

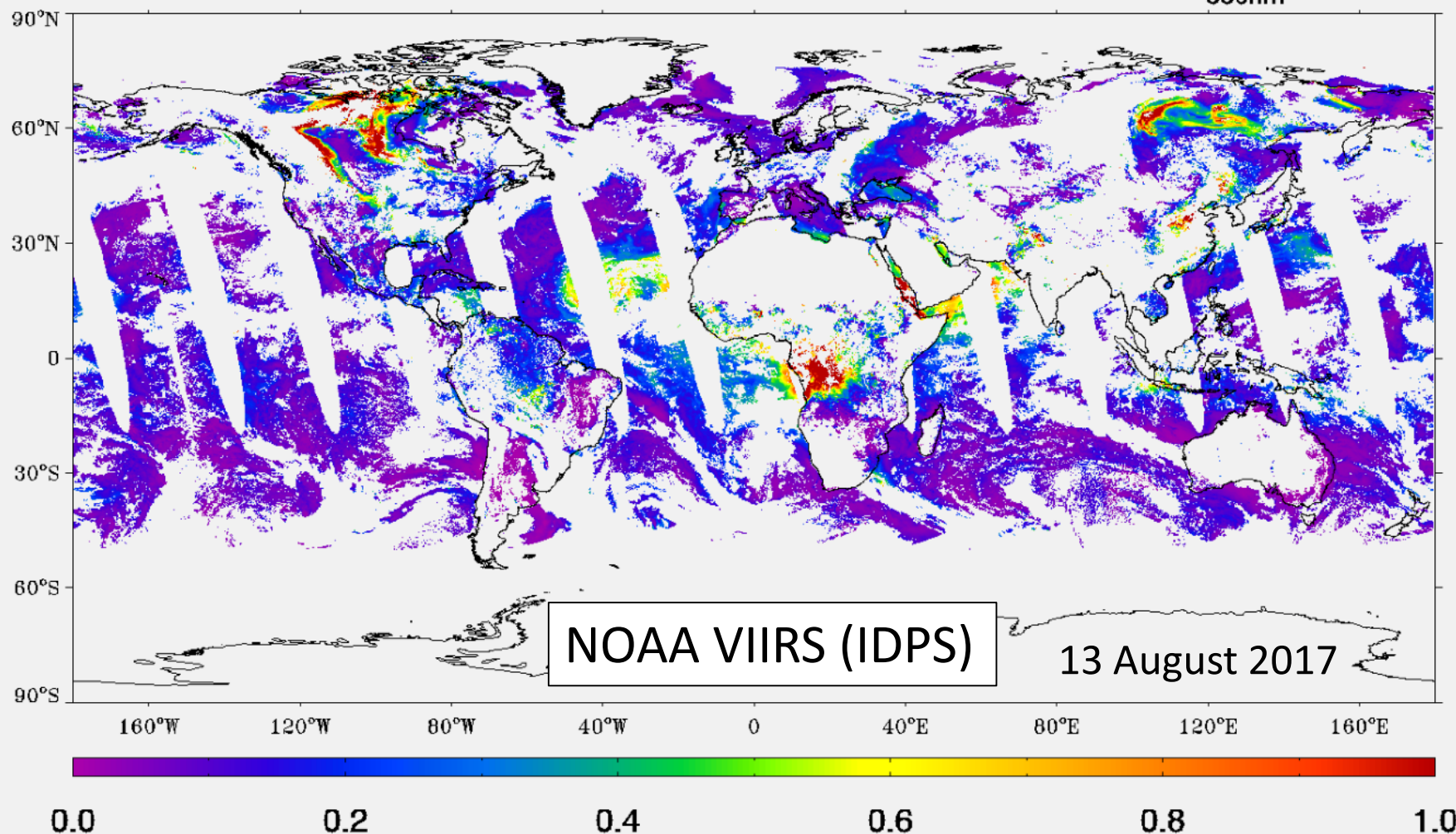
Comparison of NOAA VIIRS and NASA MODIS Aerosol Products

Lorraine A. Remer¹, Jennifer Christhilf^{1,2}, Robert C. Levy²

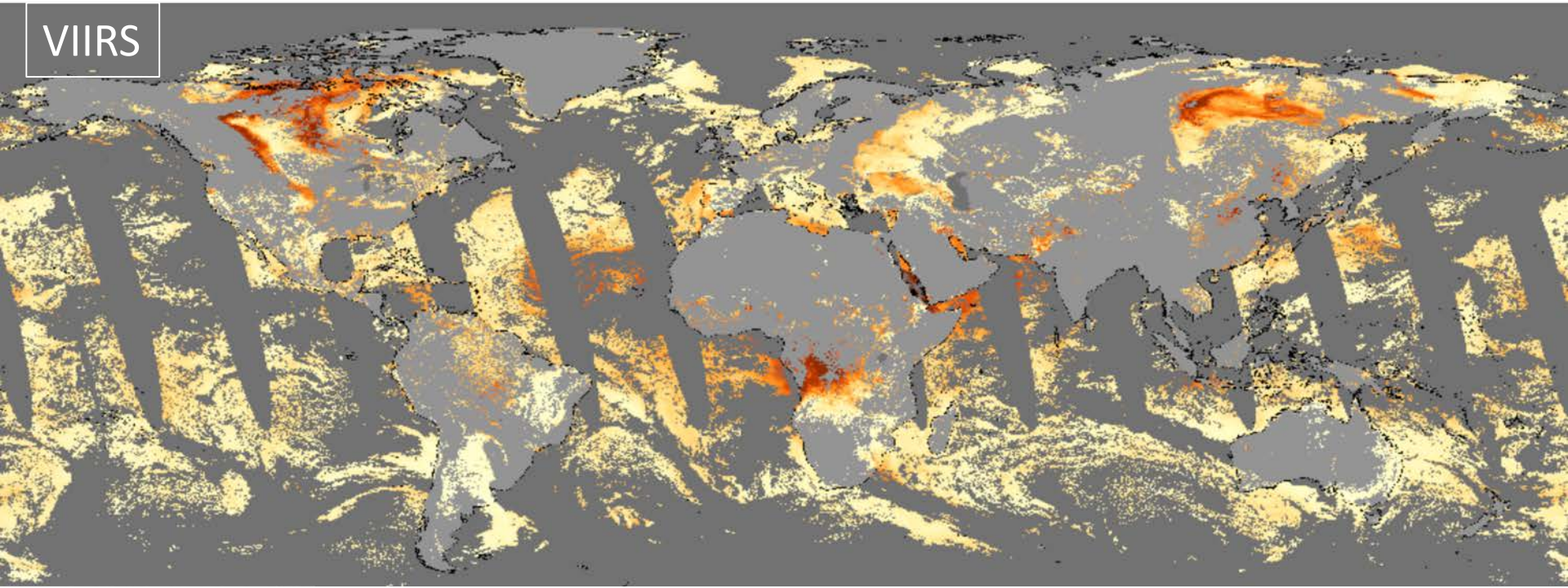
¹UMBC, ²NASA/GSFC



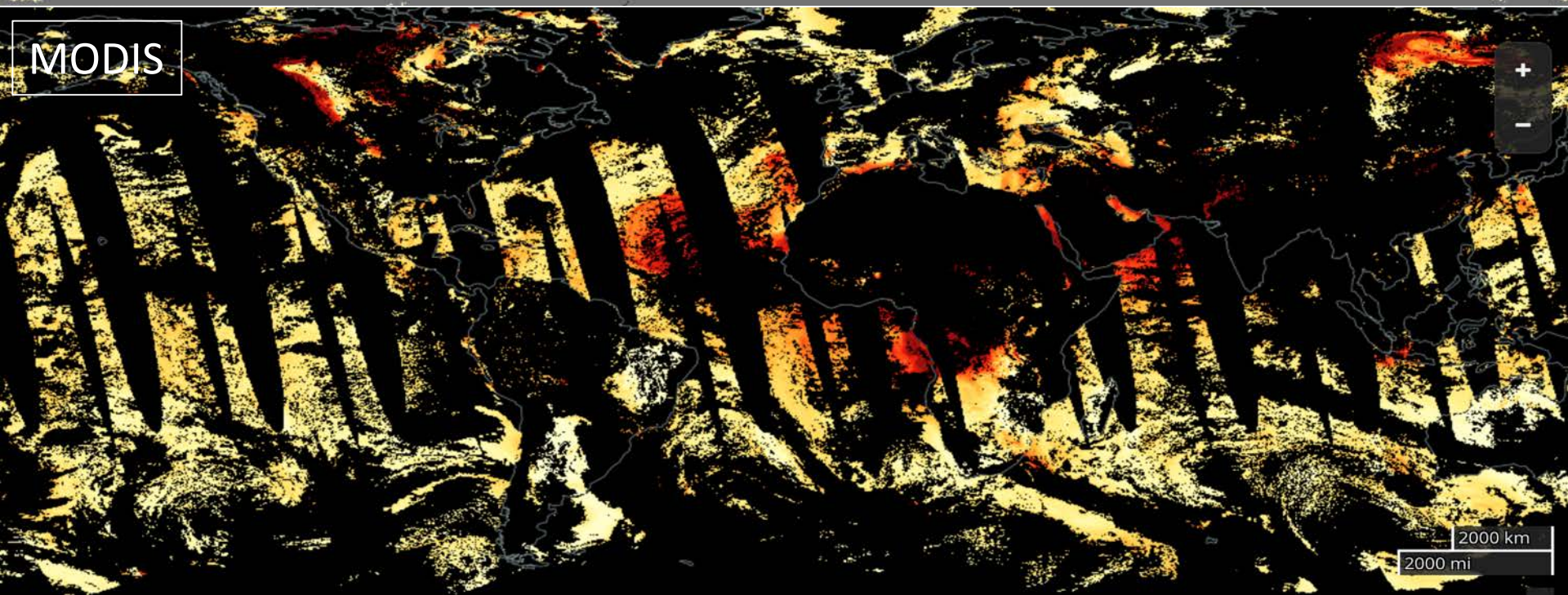
20170813 0.25°x0.25° Gridded High Quality EDR AOT_{550nm}



VIIRS

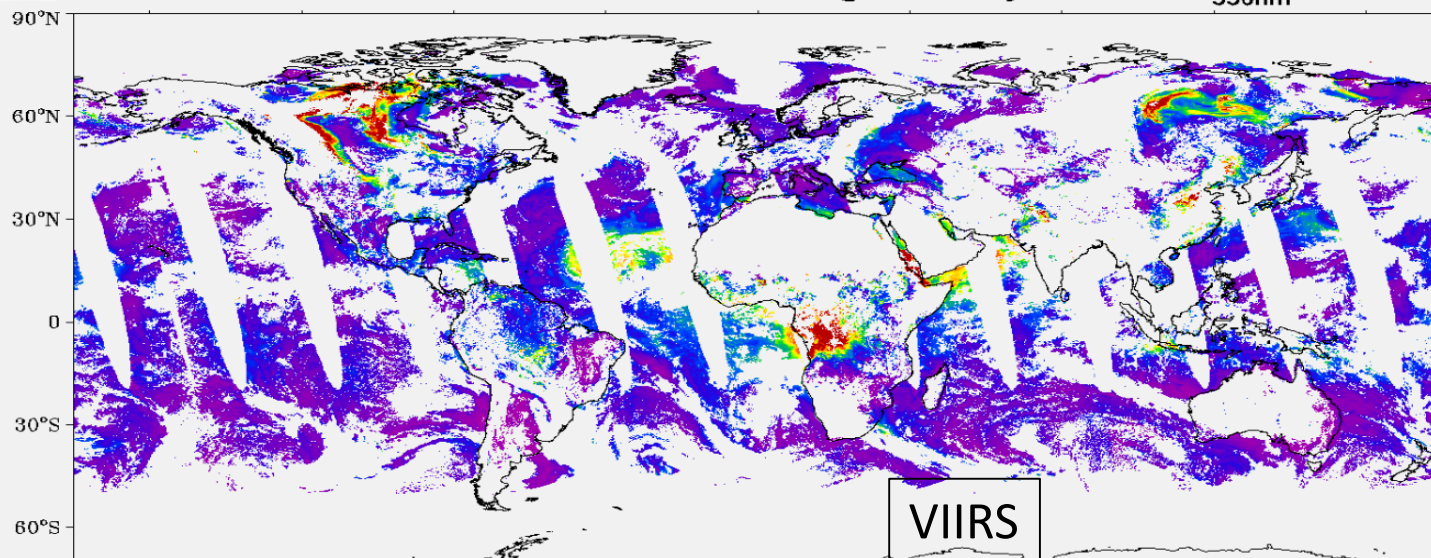


MODIS



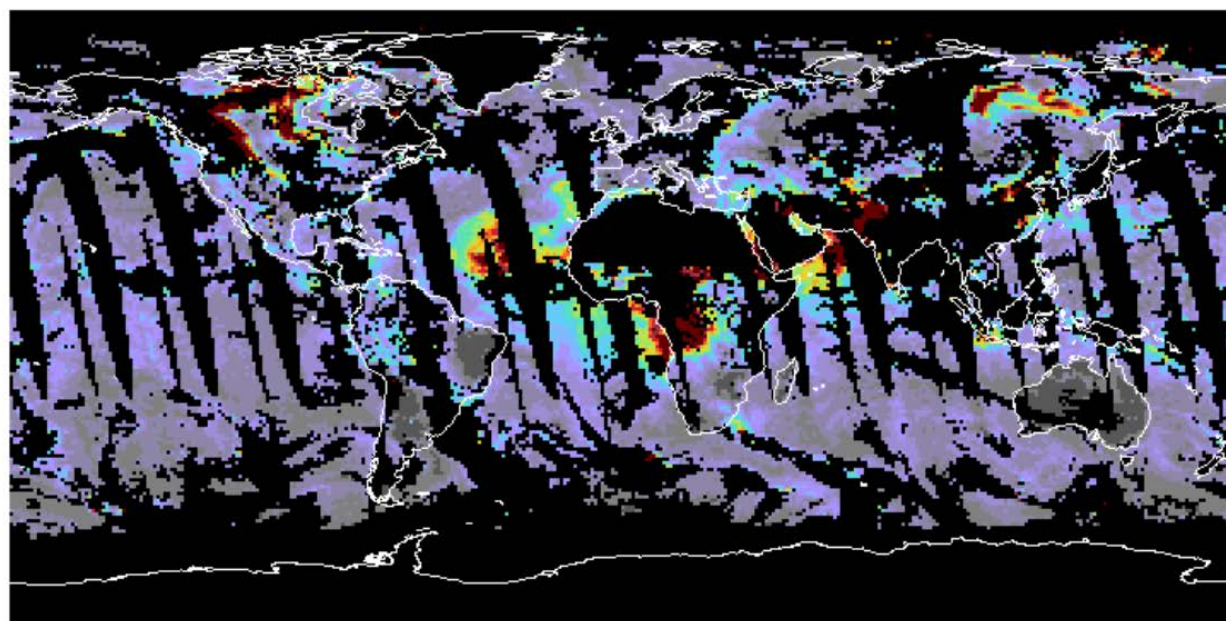


20170813 0.25°x0.25° Gridded High Quality EDR AOT_{550nm}



Aerosol_Optical_Depth_Land_Ocean_Mean

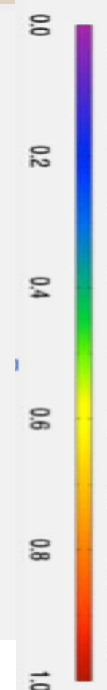
13Aug2017
0.80



MODIS/Aqua

MYD08_D3.A2017225.006.2017226175038.hdf

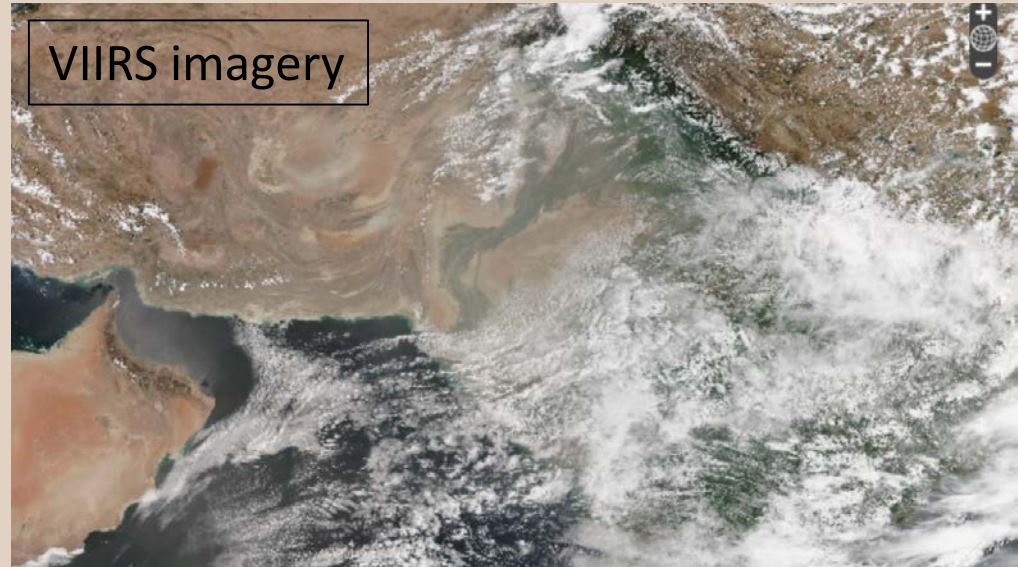
none



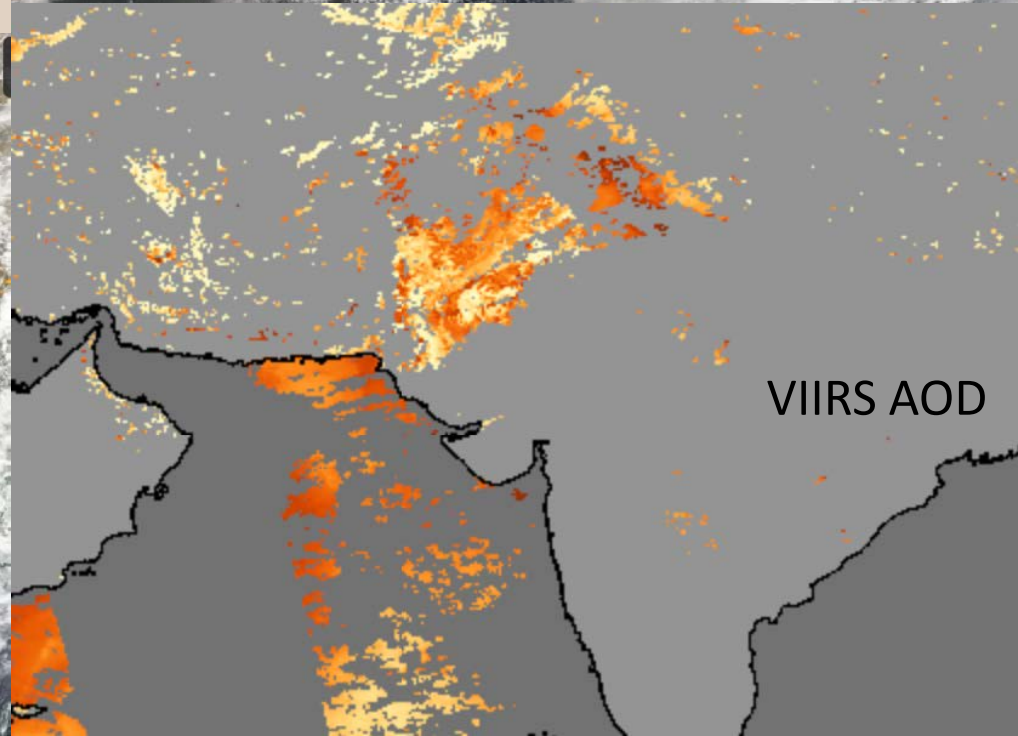
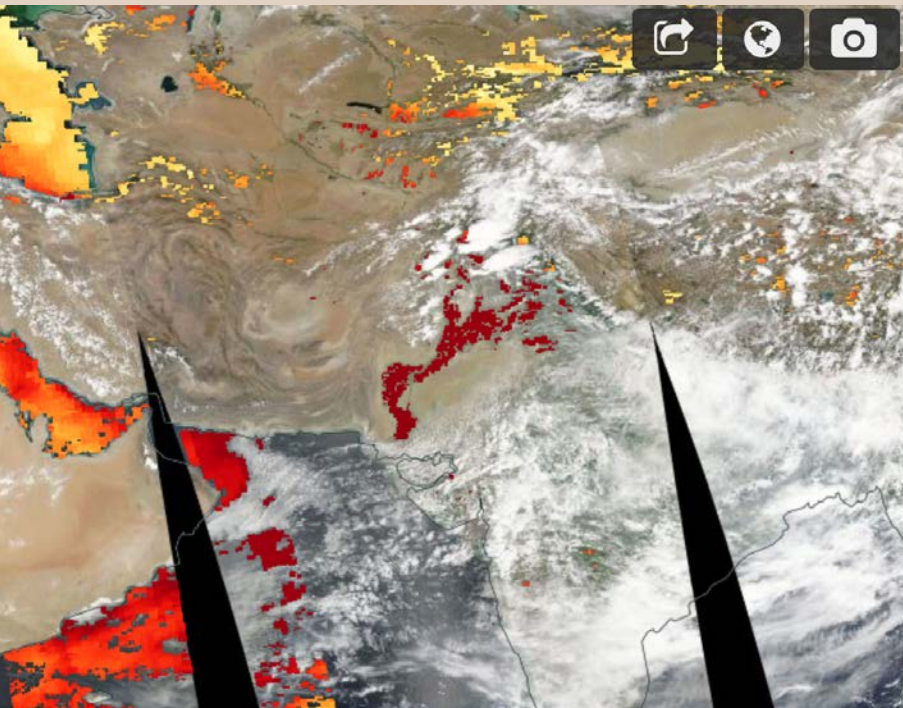
IDPS
Daily
0.25 deg
Gridded
From 6 km
High QA

DT
Daily
1 deg
Gridded
From 10 km
High QA

Real color imagery and
native resolution AOD
13 August 2017



MODIS Aqua AOD and imagery



Wavelength differences

Swath differences

Orbit differences

Spatial resolution differences

Calibration differences

Algorithm differences

>>>> Sampling differences

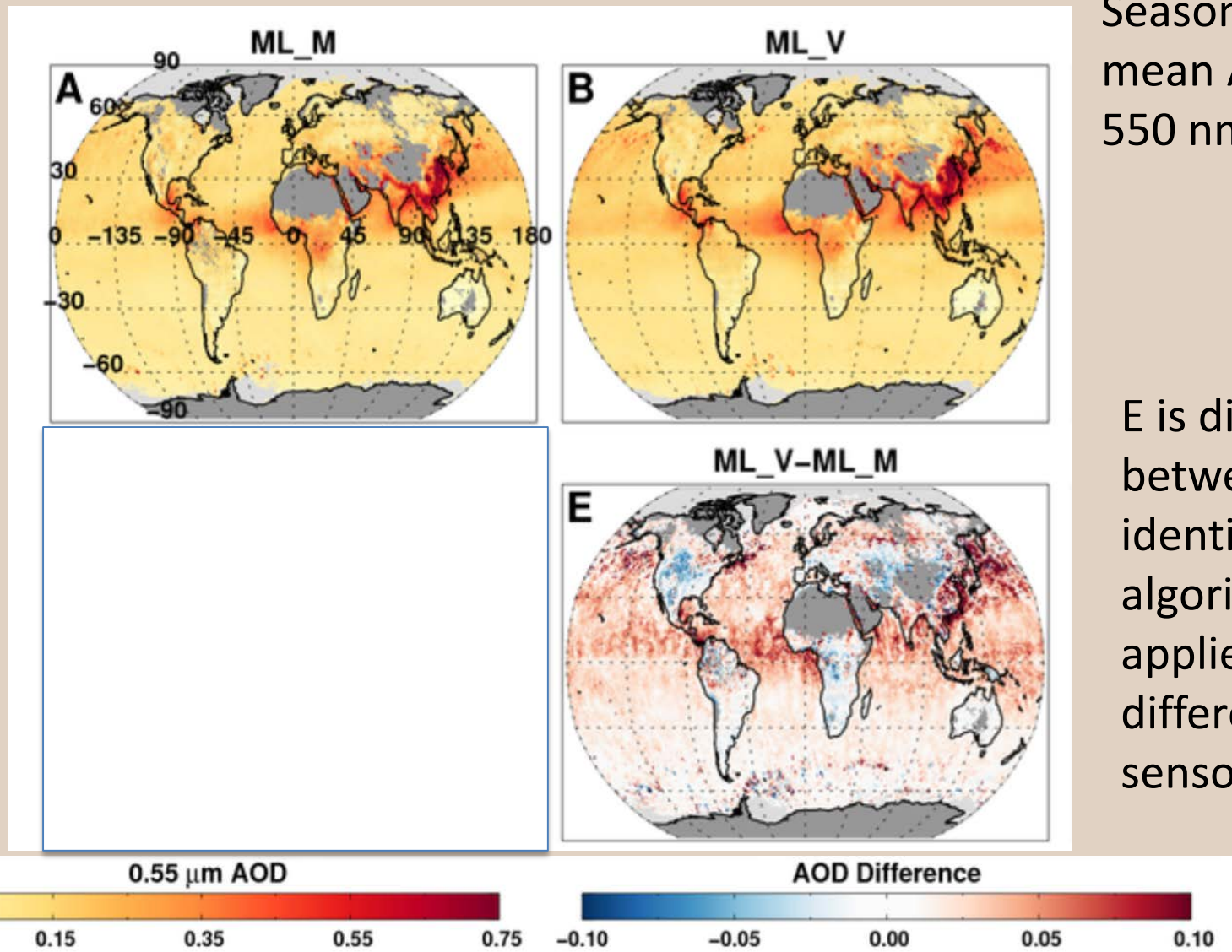
>>>> Retrieval differences

>>>> Differences in means

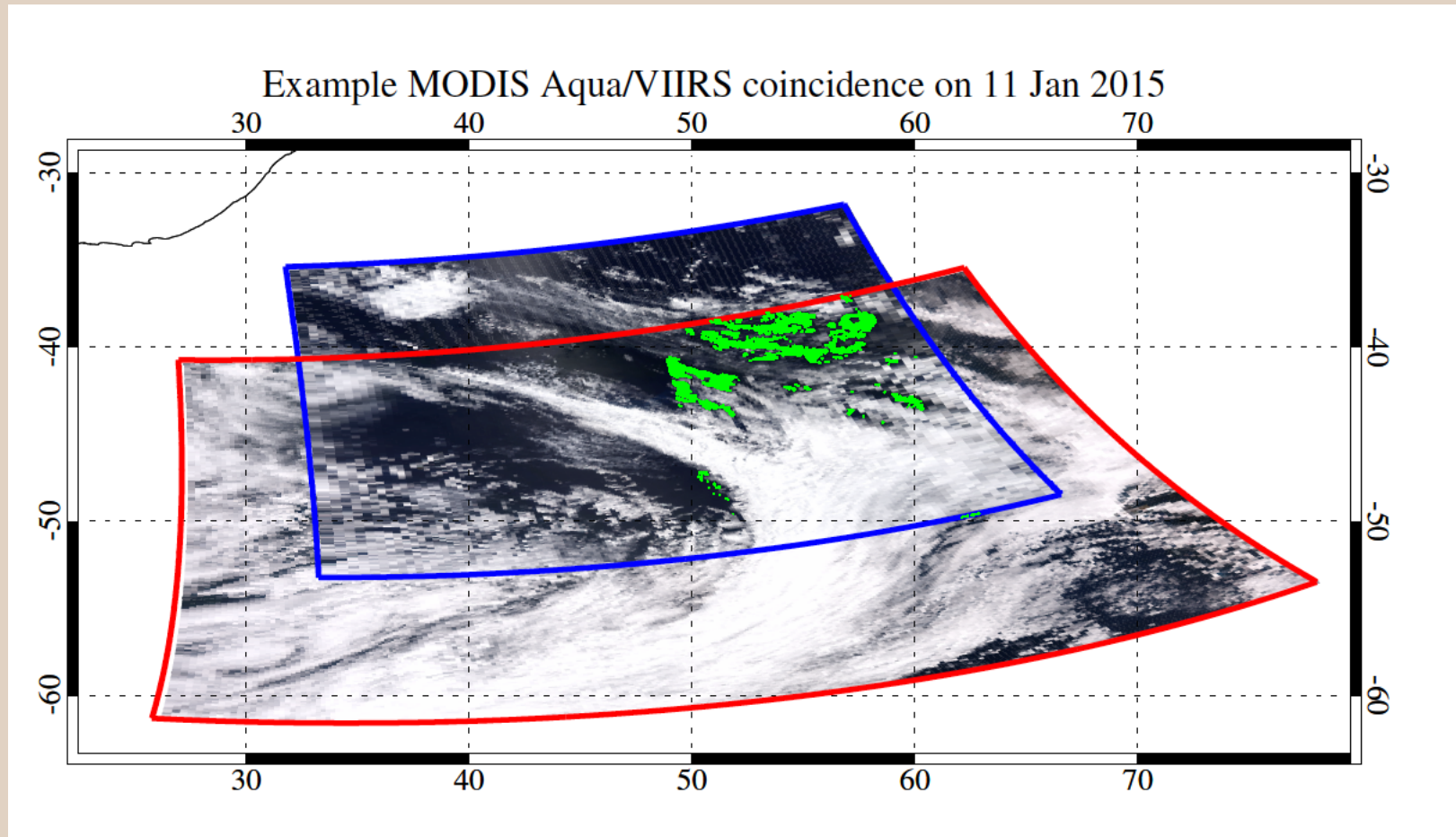
A & B are identical algorithms

Seasonal (MAM)
mean AOD at
550 nm

E is difference
between
identical
algorithms
applied to
different
sensors (B-A)

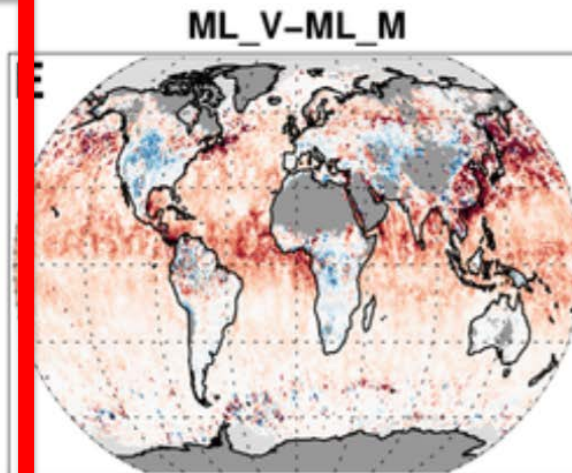
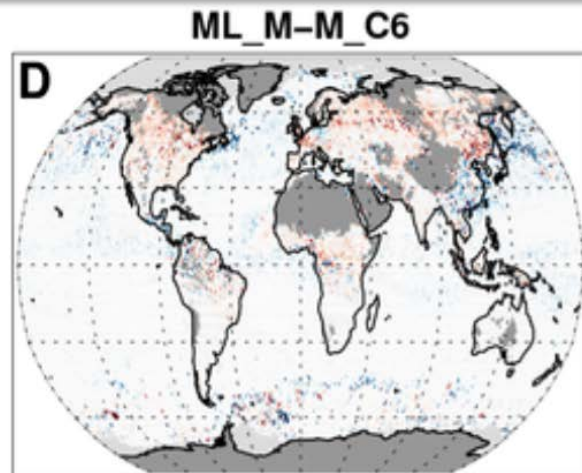
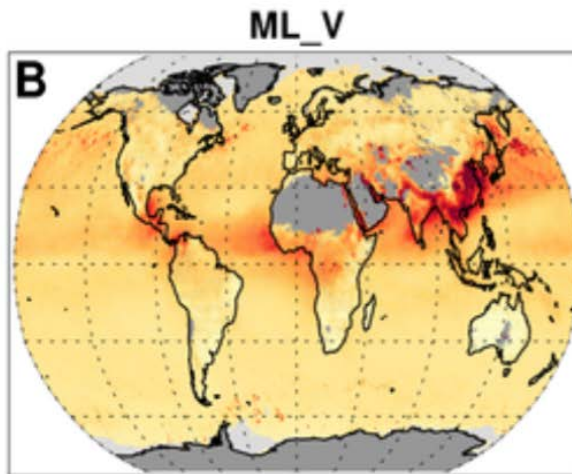
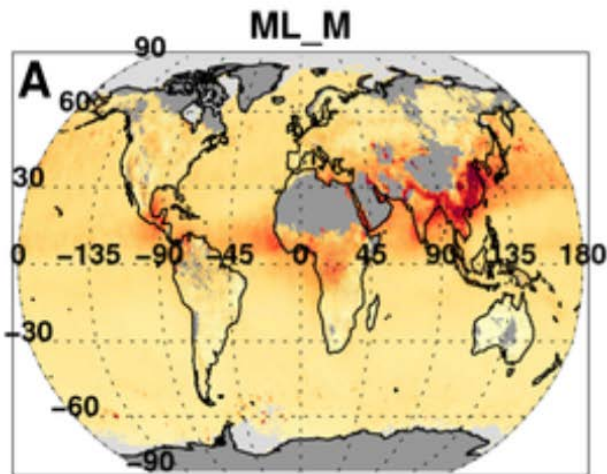


A calibration investigation using “match files” (Sayer et al., 2017)



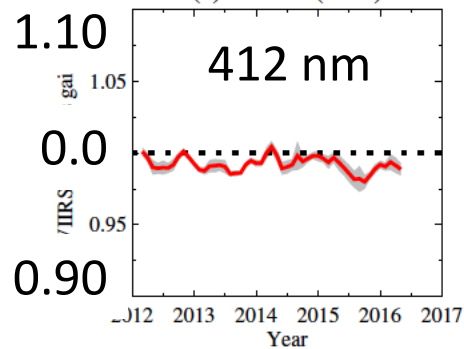
From SIPS:

MCST MODIS Aqua Collection 6 data (at 1 km pixel size, the MYD021KM product)
VCST VIIRS Version 1.1 data with Version 1.0.1 calibration (the VL1BM product).

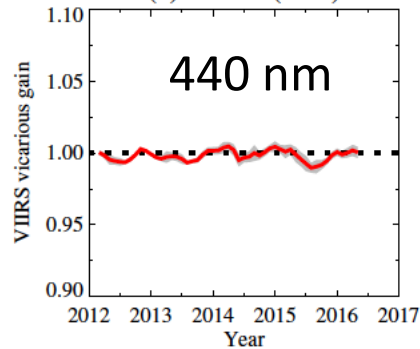


Red box outlines the difference between using the SIPS MODIS input and the operational MODIS product.

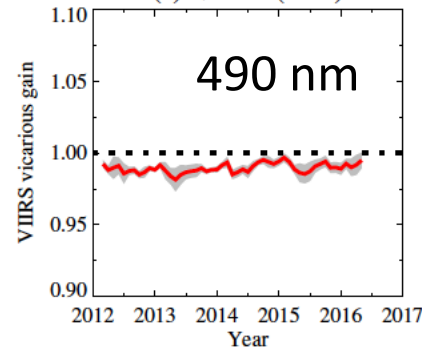
(a) 412 nm (M01)



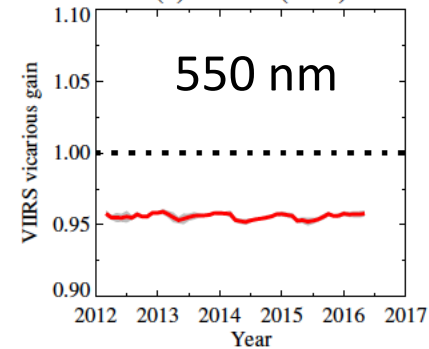
(b) 440 nm (M02)



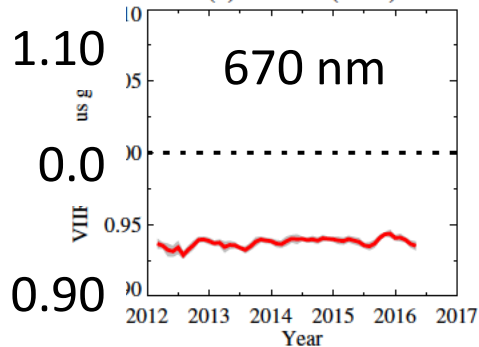
(c) 490 nm (M03)



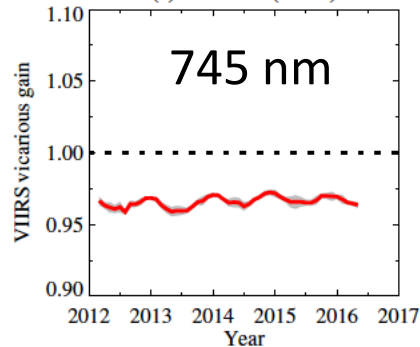
(d) 550 nm (M04)



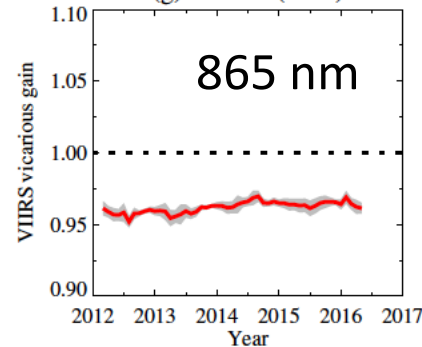
(e) 670 nm (M05)



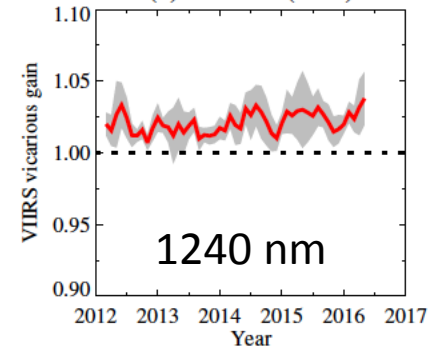
(f) 745 nm (M06)



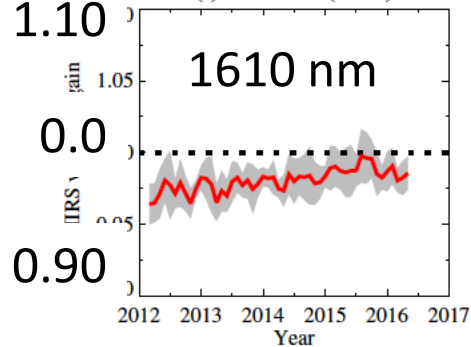
(g) 865 nm (M07)



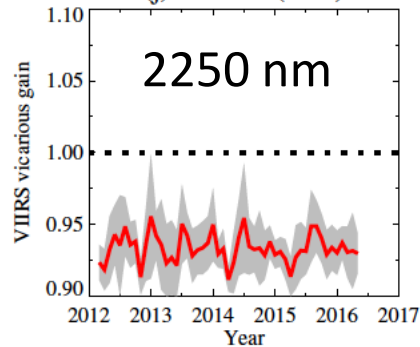
(h) 1240 nm (M08)



(i) 1610 nm (M10)



(j) 2250 nm (M11)



VIIRS Vicarious Gain

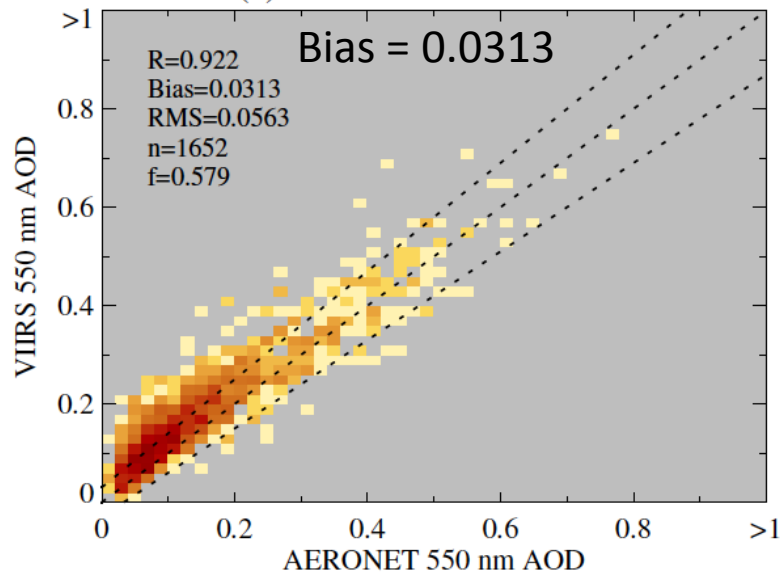
Sayer et al., 2017

Site	Latitude, °	Longitude, °	Number of matchups
ARM Graciosa	39.091	-28.029	149
Ascension Island	-7.976	-14.415	414
Ersa	43.004	9.359	624
Manus	-2.060	147.425	105
MCO Hanimaadhoo	6.776	73.183	268
Midway Island	28.210	-177.378	89

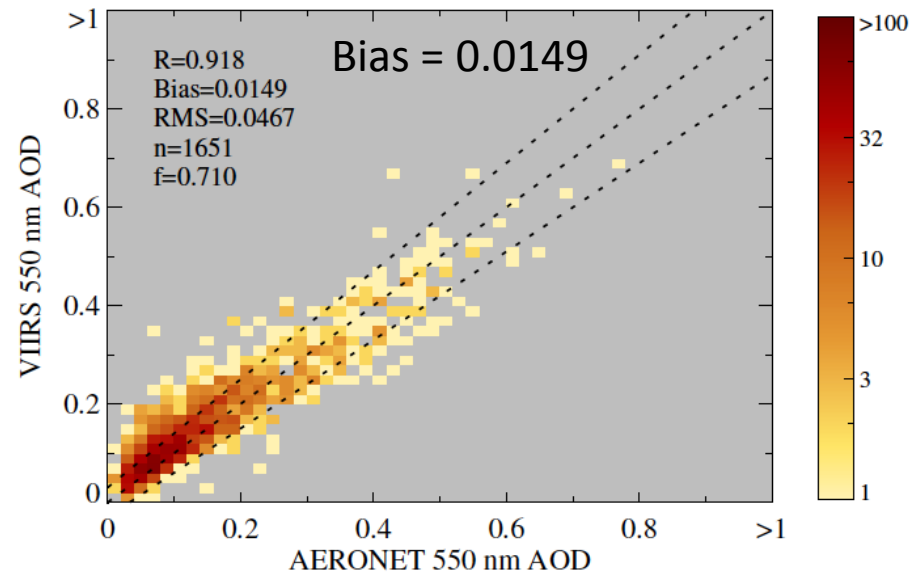
AOD validation at 6 AERONET island sites

Standard

(a) Standard L1 calibration



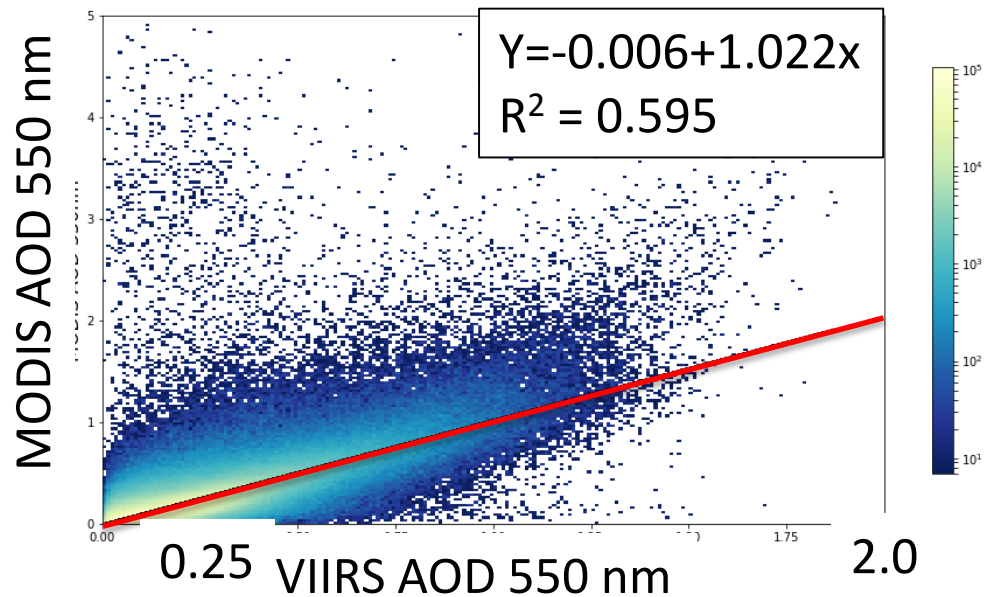
With vicarious corrections



Characterizing MODIS – VIIRS differences

- MODIS Collection 6 Level 3 AOD 550,
 - DT land and ocean,
 - 1 degree gridded
-
- VIIRS IDPS AOD550
 - 0.25 degree gridded (from VIIRS team web page).
 - Aggregated up to 1 degree (if any one of the 0.25 deg squares is populated, the 1 deg square will have a value
-
- 8-day means created from each.
 - Sync-ed
 - Start 25 January 2013
 - End 24 January 2017

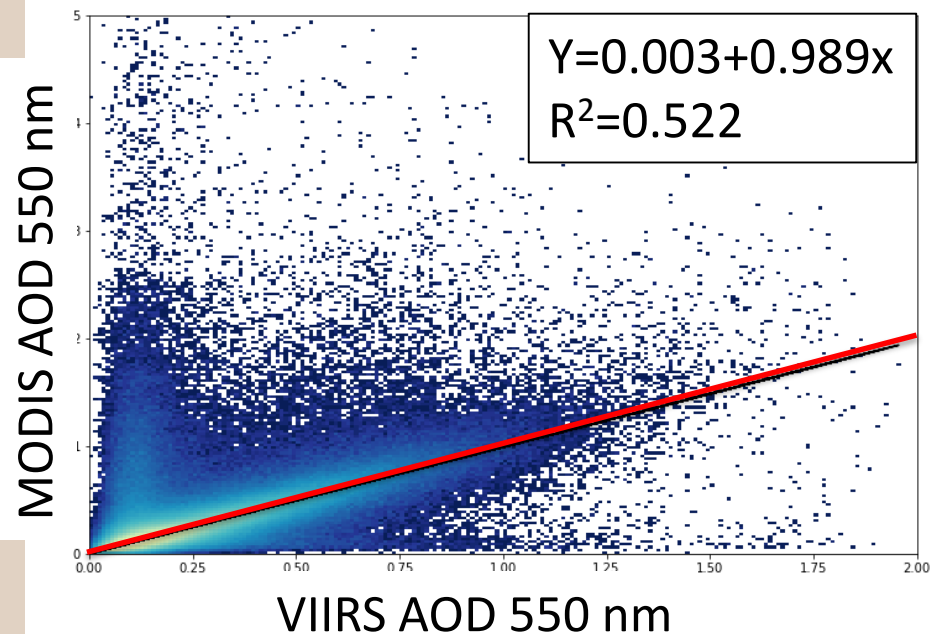
Land Scatter Jan 25, 2013 - Jan 24, 2017



Each ordered pair is an 8-day mean of a 1-degree grid box.

Red line is 1:1 line.

Ocean Scatter Jan 25, 2013 - Jan 24, 2017

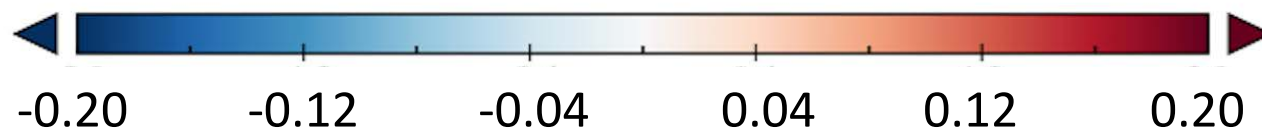
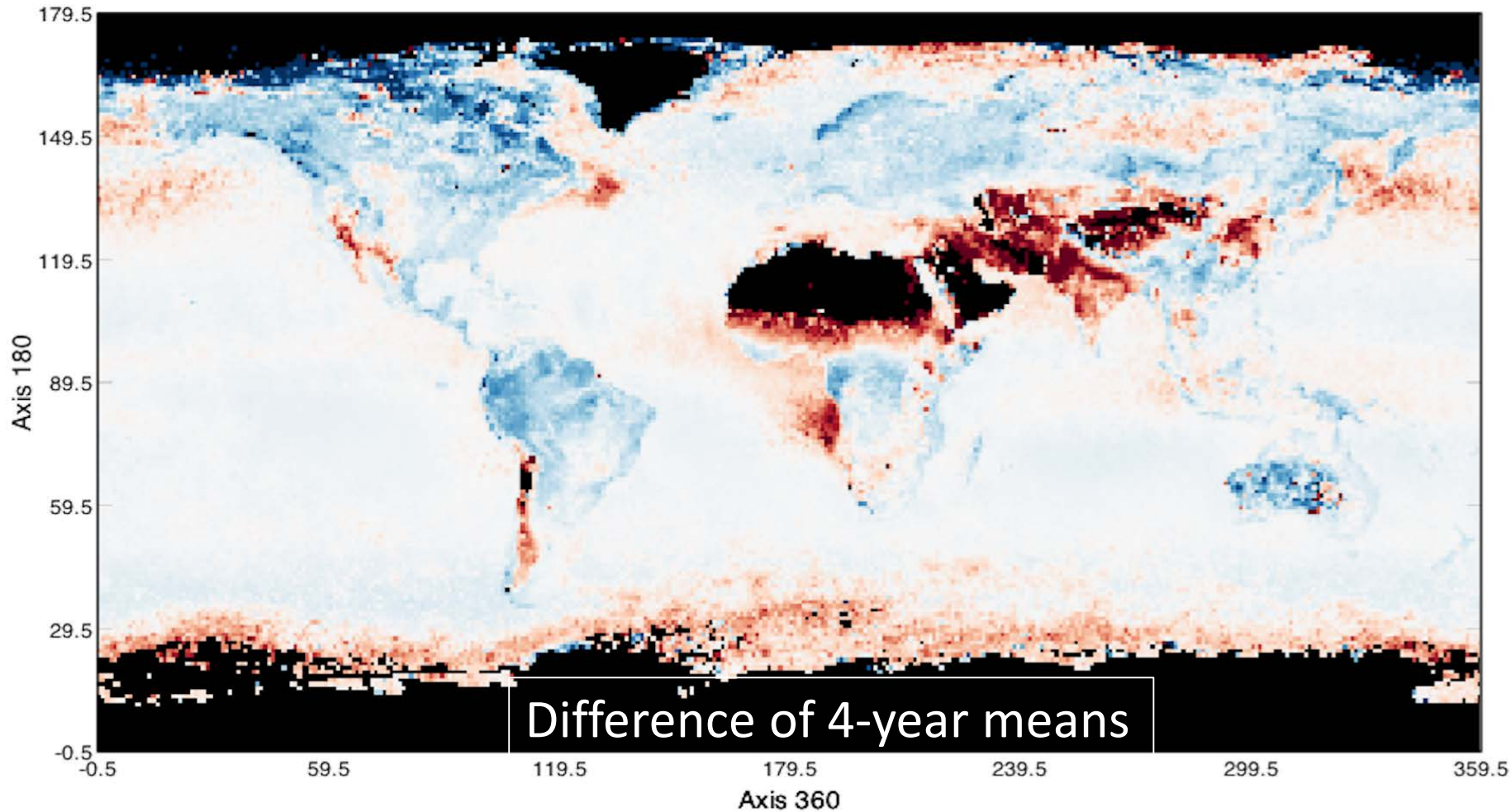


MODIS - VIIRS

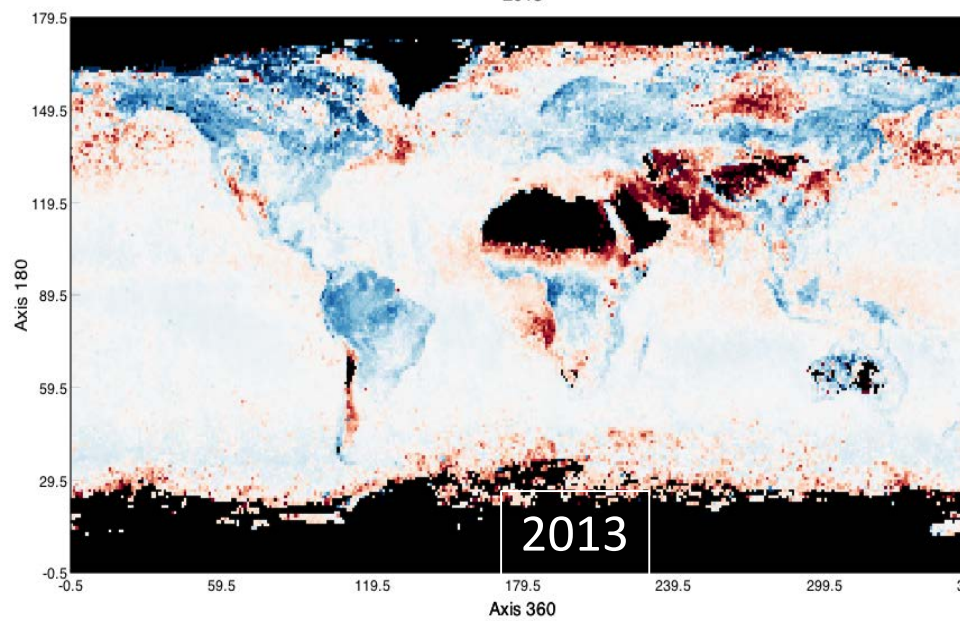
2013-2017

Feb. 2013 – Jan. 2017

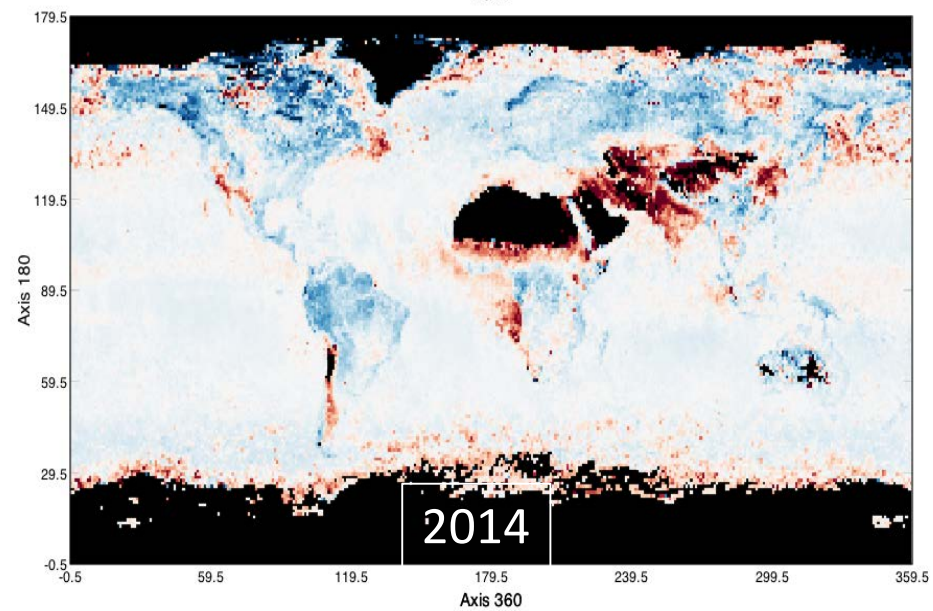
AOD 550 differences



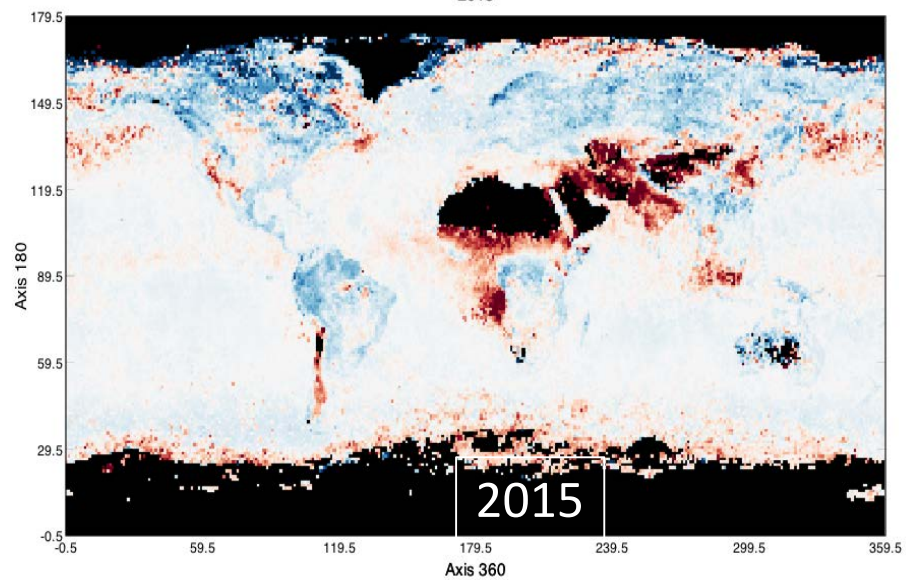
MODIS - VIIRS
2013



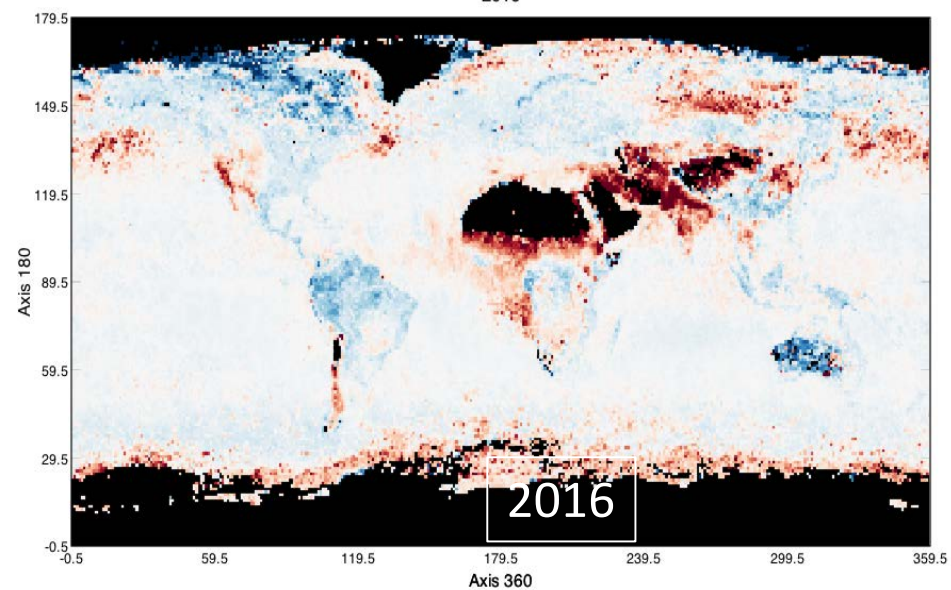
MODIS - VIIRS
2014

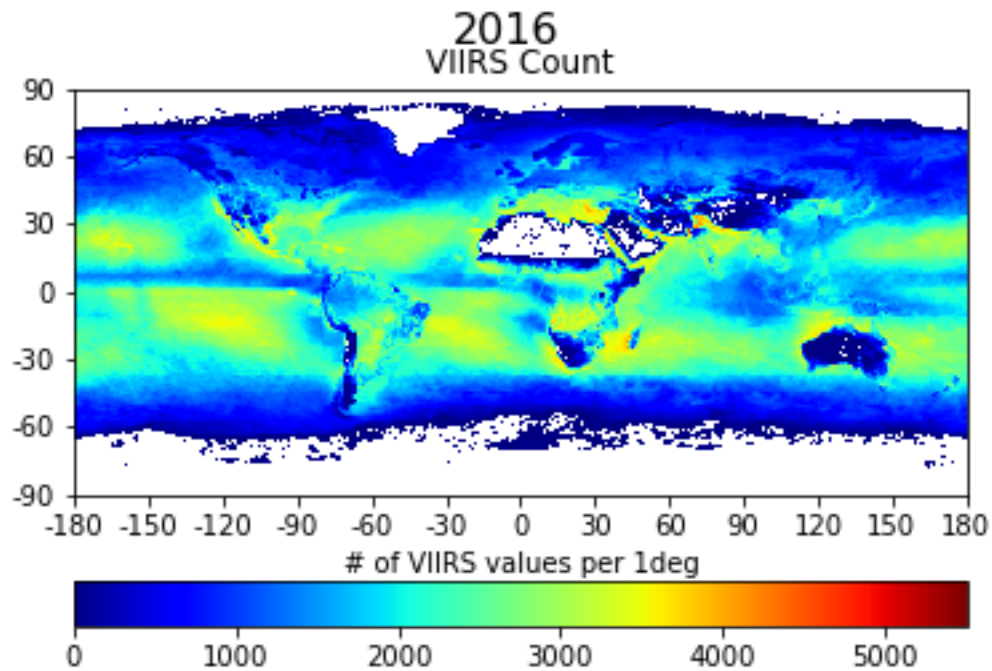


MODIS - VIIRS
2015



MODIS - VIIRS
2016

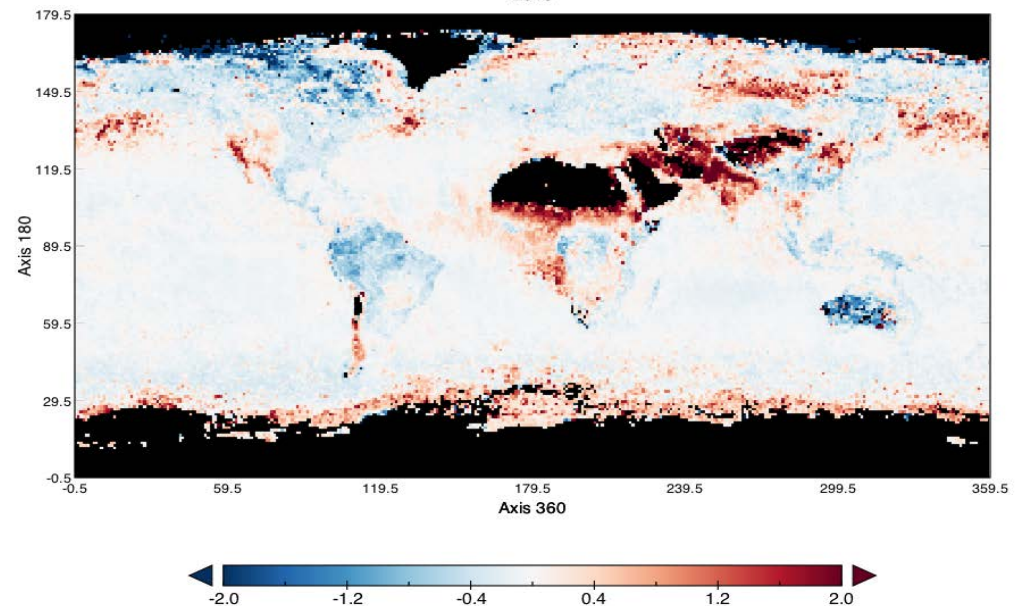


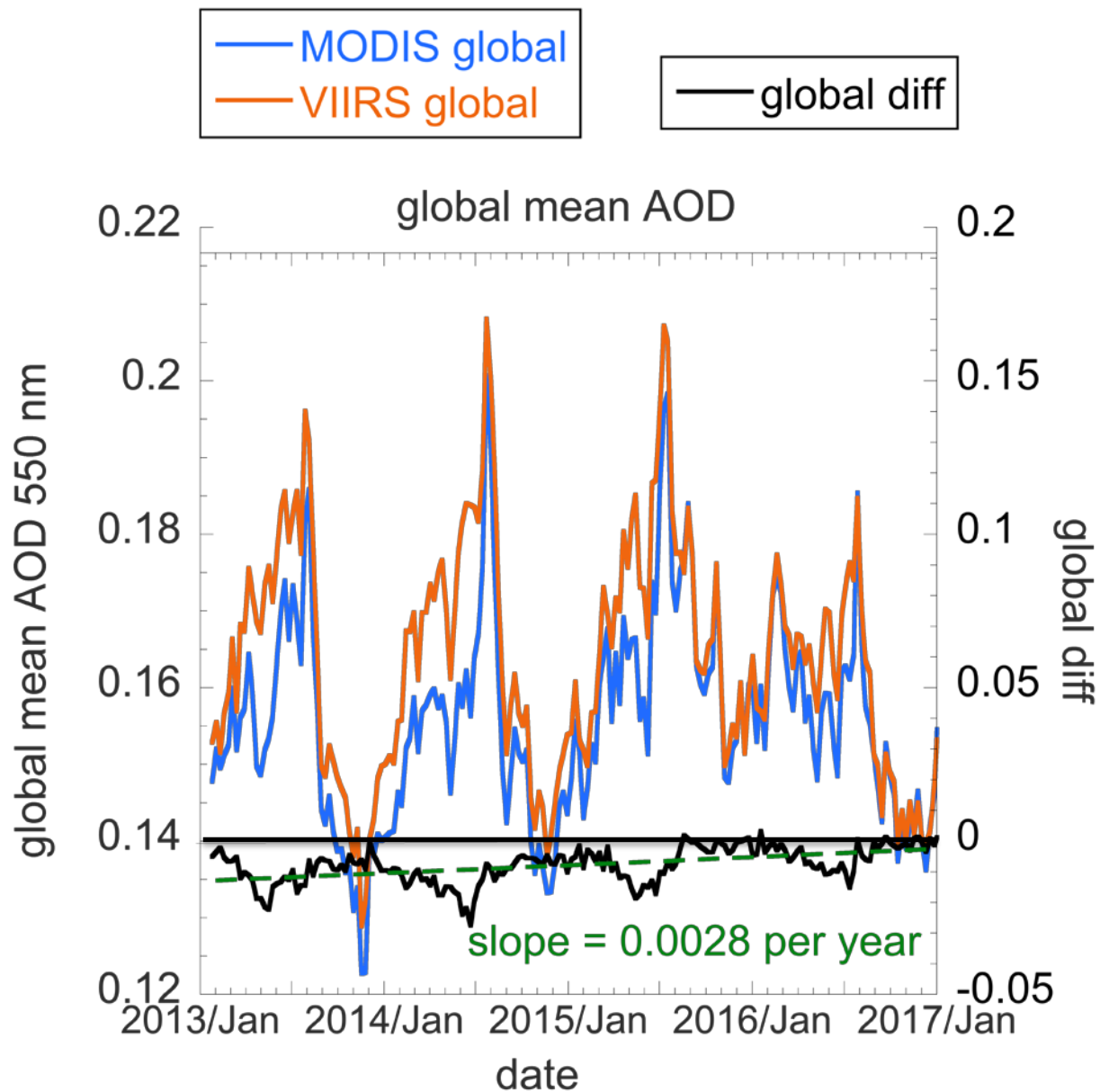


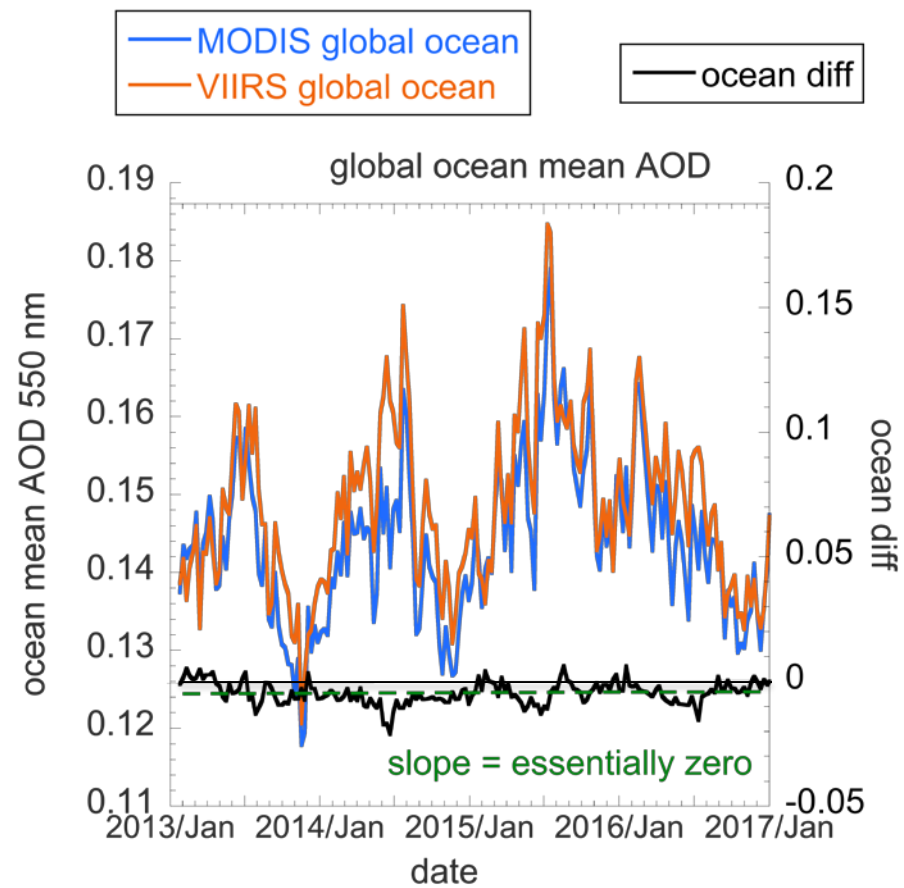
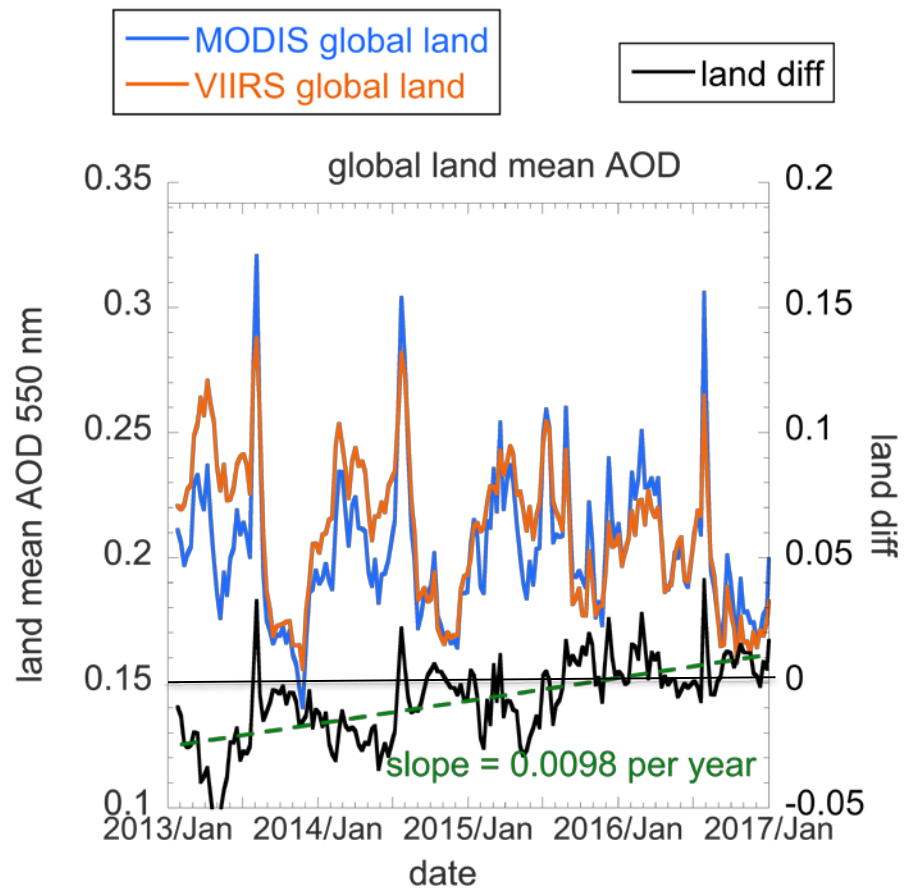
VIIRS count is the number of 0.25 deg squares in each 1 degree box for the entire period. (5840 max for 1 year).

Shown are 2016 counts and differences.

MODIS - VIIRS
2016





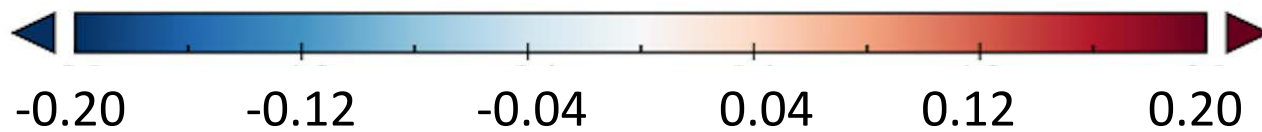
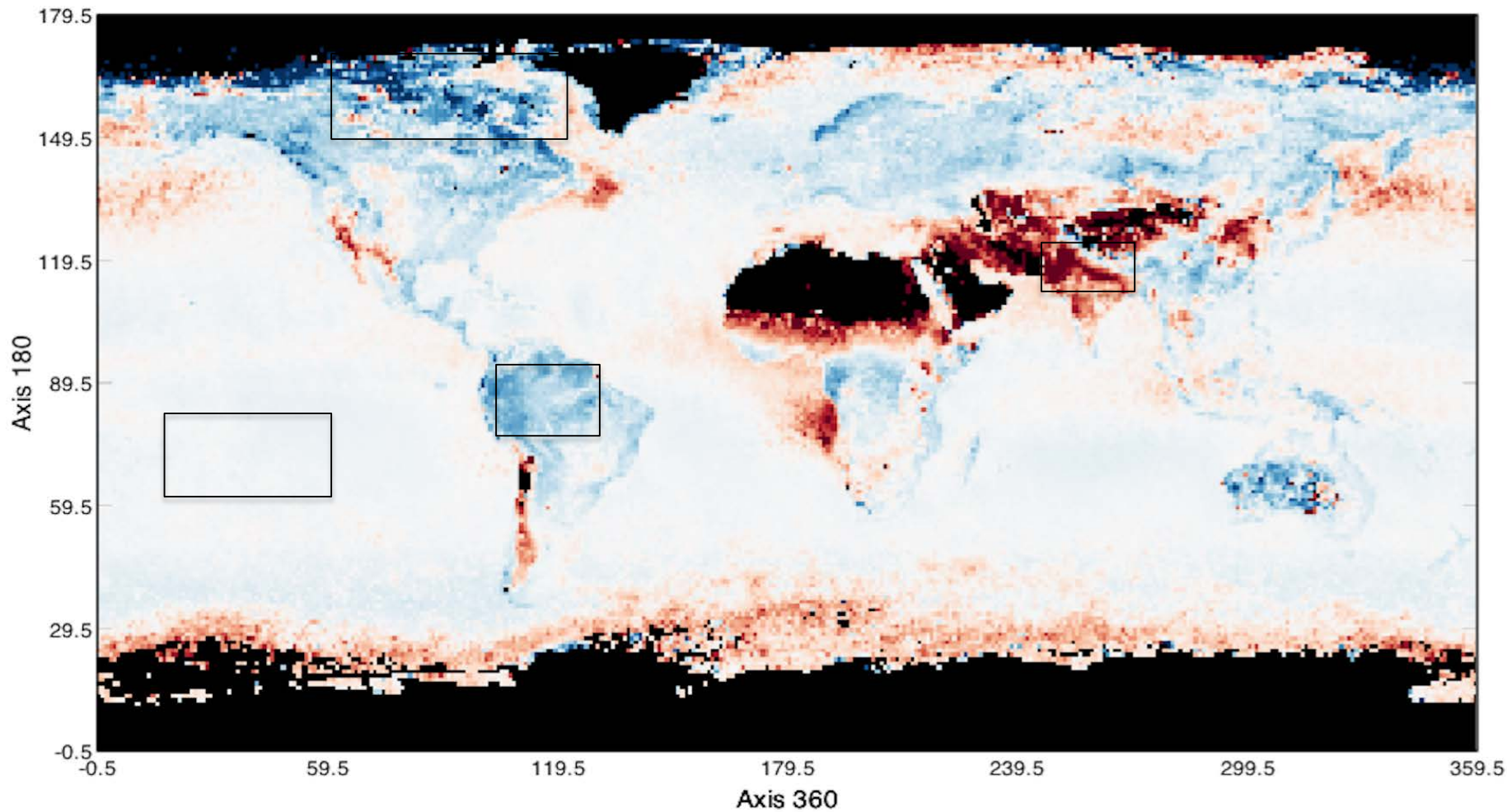


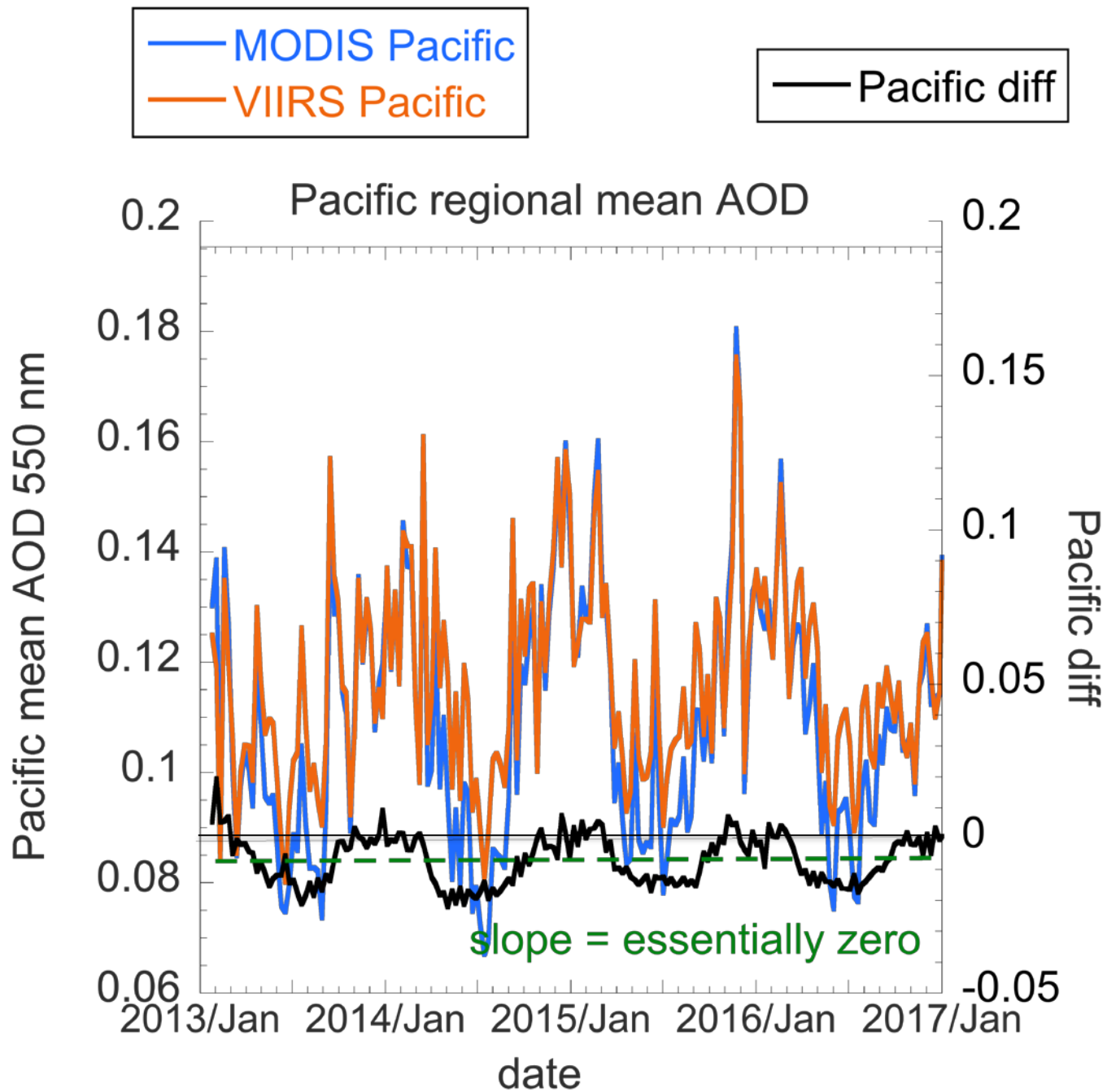
AOD 550 differences

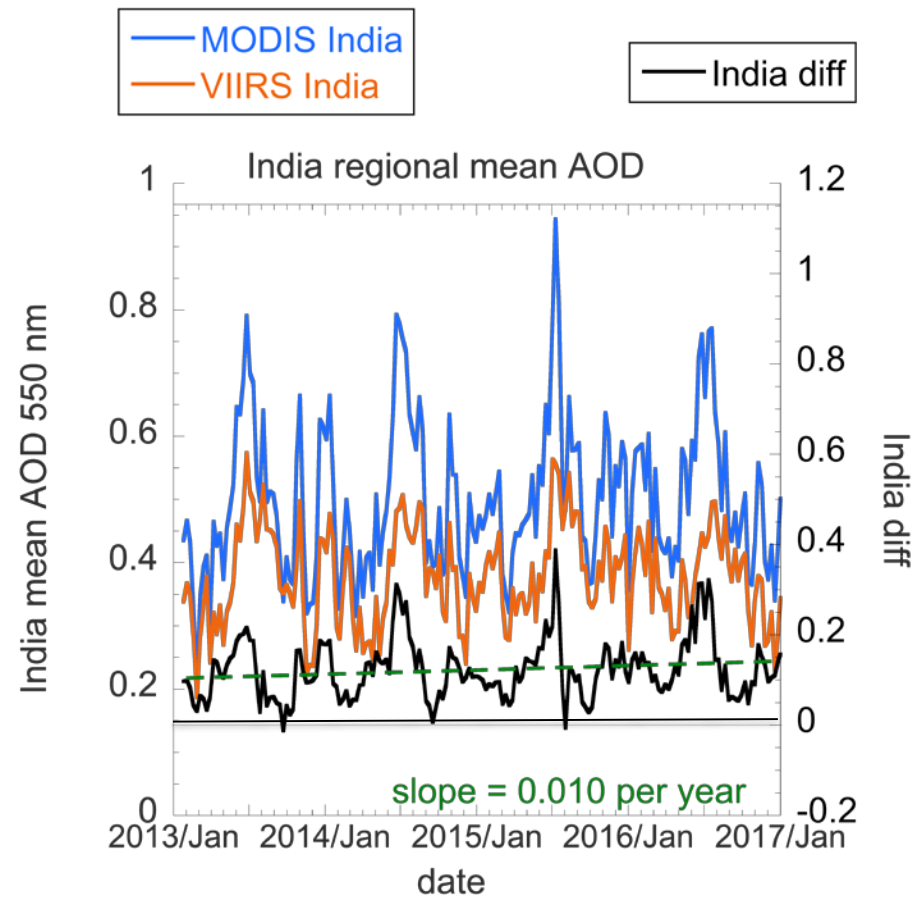
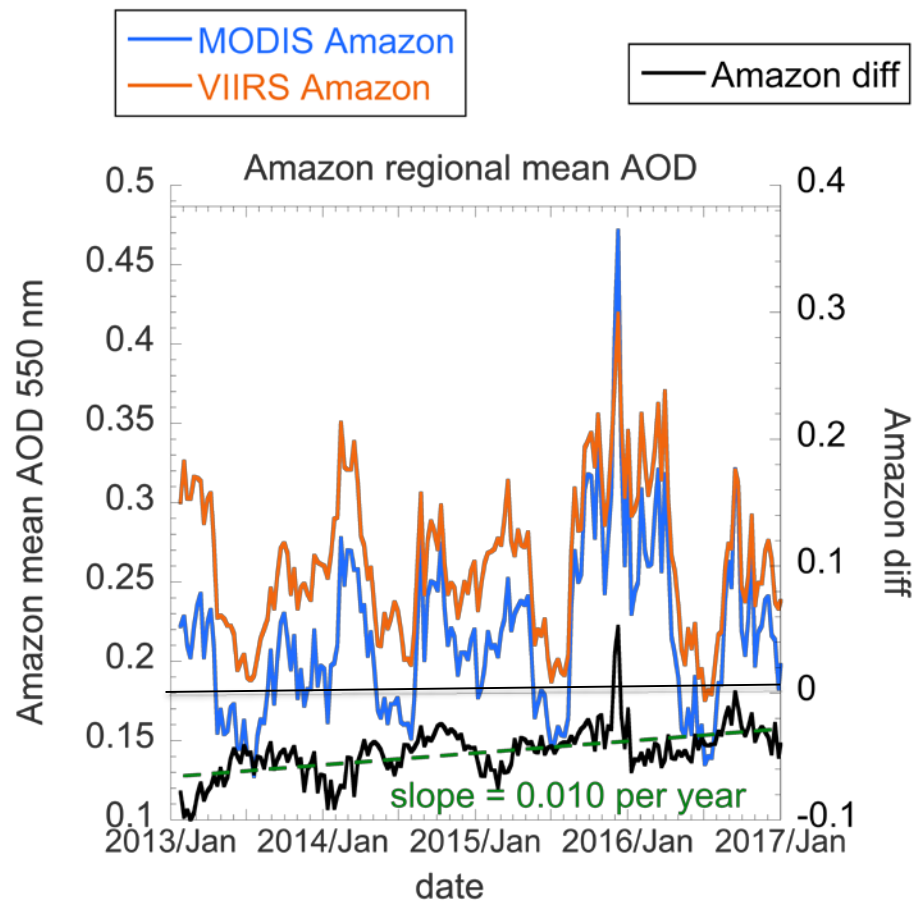
MODIS - VIIRS

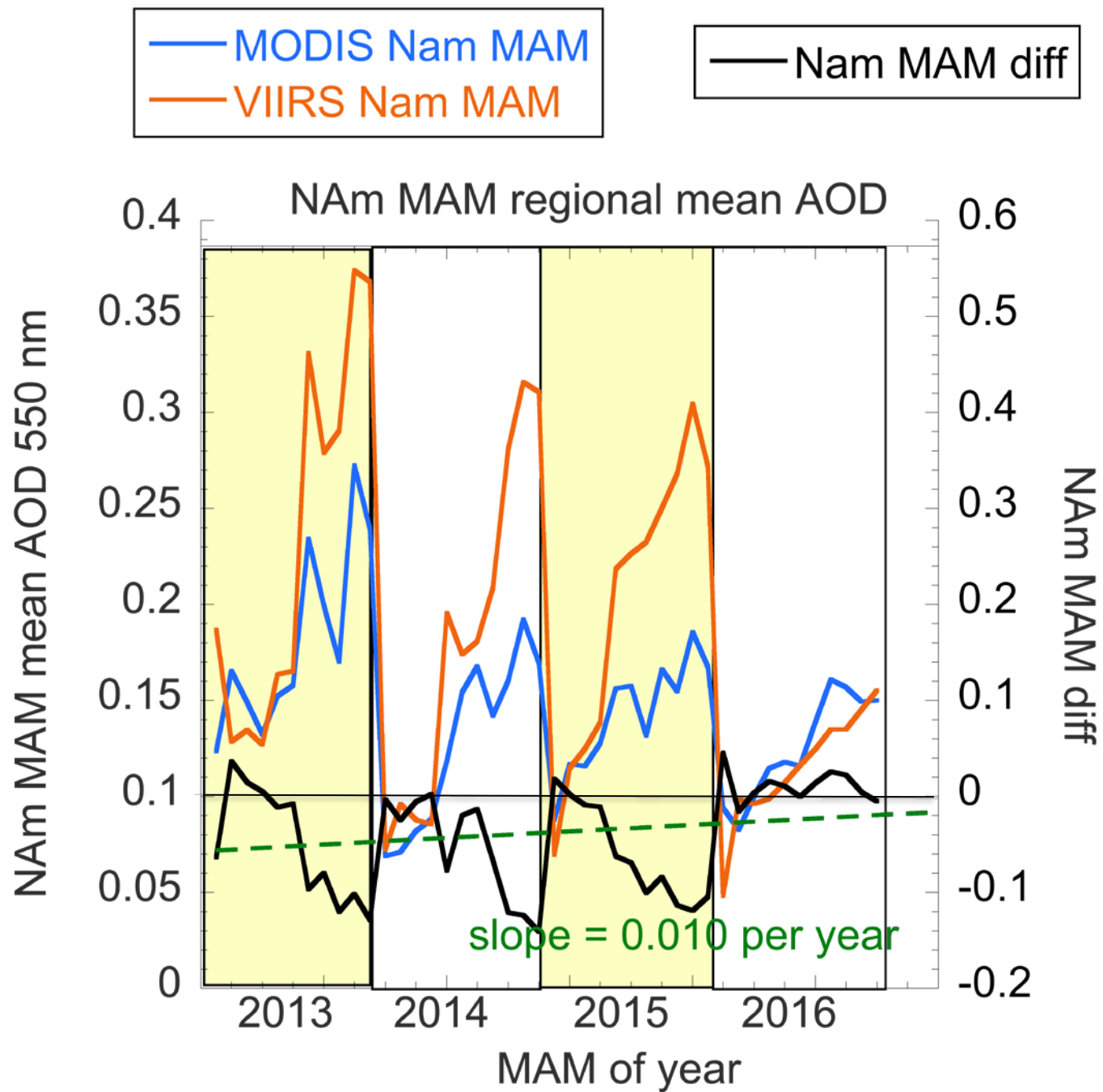
2013-2017

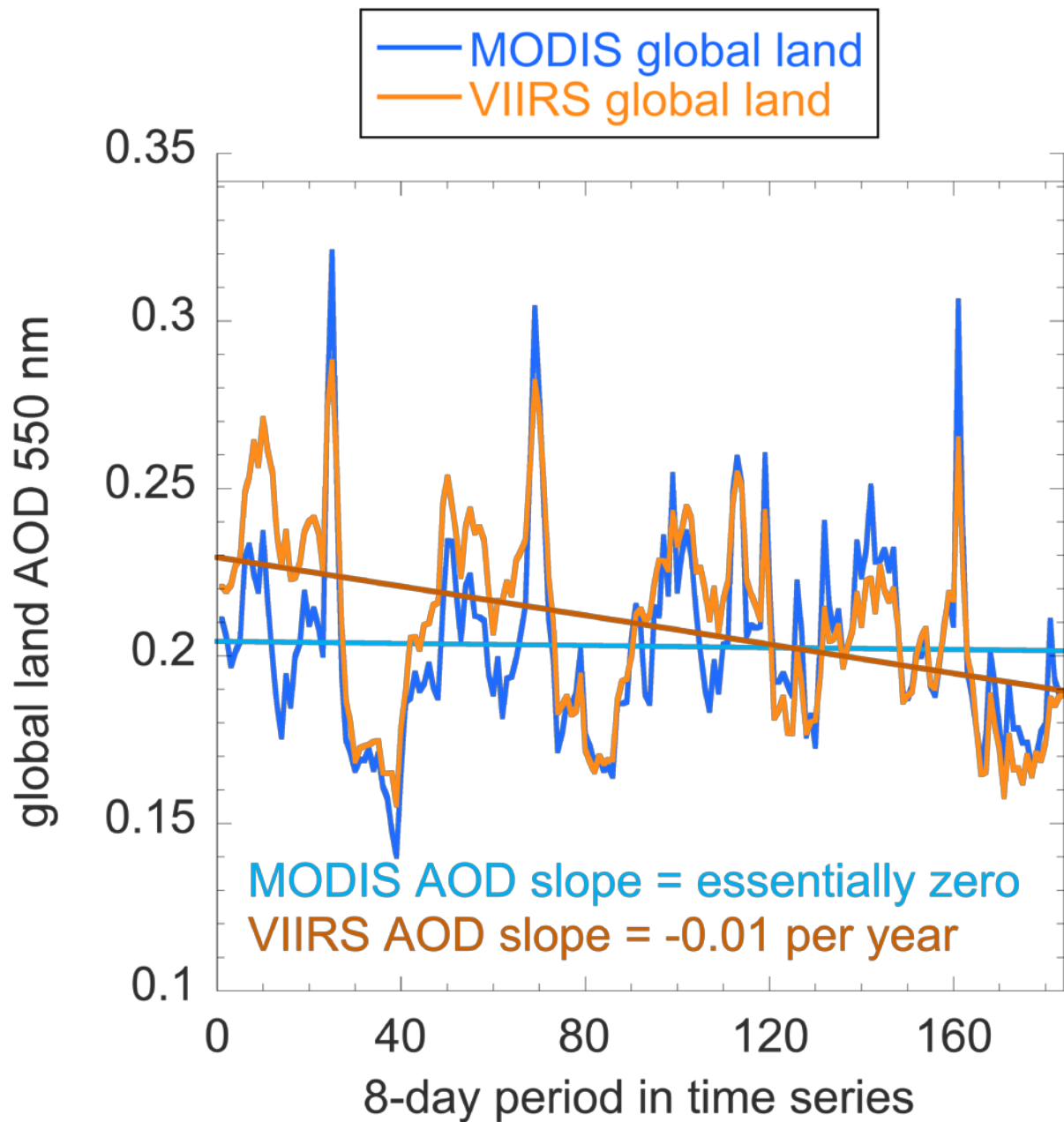
Feb. 2013 – Jan. 2017











Something happened to VIIRS in 2015 that caused land AODs to decrease.

Translates to 0.01 per year, but is really a jump, not linear.

Result over all is to bring VIIRS closer to MODIS.

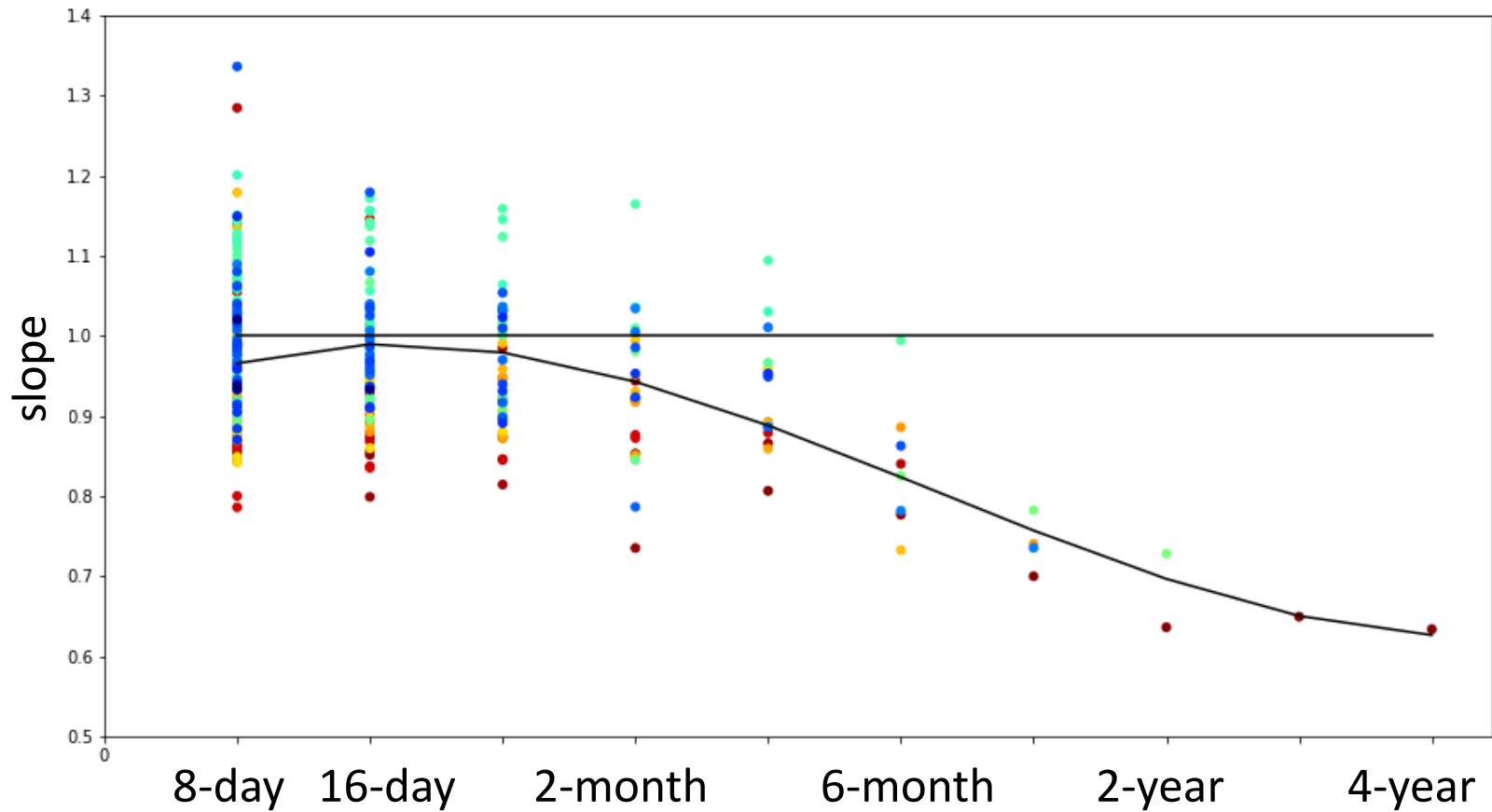
But not in India, and other land locations where VIIRS is higher than MODIS.

No temporal change to ocean AODs.

VIIRS background ocean AOD still 0.005 higher than MODIS.

Global

4 Years, Slope



Averaging interval

Each ordered pair
is 8-day mean

Each ordered
pair is a 4-year mean