduction
The MODIS/VIIRS, Atmosphere Discipline Team develops and maintains image products supporting the detection and characterization of aerosols and clouds. This includes products for the estimation of aerosol properties, and processes occurring in the Earth's atmosphere. The team meets regularly to discuss issues related to the MODIS standard and continuity products. See https://atmosphere-imager.gsfc.nasa.gov for updated information.

News and Spotlight
New Python-based L3 browse imagery under development
- Platte Carrée and Mollweide projections
- Rainbow and colorblind friendly color bars

Documentation, known issues, browse imagery, and much more...

https://atmosphere-imager.gsfc.nasa.gov/