VIIRS Atmosphere Breakout Session, Wednesday, June 8, 1:30 pm - 5:30 pm

"Atmosphere SIPS update"   1:30 pm
Liam Gumley

"VIIRS Nighttime Lights Development Update"   2:00 pm
Kim Baugh and Chris Elvidge

"Application of DNB for air quality and fire monitoring"   2:15 pm
Jun Wang

"The VIIRS M9 channel and the development of the VIIRS cirrus reflectance
algorithm"   2:30 pm
Bo-Cai Gao and Rong-Rong Li

"Update on MODIS ice particle models"   2:45 pm
Ping Yang

Break   3:00 pm

Discussion of Issues (we'll get through as many as possible)   3:30 pm
    a. product descriptions requested: Jaime Nickeson
    b. request VIIRS L1B analog of the MYD02SSH (5-km sub-sampled data)
    c. MODIS Atmosphere 6.1 reprocessing discussion (impact of L1B changes, etc)
    d. VIIRS and CrIS 6-min Level 1b concerns
    e. missing or additional ancillary data requests
    f. Level 3 plans
    g. ATBD documentation
    h. process for SIPS product transfer to LAADS
    i. product validation
    j. converge on calibration

Adjourn   5:30 pm

VIIRS Atmosphere Team

Aerosols

Deep Blue and Dark Target teams are making good progress and are on target for product generation this year

Products will be similar to those from MODIS

Clouds

MVCM: MODIS-VIIRS Cloud Mask needs to become a beta product for testing by entire team

Cloud product will be quite similar to MOD06 with exception of cloud-top property algorithm (two parallel investigations, teams working together)

Gridded cloud product "baseline" will be similar to MOD08 (offering to do for other MODIS-like products)

Discussion of entire cloud team moving to GEOS product (moving away from GDAS)

VIIRS TPW Status Report

Eva Borbas (PI), Zhenglong Li, Paul Menzel, and Laura Dobor

University of Wisconsin-Madison

Validation for 2012-2015 with TPW from ground-based GPS network, MWR, and RAOBs

VIIRS TPW L2 algorithm/products based on 6 min granules
- Hole filling
- Smoothing
- Algorithm delivered

Granule and one day global validation using MYD07

Integrated at SIPS for global processing
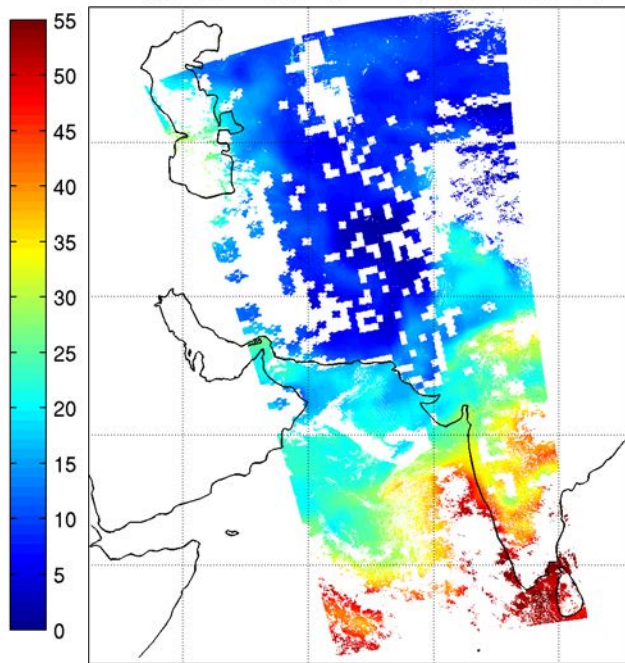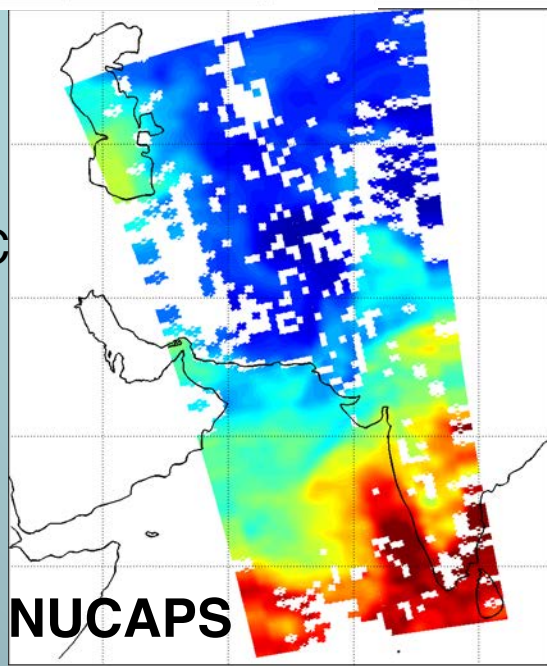
Working on L3 algorithm as well as ATBD

VIIRS Only
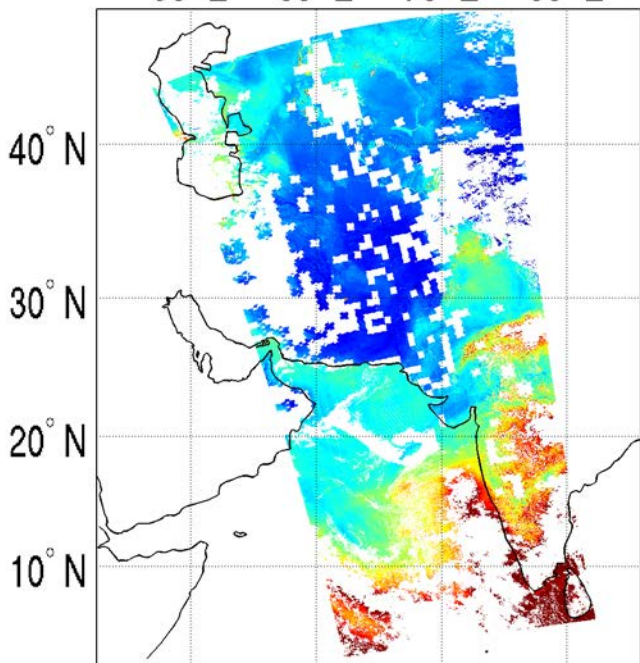
VIIRS+NUCAPS smoothed

Unit: mm

Retrieval Comparison

0842~0854 UTC
10/15/2014

NUCAPS

Difference Images
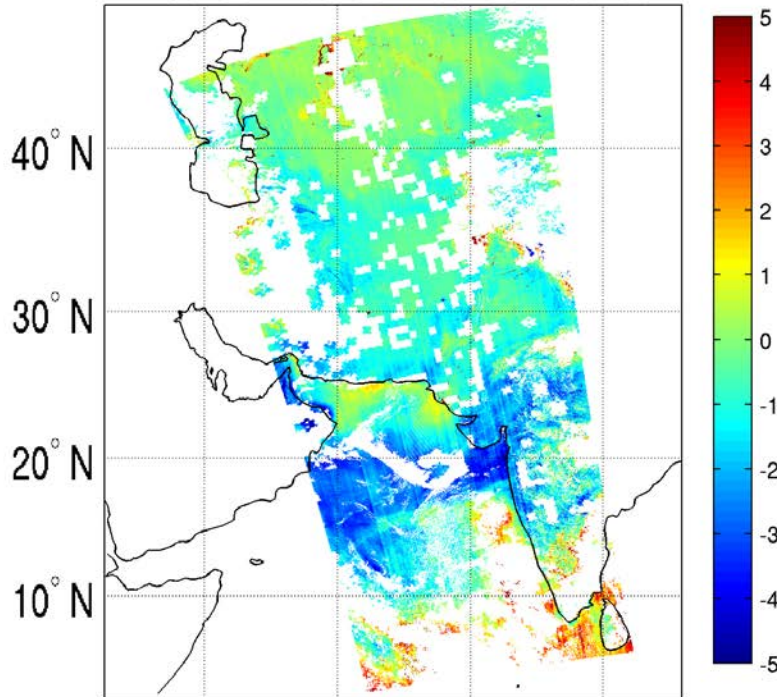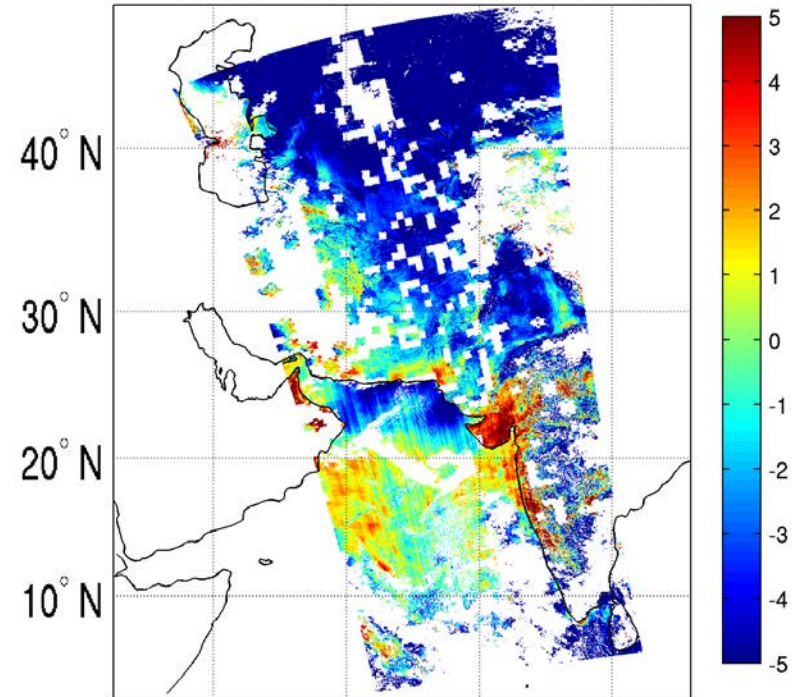
Unit: mm

VIIRS Nighttime Lights Development Update
Kim Baugh and Chris Elvidge (NOAA)

A nighttime lights composite is made to serve as a baseline of persistent light sources.

Composites are made as an average of the highest quality nighttime lights imagery over desired time period – usually monthly or annually.

"Stable Lights" composites have ephemeral light sources and non-light (background) areas are removed from a composite.

EOG group is producing current monthly cloud-free/no-moon DNB nighttime lights composites and is doing algorithm development to turn these in to Stable Lights composites.

Products still generated using IDPS VIIRS granules; need to switch to NASA 6-min granules
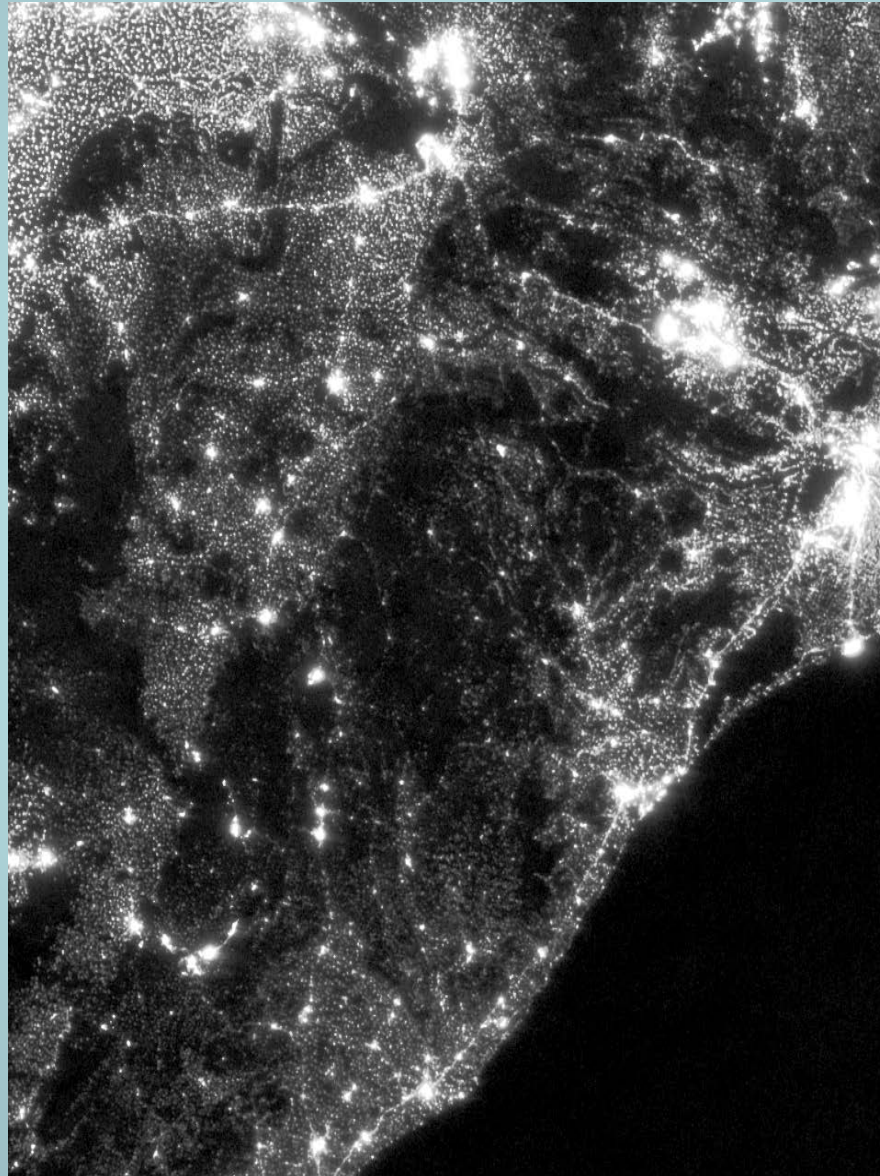
Products are distributed by NOAA

DNB Ephemeral Lights: Before Outlier Removal

In this example there are regions with fire activity
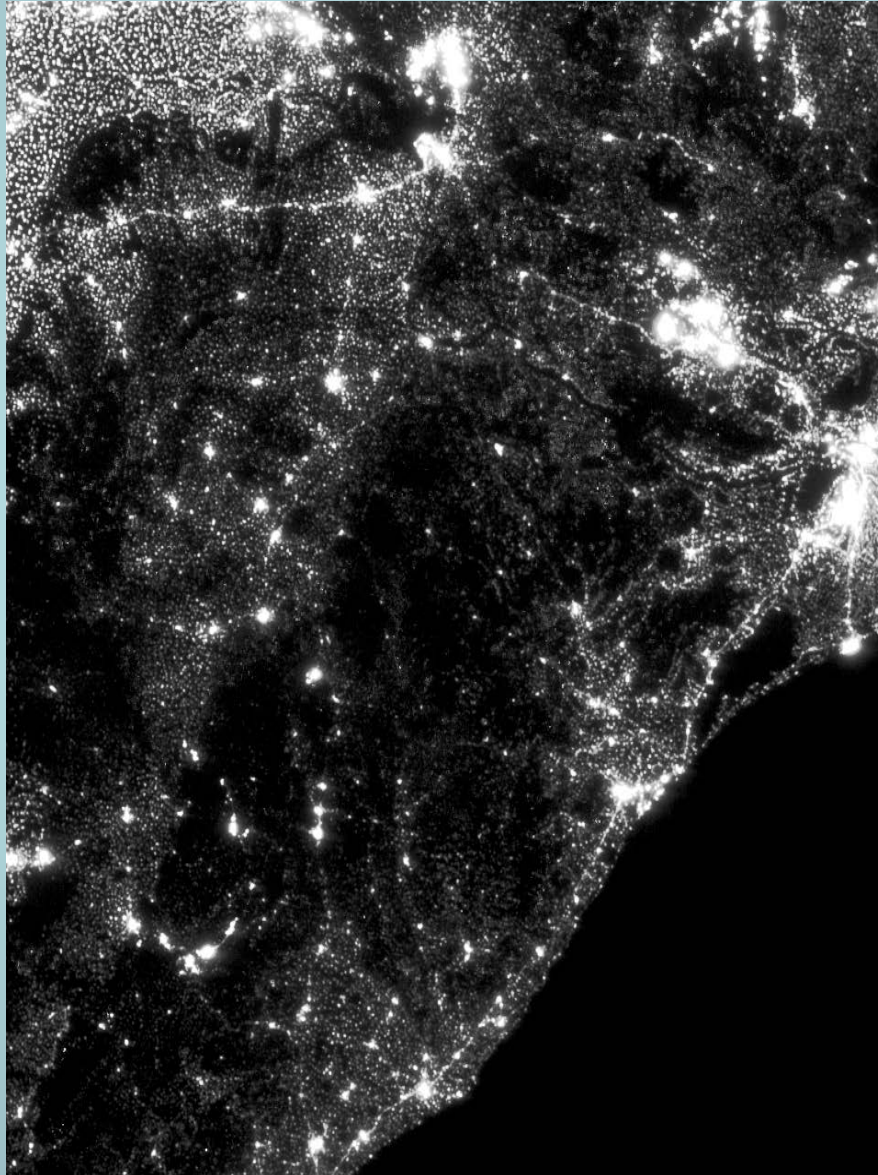
DNB Ephemeral Lights: After Outlier Removal

Notice how regions with fire activity return to background radiance levels after outlier removal

Application of DNB for air quality and fire monitoring
Jun Wang and colleagues

Potential application of VIIRS Day/Night Band for monitoring nighttime surface PM$_{2.5}$ air quality from space

Jun Wang [a, *], Clint Aegerter [a], Xiaoguang Xu [a], James J. Szykman [b]

[a] Department of Earth and Atmospheric Sciences, University of Nebraska, Lincoln, NE, USA
[b] National Exposure Research Laboratory, U.S. Environmental Protection Agency, RTP, NC, USA

HIGHLIGHTS

- VIIRS Day/Night Band (DNB) is much more sensitive to aerosols than to water vapor
- Modeling of outdoor light transfer in nighttime atmosphere for VIIRS DNB
- DNB potential for estimating surface PM$_{2.5}$ is shown qualitatively and quantitatively
- PM$_{2.5}$ at VIIRS night overpass time is much closer to daily-mean PM$_{2.5}$ than at daytime
- Strategies for future DNB remote sensing of aerosols are elaborated

NAAQS uses daily and annual averages of PM$_{2.5}$
Can we use DNB to estimate surface PM$_{2.5}$ at night?

- At night, aerosols are often mixed in a shallow nocturnal boundary layer.

- Retrieval of AOD from DNB is still in its infancy; preliminary work include Zhang et al. (2008) and Johnson et al. (2013).

- We like to make a first attempt to apply DNB for night time PM$_{2.5}$ air quality.
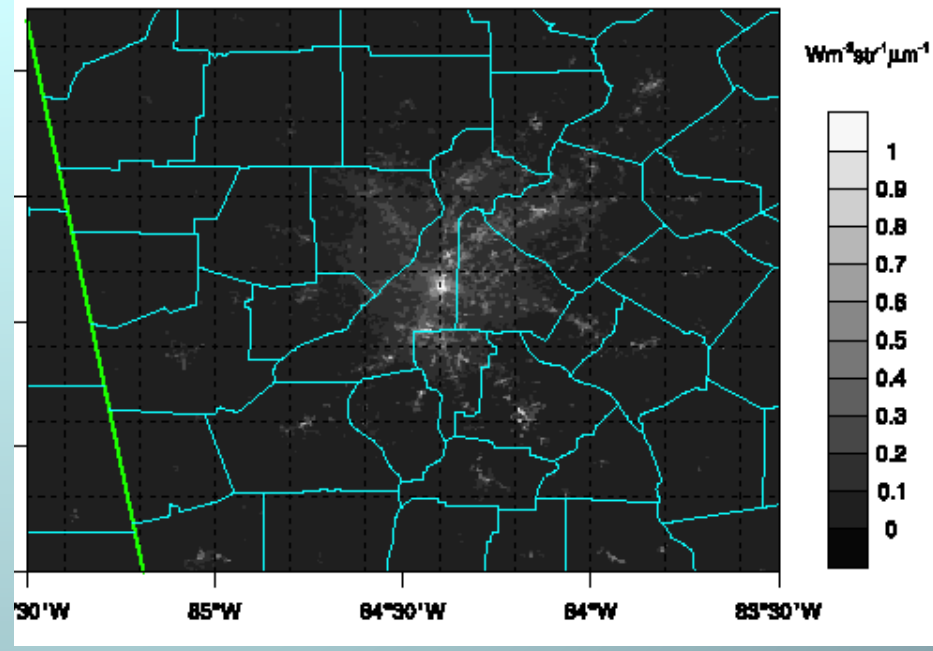
- Aug – Oct 2012. Focus area: Atlanta

PM$_{2.5}$: 5 ug/m^3
VIIRS DNB, 7 Sep. 2012
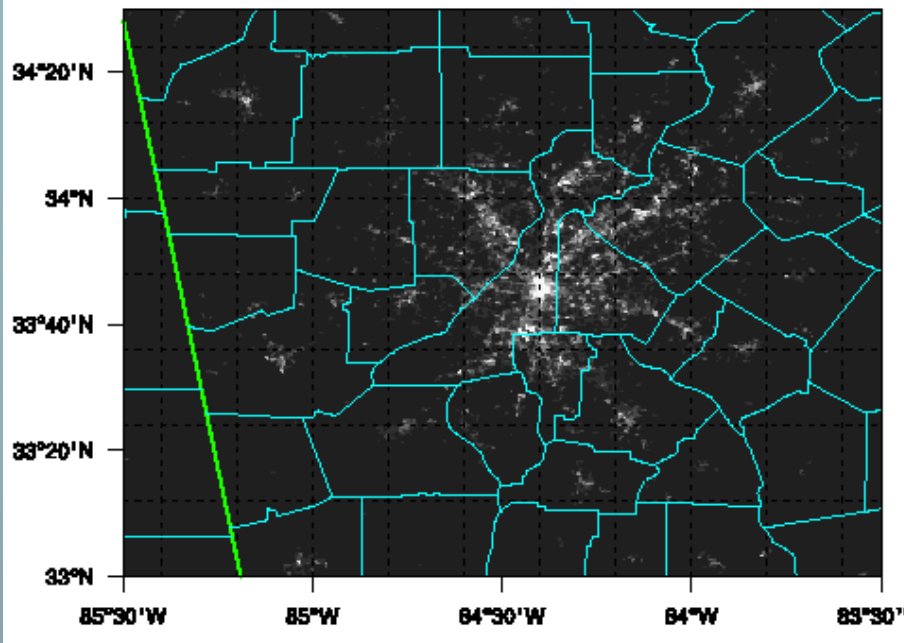
PM$_{2.5}$: 13 ug/m^3
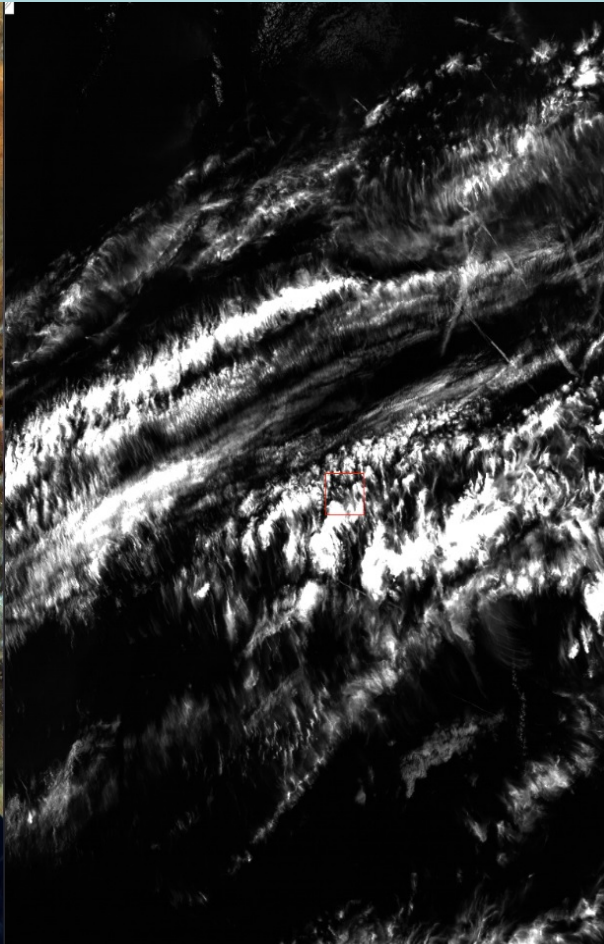VIIRS DNB, 8 Sep. 2012

Example of VIIRS Cirrus Detection & Cirrus Removal Over the Red Sea
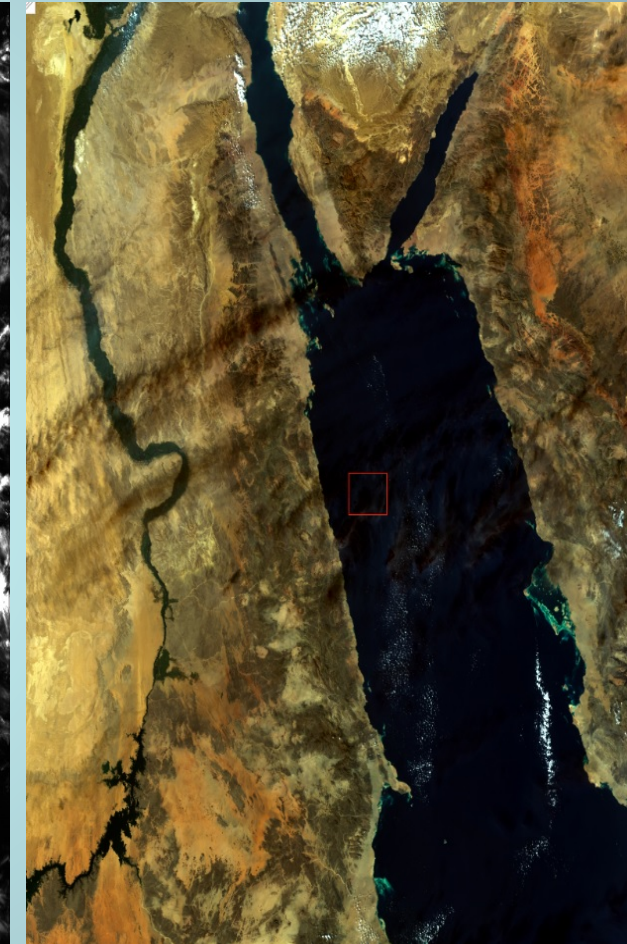## Bo-Cai Gao and Rong-Rong Li

VIIRS RGB Image   Cirrus Reflectance   Cirrus-Removed RGB

No horizontal striping effects are introduced in the cirrus-corrected RGB image.

Level 2 formats and metadata
New information

- ESDIS requires that netCDF4 be used as the Level 2 product format.

- Sufficient metadata must be included in the files to provide
  - Information about the source observations (e.g., date, time, sensor, platform, …)
  - Information about the processing (e.g., algorithm/software versions, LUT names, ANC names, …)
  - Information about the product (e.g., quality flags, uncertainty indices, …)

- Additional metadata must be provided to allow delivery, archive, and distribution at LAADS.

Process for Level-2 metadata generation

This was a rather onerous process for MODIS cloud/aerosol products
back in the day

Liam Gumley (Atmosphere SIPS) presented an approach to easing this
process for algorithm developers

Approach is to build a template with the necessary global and scan-
line specific attributes; then fill in the necessary arrays during
product generation

Aerosol teams (Deep Blue followed by Dark Target) will be the first to try
out this process

Develop subsampled Products – Level 1B and L2

Analog to MYD02SSH and MYDATML2

Provides a lower volume when you need to process the entire data stream repeatedly

Platnick team will develop analog to MODIS ATML subsampled Level-2 product and will need to work with SIPS on this process. Need to ensure that the ATML subsampled product is based on the same pixels chosen for the subsampled L1B product.

Subsample issues: Inclusion of Bowtie Deleted pixels in SIPS IFF files, 4x4 sampling for VIIRS (vs. 5x5 for MODIS)

Discussion of calibration impacts

As noted during plenary talks by aerosol and cloud teams, MODIS and MODIS-VIIRS relative calibration issues are becoming more apparent. This involves both mitigation of solar and IR channels as well as issues after safe hold (see following slides for refresher).

MODIS Terra: b27, b29 (pre- and post-safe hold) impacts on cloud mask => CTP, COP
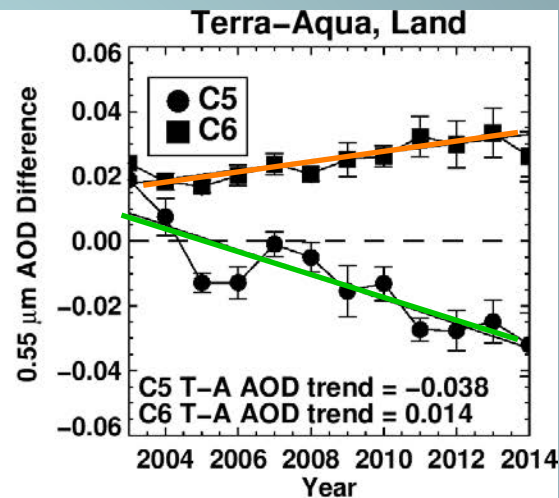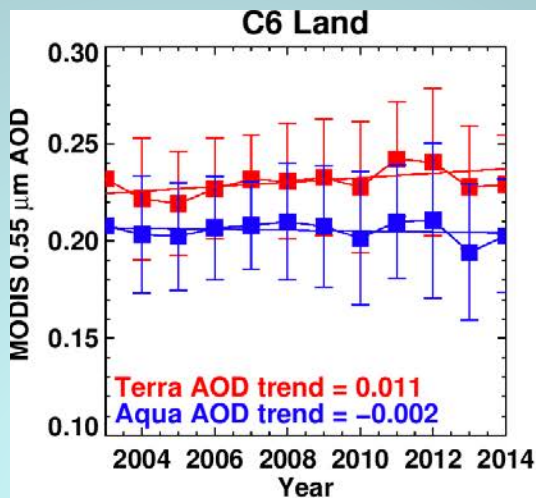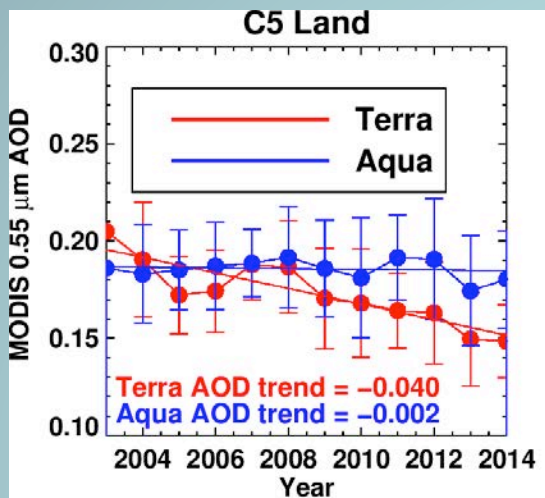MODIS Aqua: concern about some shortwave degradation
VIIRS vs. MODIS: compromising data/instrument continuity

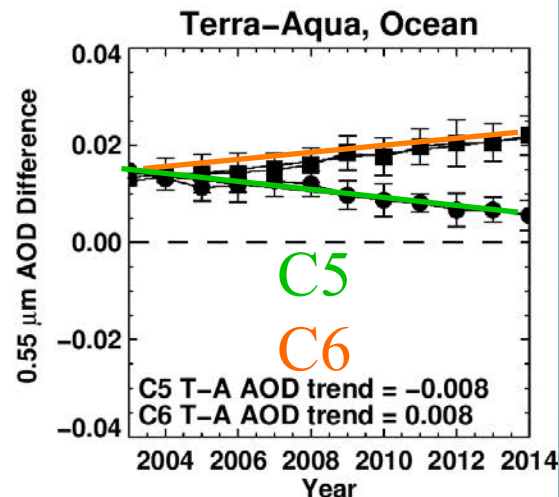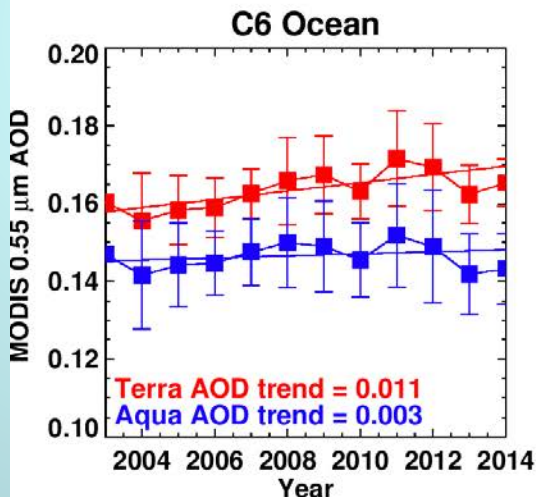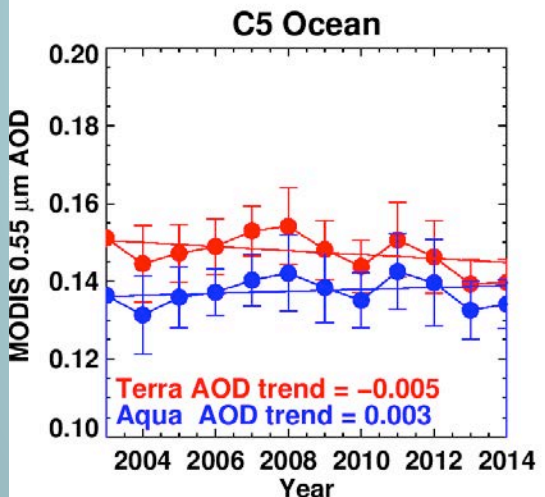Discussion revolved about how to fix the broken cloud mask and downstream product records

# Time series of MODIS-derived AOD
Dt = Terra - Aqua

LAND

OCEAN

Good news: Strong Dt negative "trending" is reduced in C6
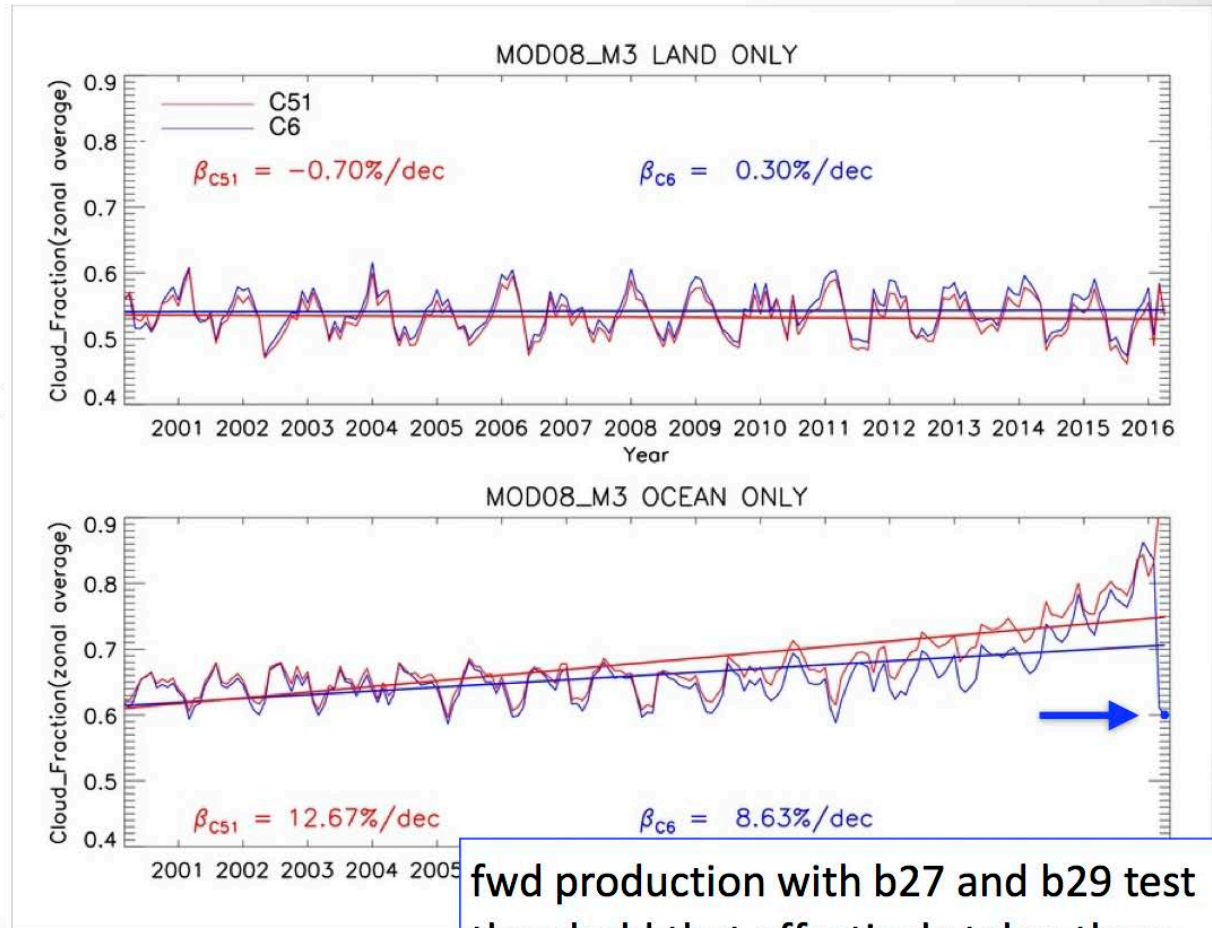Bad news: 1) Dt offset increases, and 2) there is now a positive trend

Terra Pre-Safe Hold Radiometry Issue & Impact: B29 "Warming"

<u>Cause</u>: Cloud mask test over ocean that uses 8.6 μm channel (b29) that's experienced gradual warming over the last ~5 years, apparently related to crosstalk & not captured by on-board calibration systems.

Aqua–Terra Monthly Cloud Fraction time series (ocean)
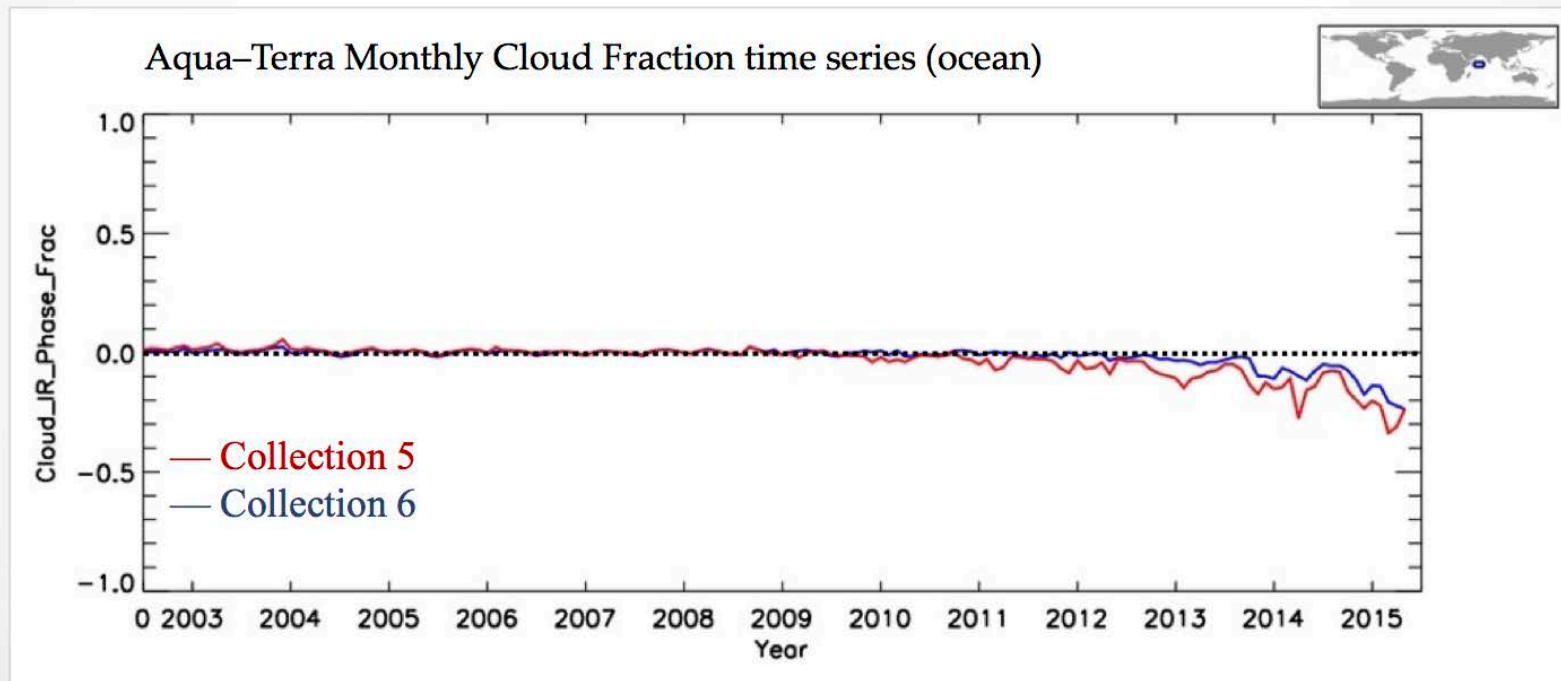
Terra Post-Safe Hold Radiometry Issue & Impact: B29 & B27

MOD35 ±25° Zonal
Mean Time Series:

Terra Cloud Mask
Land (top)
Ocean(bottom)
C6
C51

fwd production with b27 and b29 test threshold that effectively takes them out of the decision making.

MODIS-VIIRS Continuity

Discussion of approach taken to generating MODIS Aqua/Terra and VIIRS continuity cloud products, i.e., using same channel set and algorithms for MODIS as for VIIRS (MODAWG).

Issue for future solicitations/Senior Review is in how to balance resources associated with potential MODIS streams (Collection 6.1and C7 activity) vs. generation and validation of MODIS-VIIRS continuity product.

Future plans for product generation for VIIRS JPSS-x?