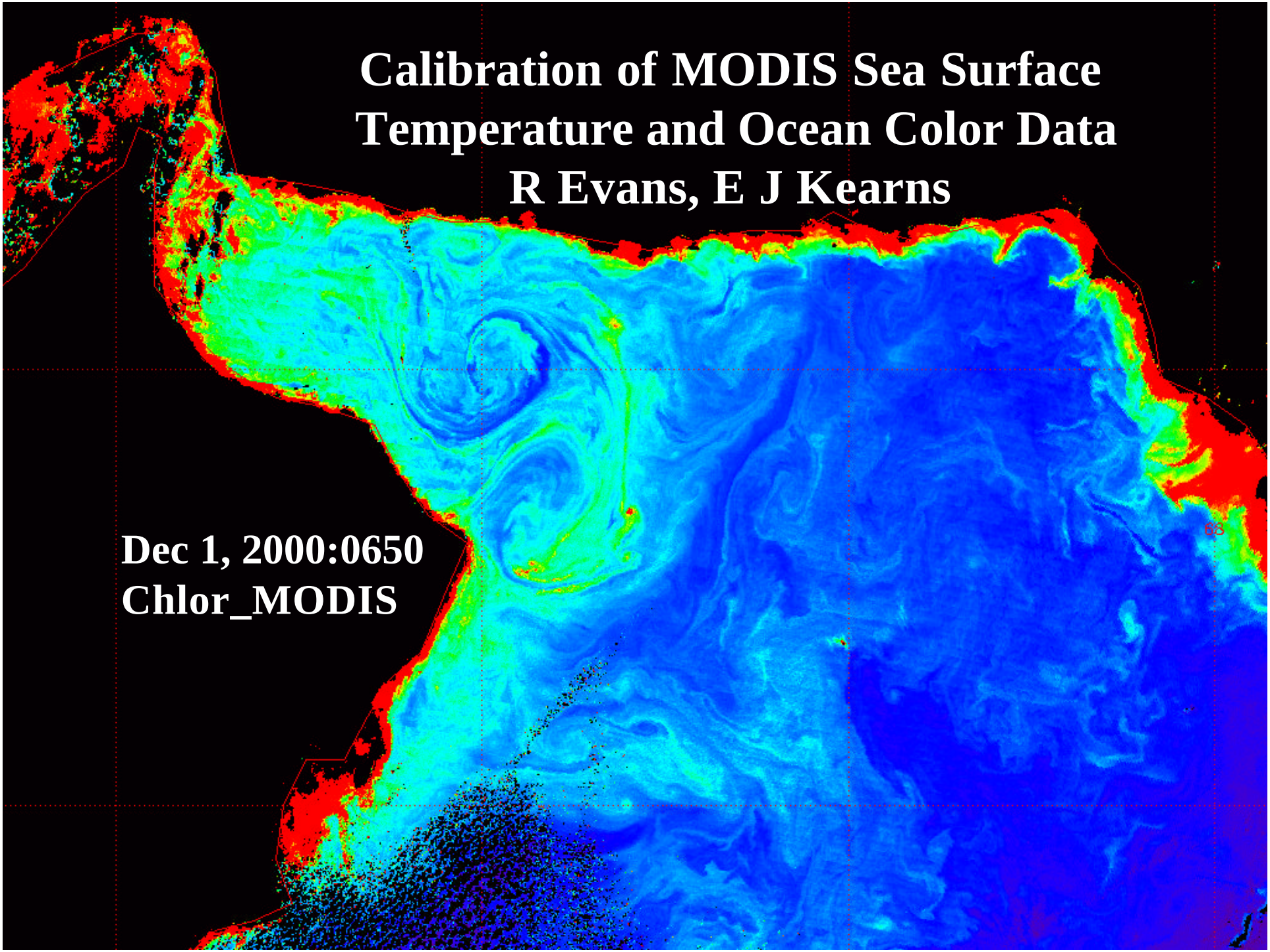
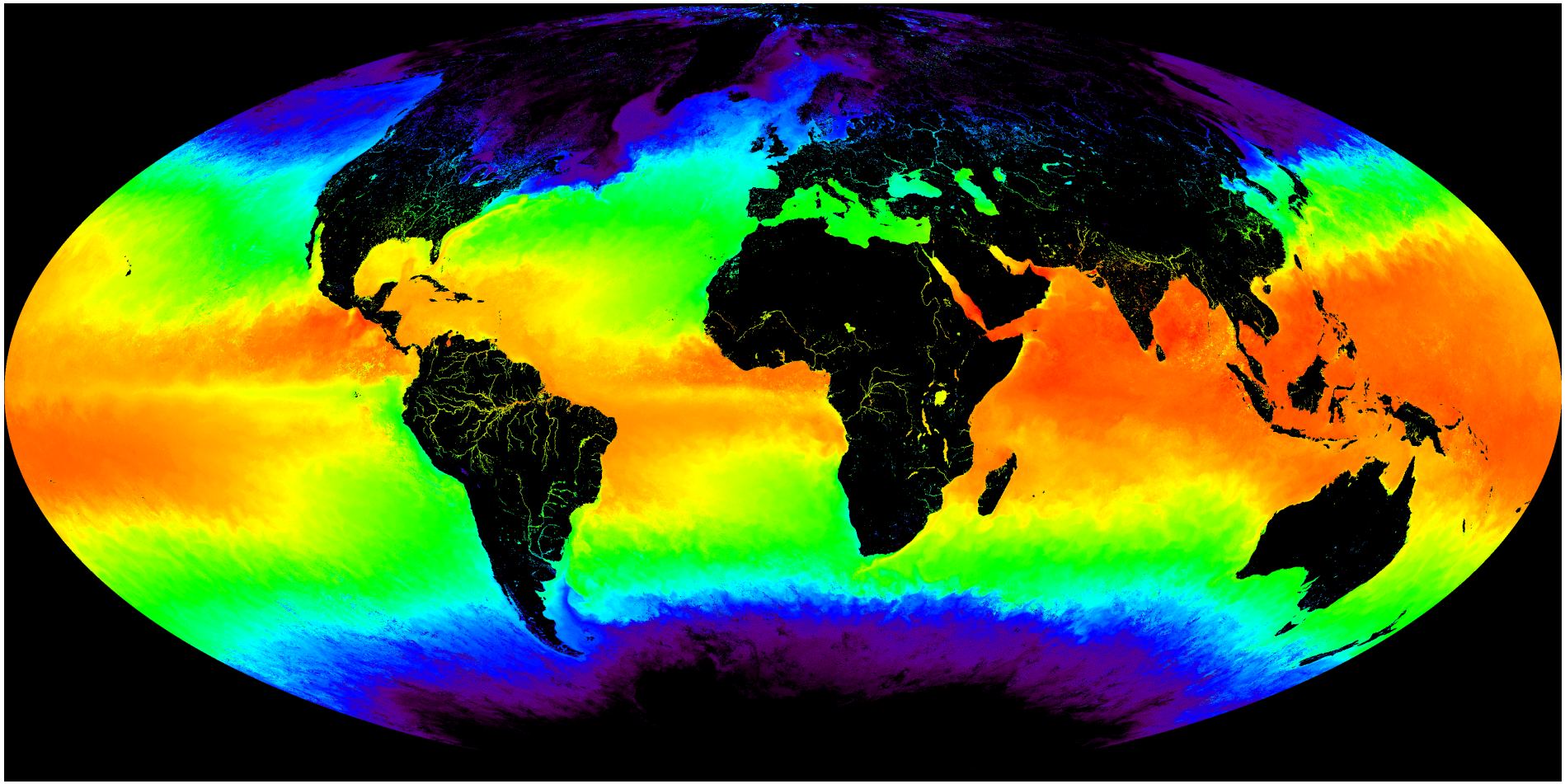

Calibration of MODIS Sea Surface Temperature and Ocean Color Data
R Evans, E J Kearns
Dec 1, 2000:0650
Chlor_MODIS

Overview

- **Sensor characterization has examined several issues.**
  - **Detector-to-detector discrepancies within wavebands**
  - **Variations in the mirror response as a function of angle of incidence**
  - **Differences in characteristics between mirror sides**
  - **Problems associated with polarization and sun glint.**
  - **Initial SST and nLw error**

TERRA MODIS NIGHTTIME 4μm SST



-2 5 10 15 20 25 30 35

C°

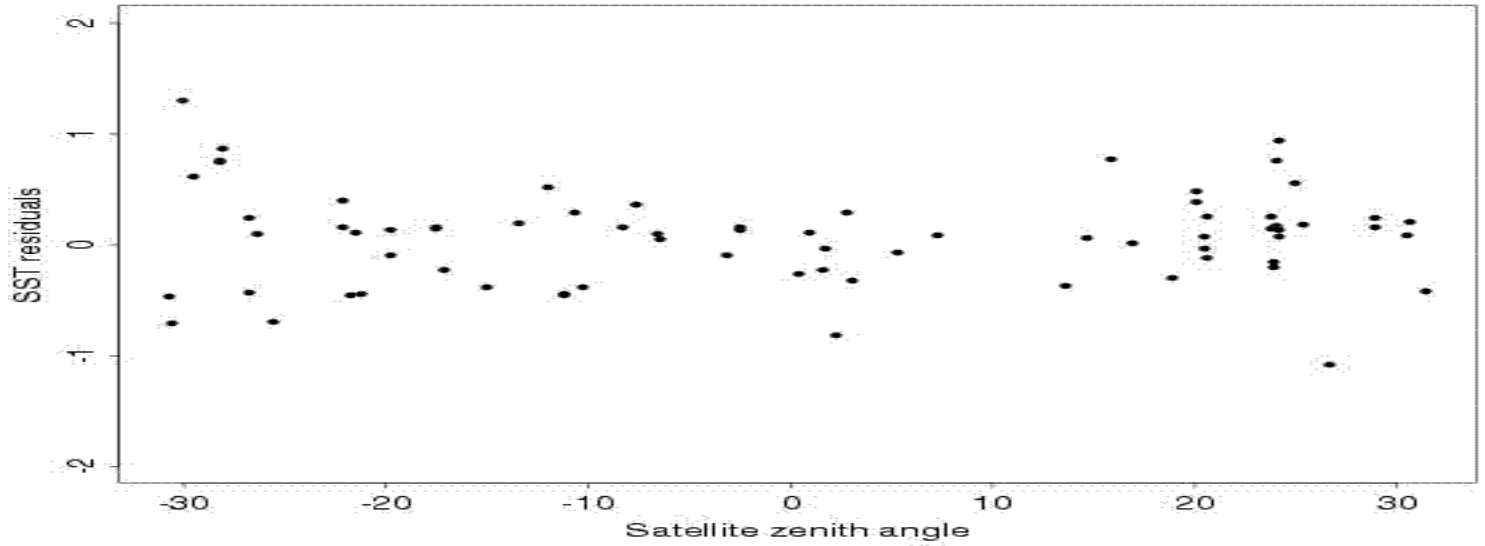
MAY 2001

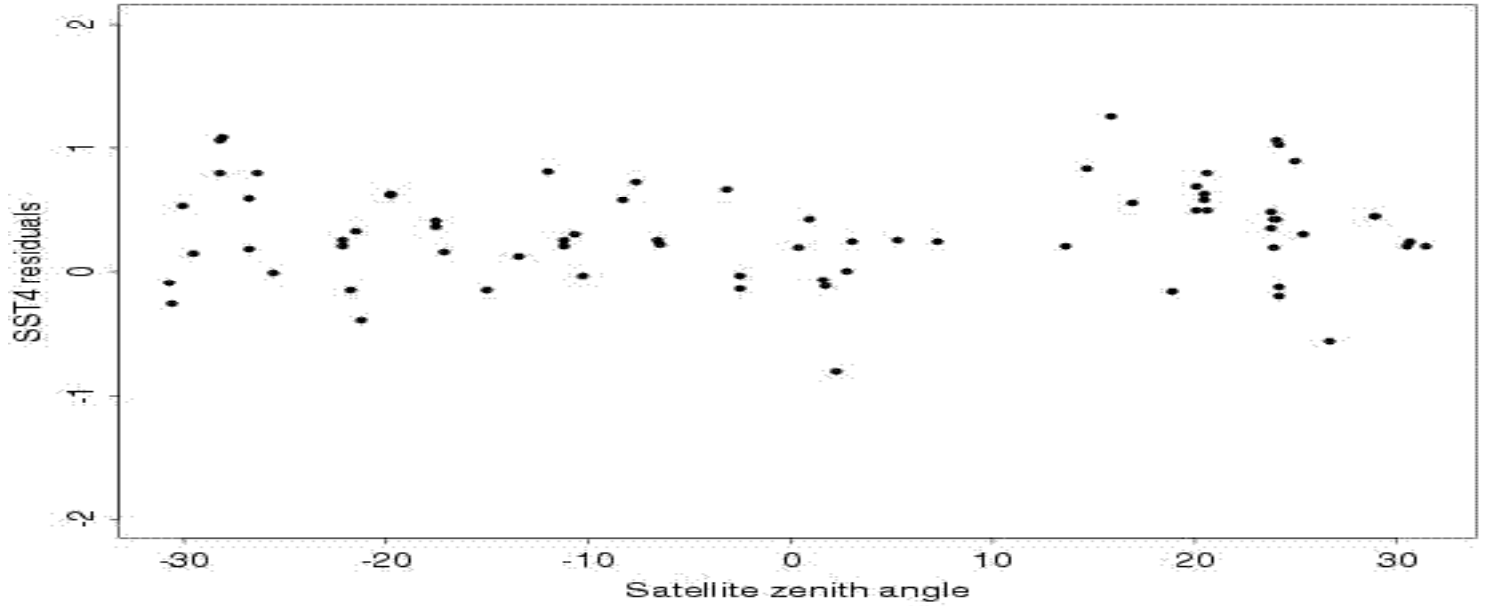
V 3.3.1

MODIS/OCEAN GROUP
GSFC, RSMAS

SST, SST4 dependence on Satellite zenith angle

MODIS comparison with Buoy measurements

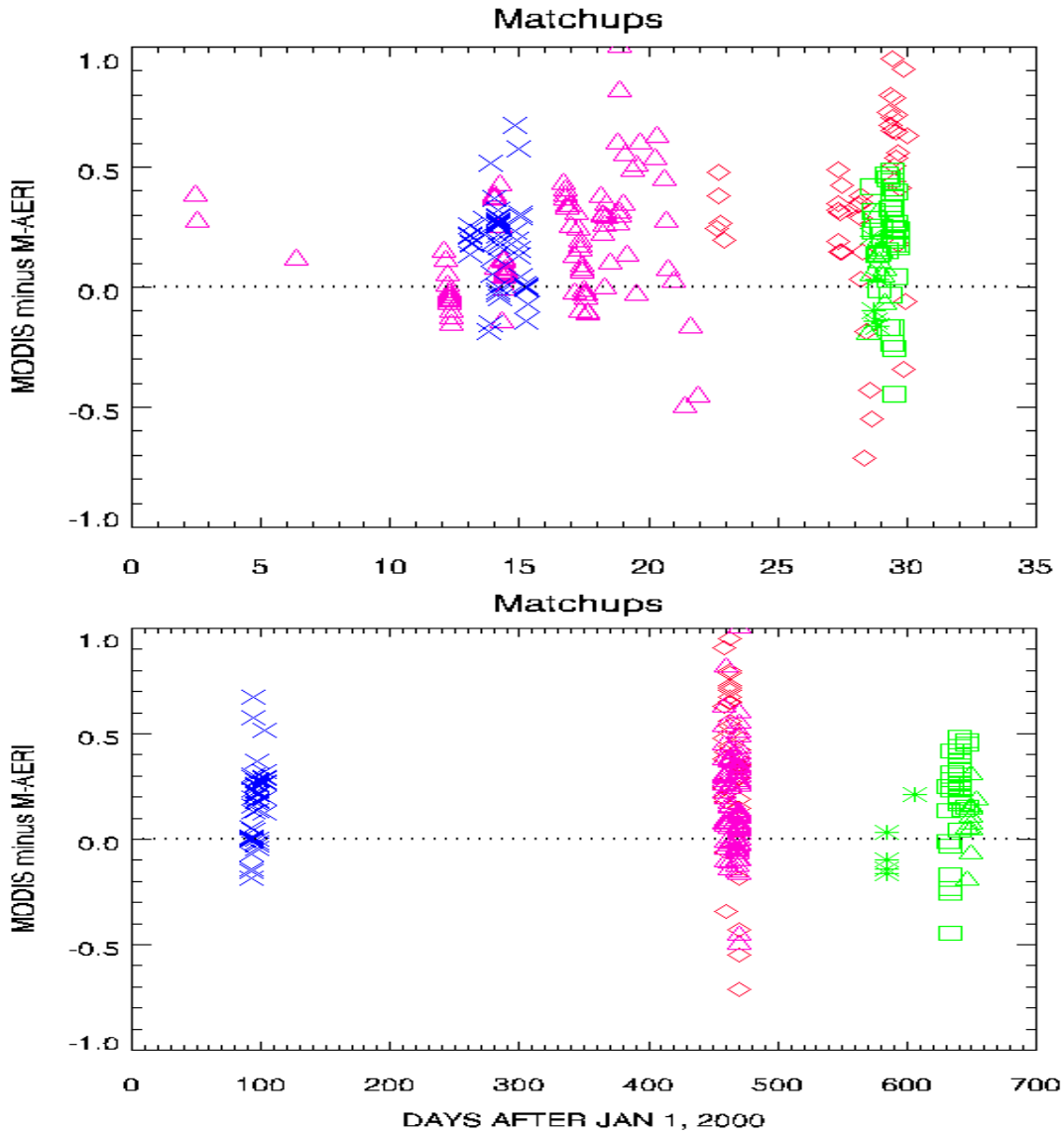


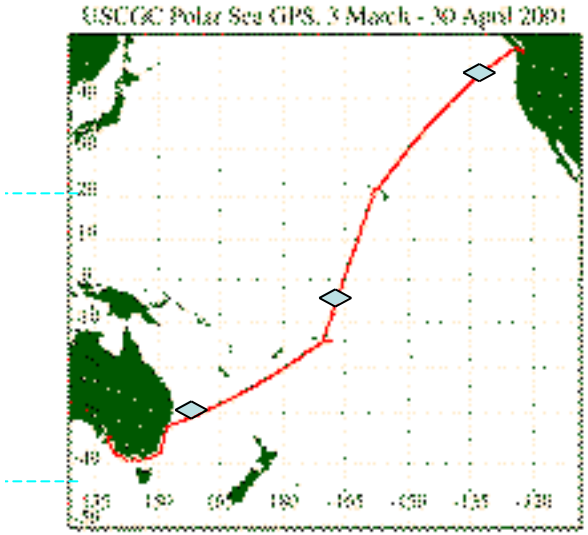


MODIS-M-AERI Matchups

Red=Pacific March-April 2001, Blue = Mediterranean - April,2000

Pink = ACE 2001.Pacific, Green = Explorer





All data

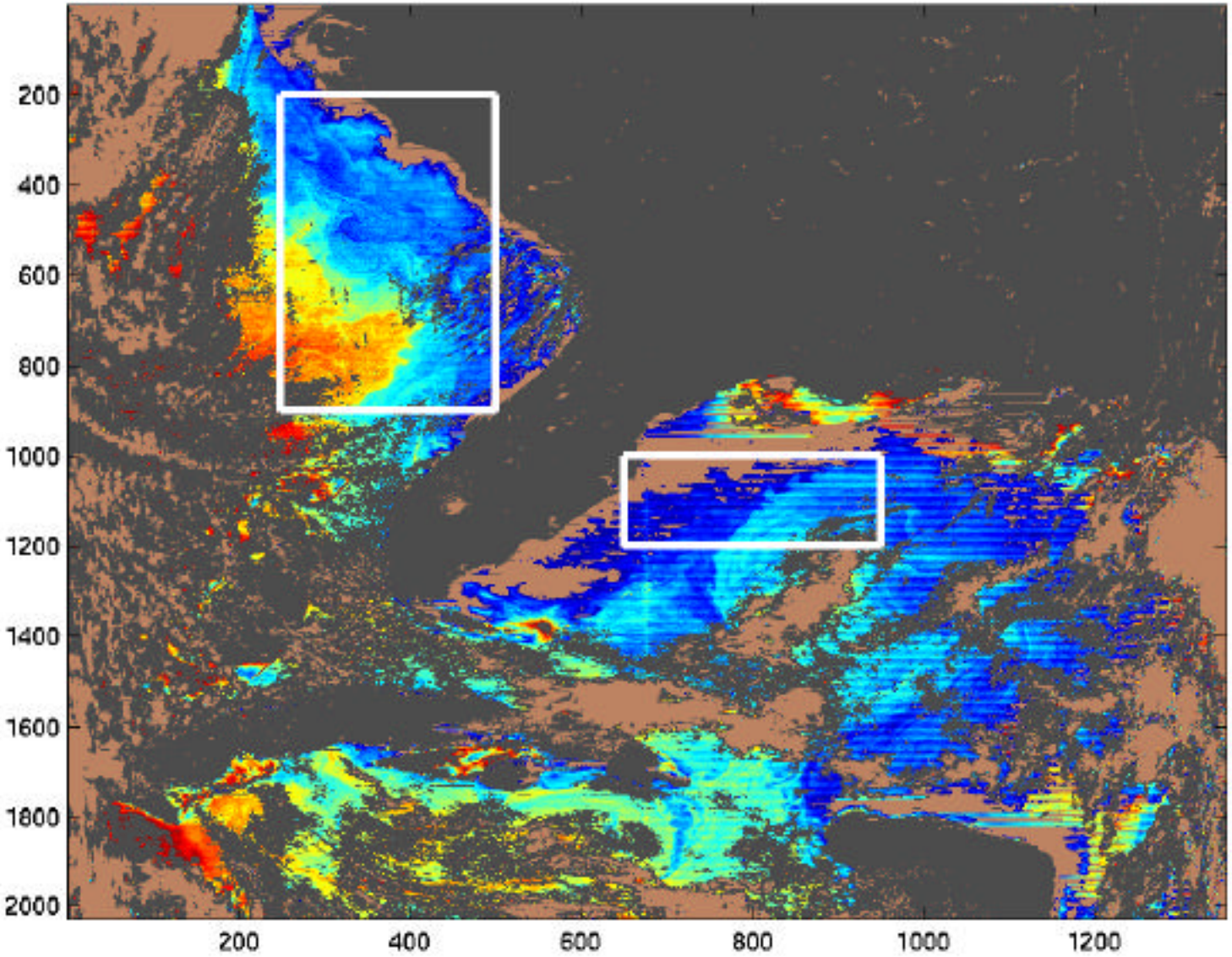
m=0.20 std=0.26 n=242

Explorer

m=0.15 std=0.21 n=50

Southeastern North America nLw 412nm

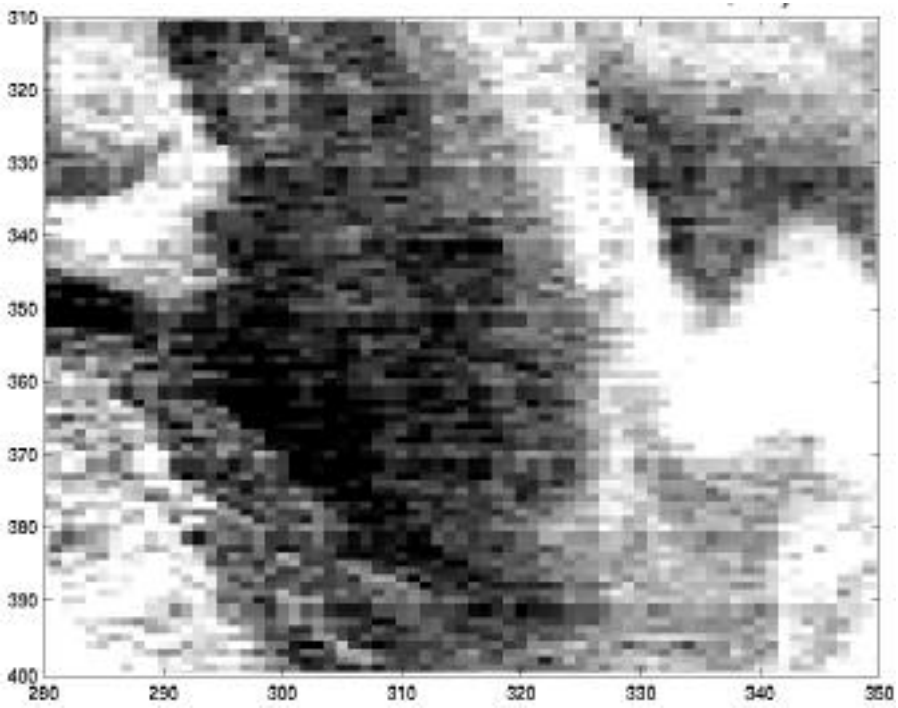
November 1, 2000



Northeastern Gulf of Mexico nLw 412 nm

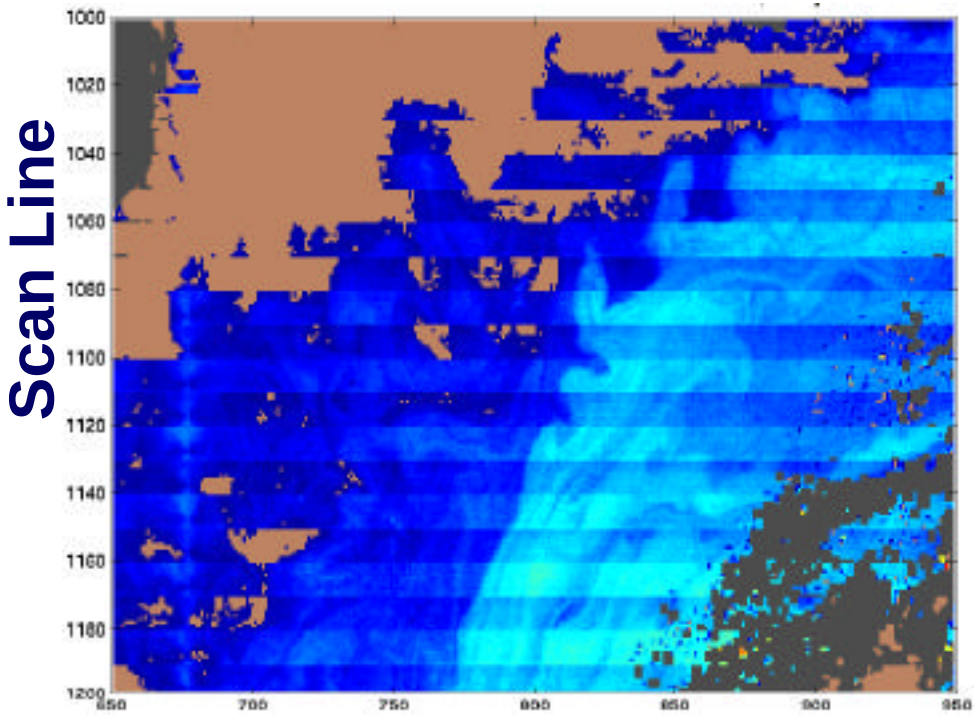
November 1, 2000

Detector Striping



Pixel Number

Mirror Side Banding

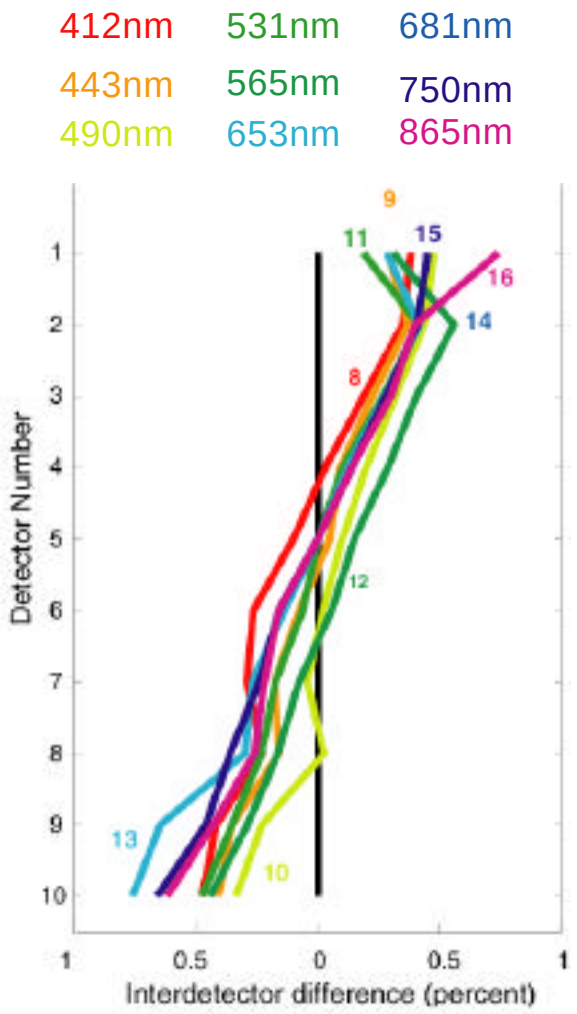


Pixel Number

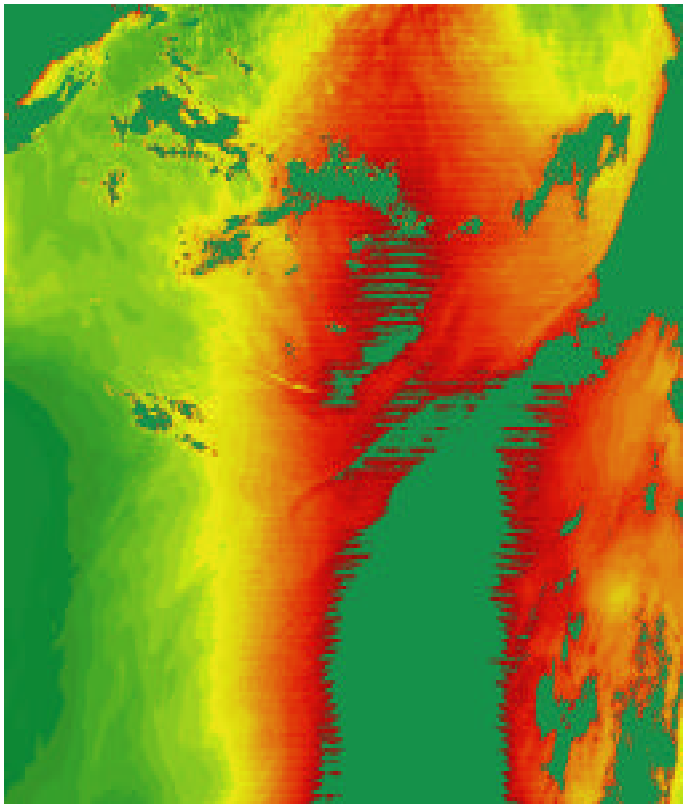
Inter-Detector gain adjustments

- **Plot of the at-launch relative response of each of the 10 detectors.**

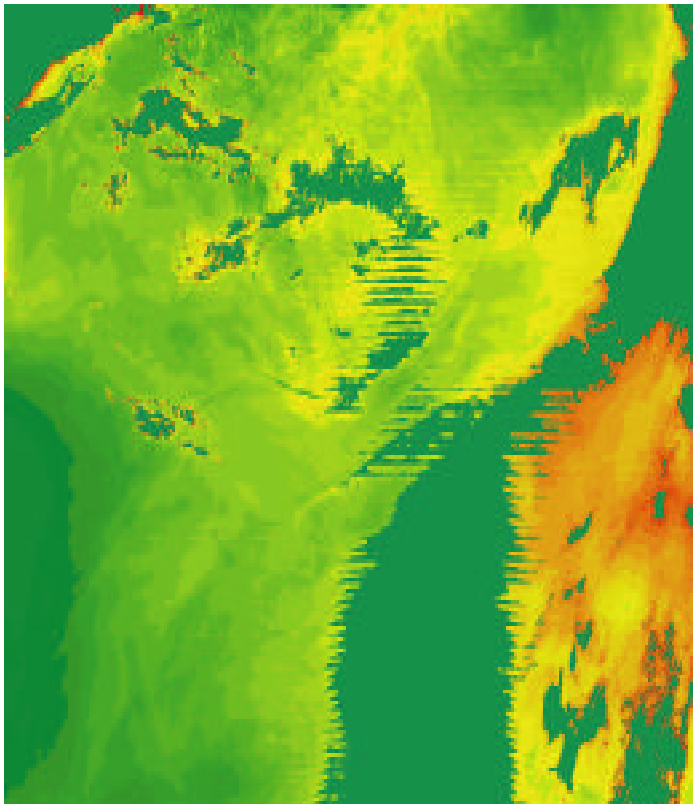
- **A general increasing linear response from detector 1 to detector 10 on the order of ~1% is present in all bands. The black line represents the inter-detector response after gains were adjusted by normalizing response to detector 5 and filtering La.**



Glint Corrected La 865nm



Uncorrected La 865nm
Yellow - red region glint contaminated
(Lg> 5*La).

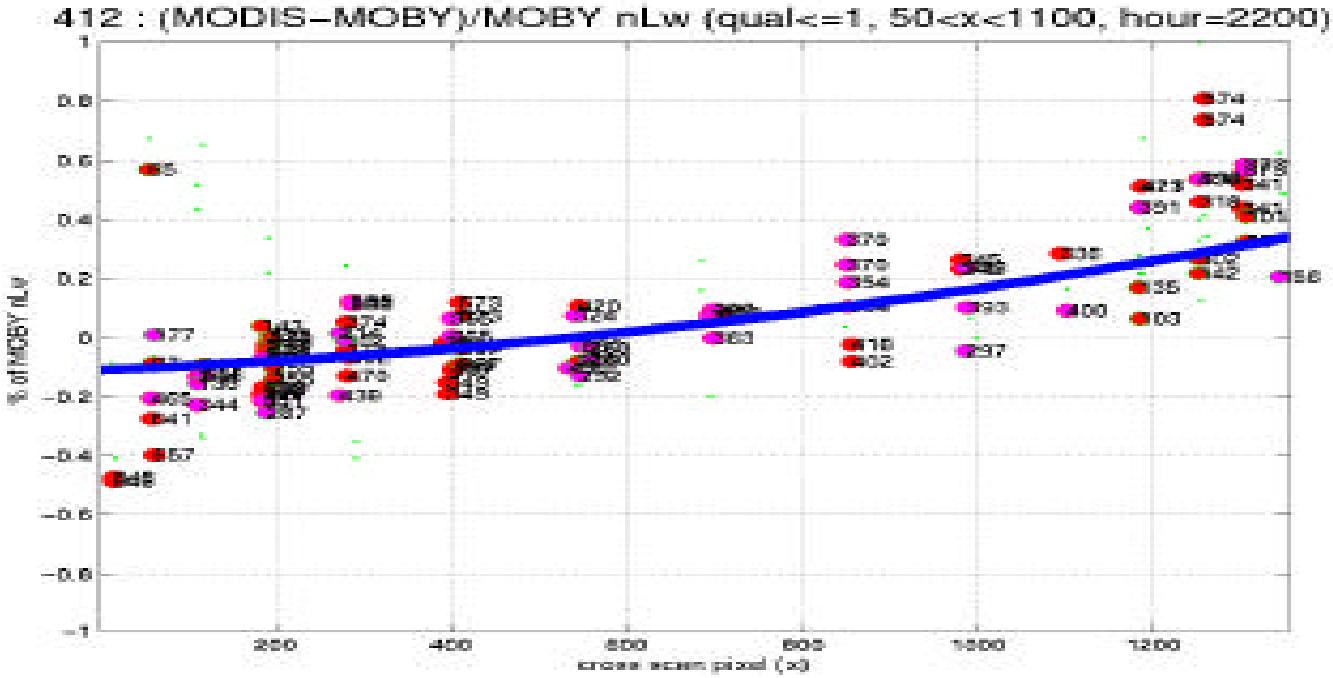


Corrected La 865nm
Sun glint removed La865nm.

Cross-scan correction

MODIS-MOBY Time Series

412 nm



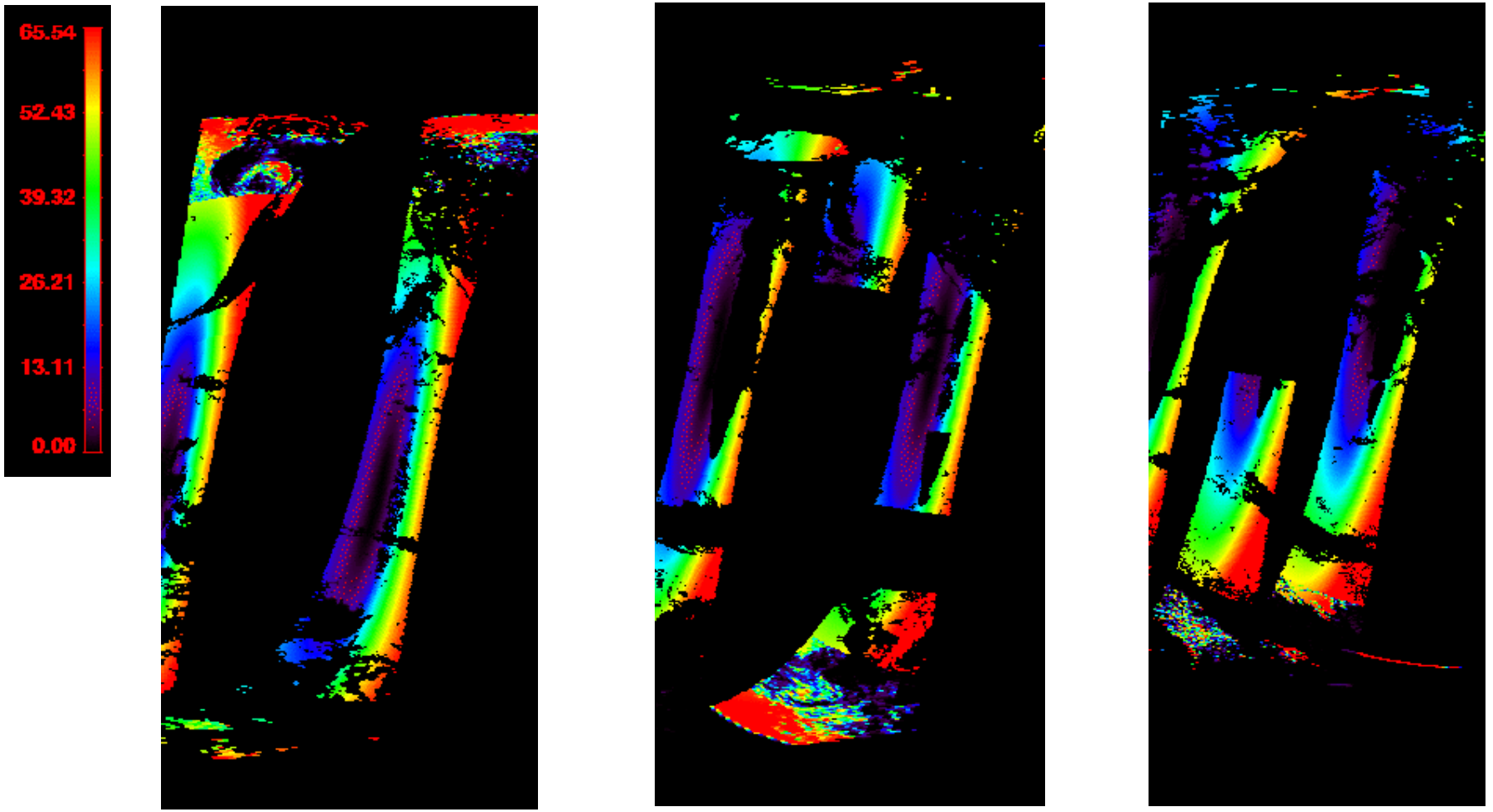
No cross-scan correction

Degree of polarization of L_r

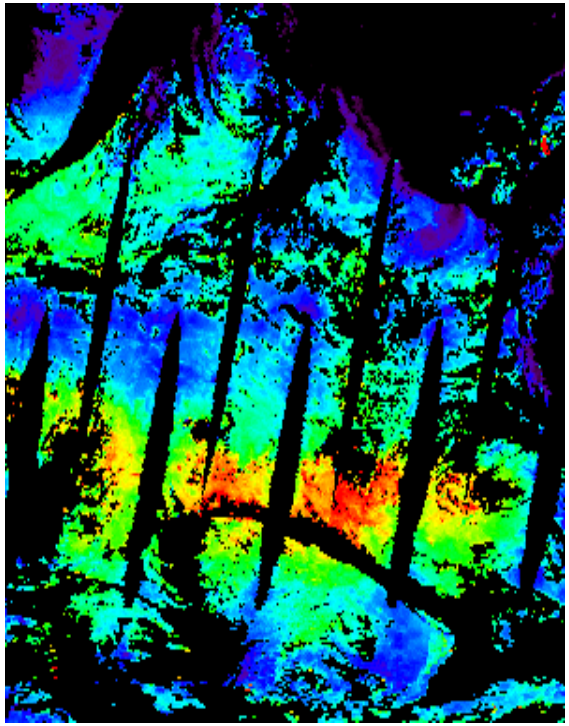
Dec 4, 2000

Apr 8, 2001

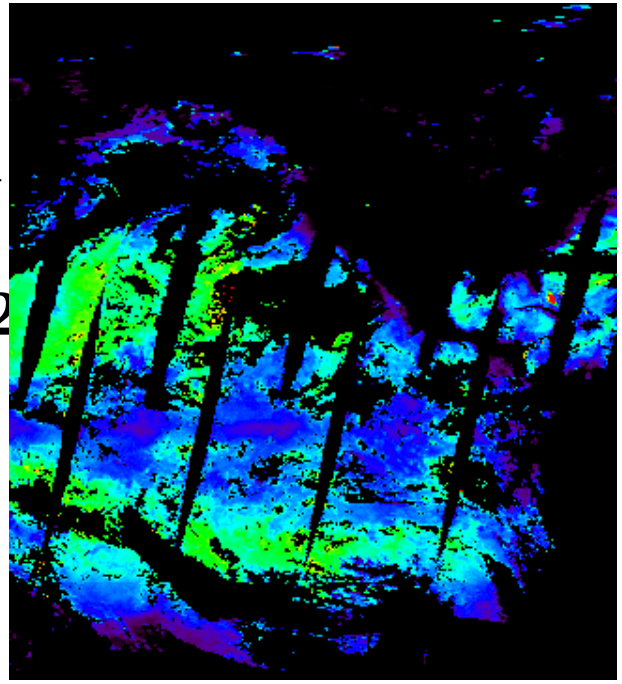
June 10, 2001



Dec 412 pol

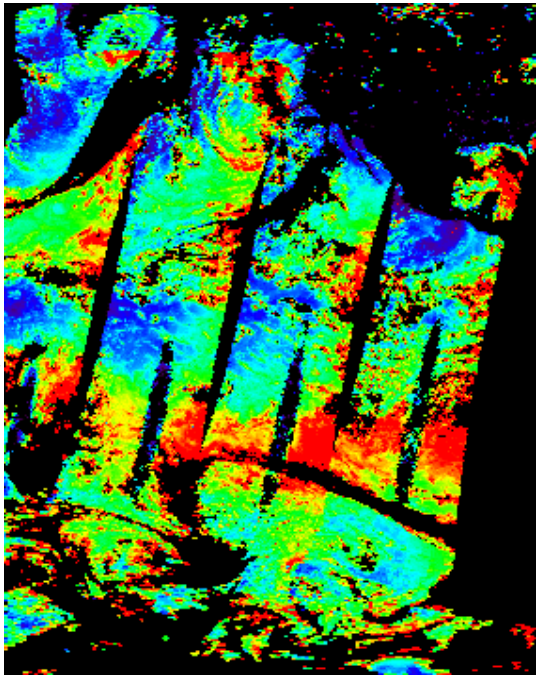


Impact of Polarization and cross-scan correction on 412 nm nL_w

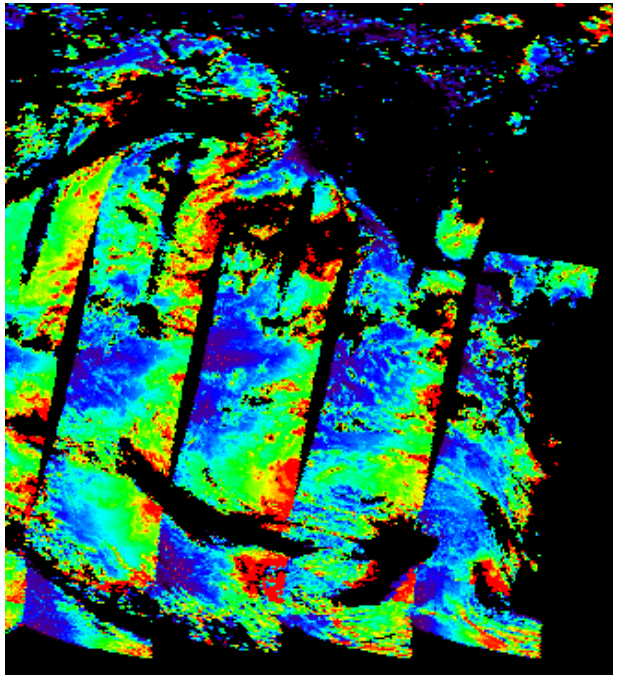


June 412 pol

Dec 412 nopol



East/west transition between adjacent orbits not smooth for non-polarization correction



June 412 nopol

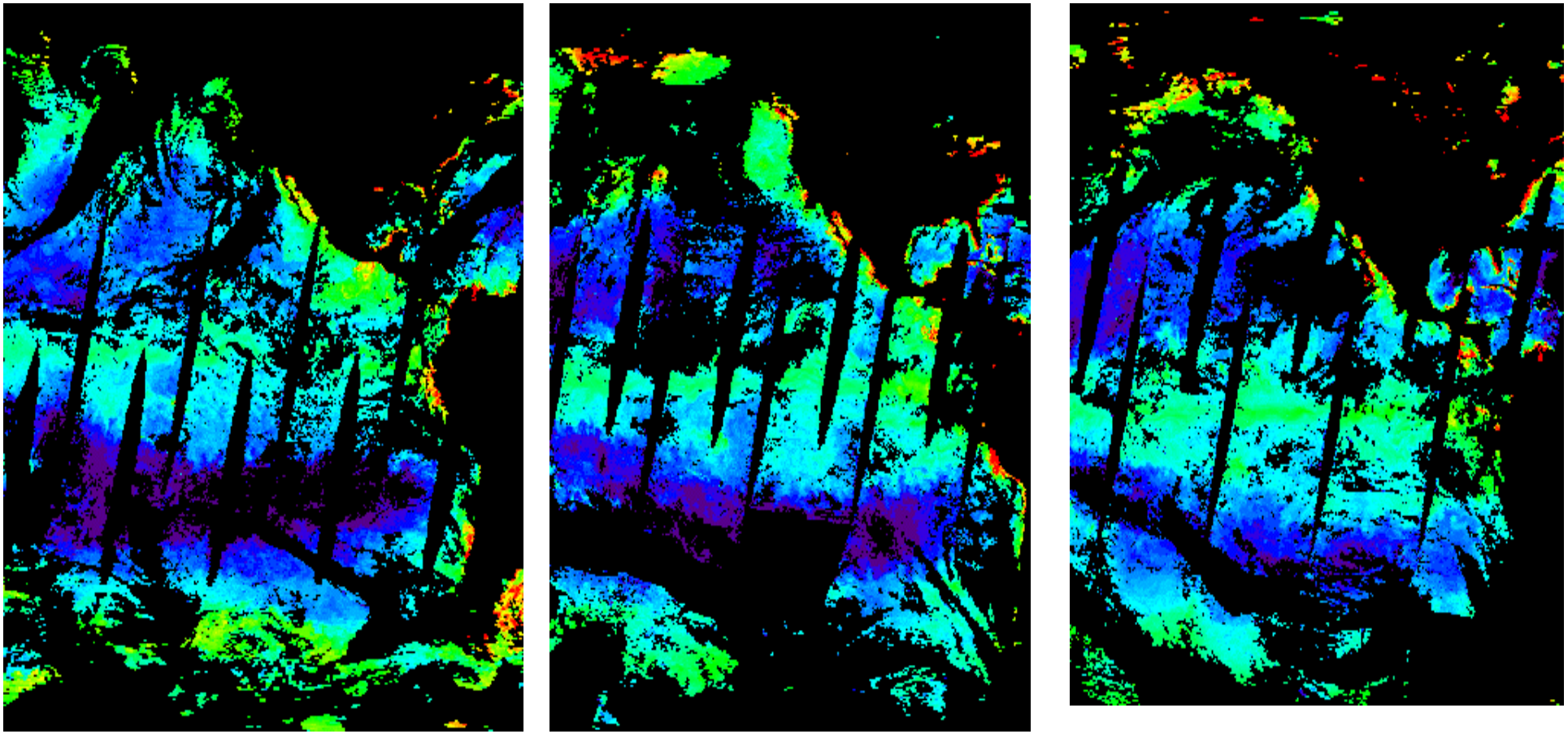
MODIS Non-rotated Polarization and cross-scan correction

with reduced Sun Glint Mask

(single day coverage)

Chlor_a2 (SeaWiFS equivalent)

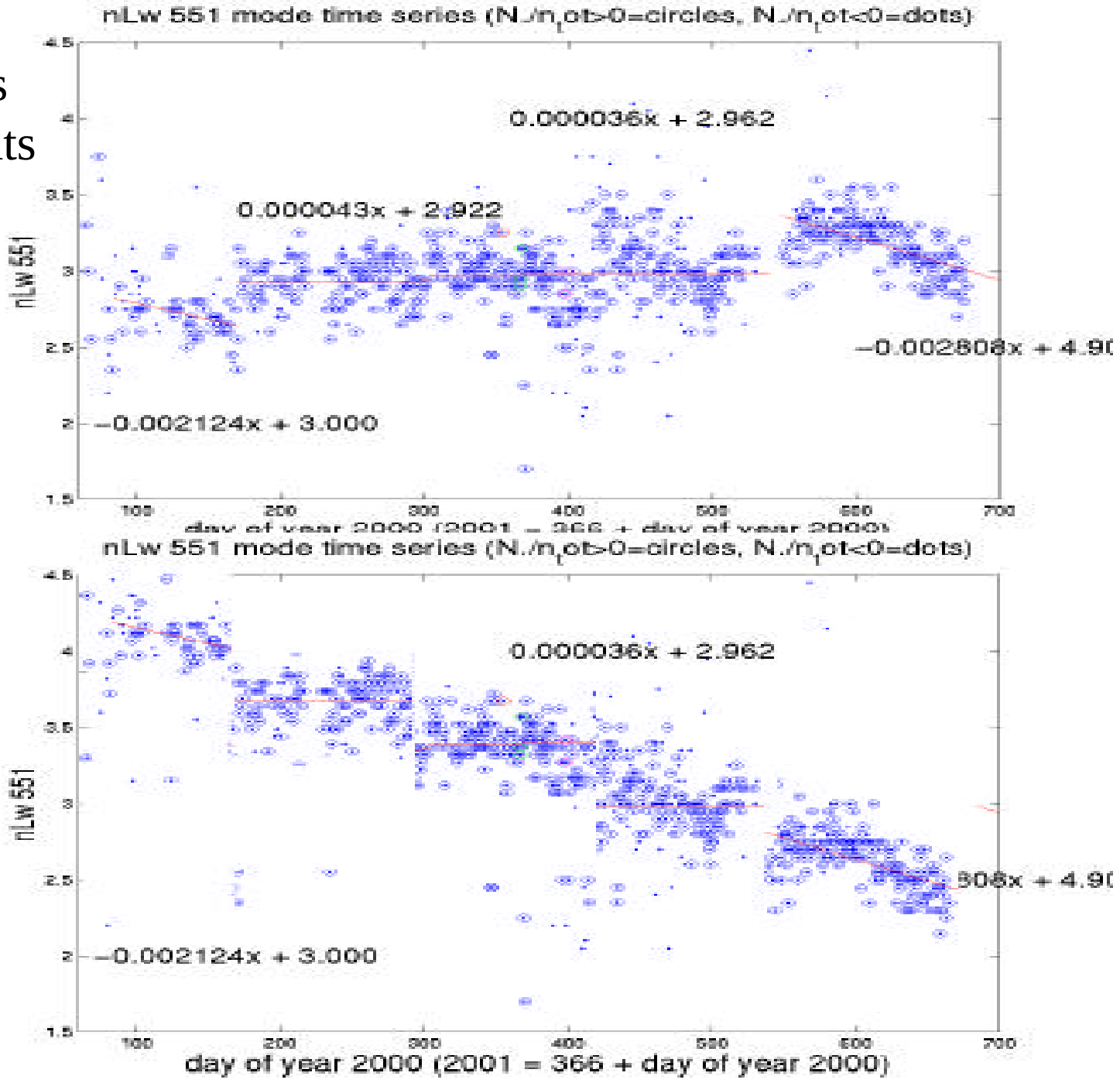
Dec 4, 2000 Apr 8, 2001 June 10, 2001



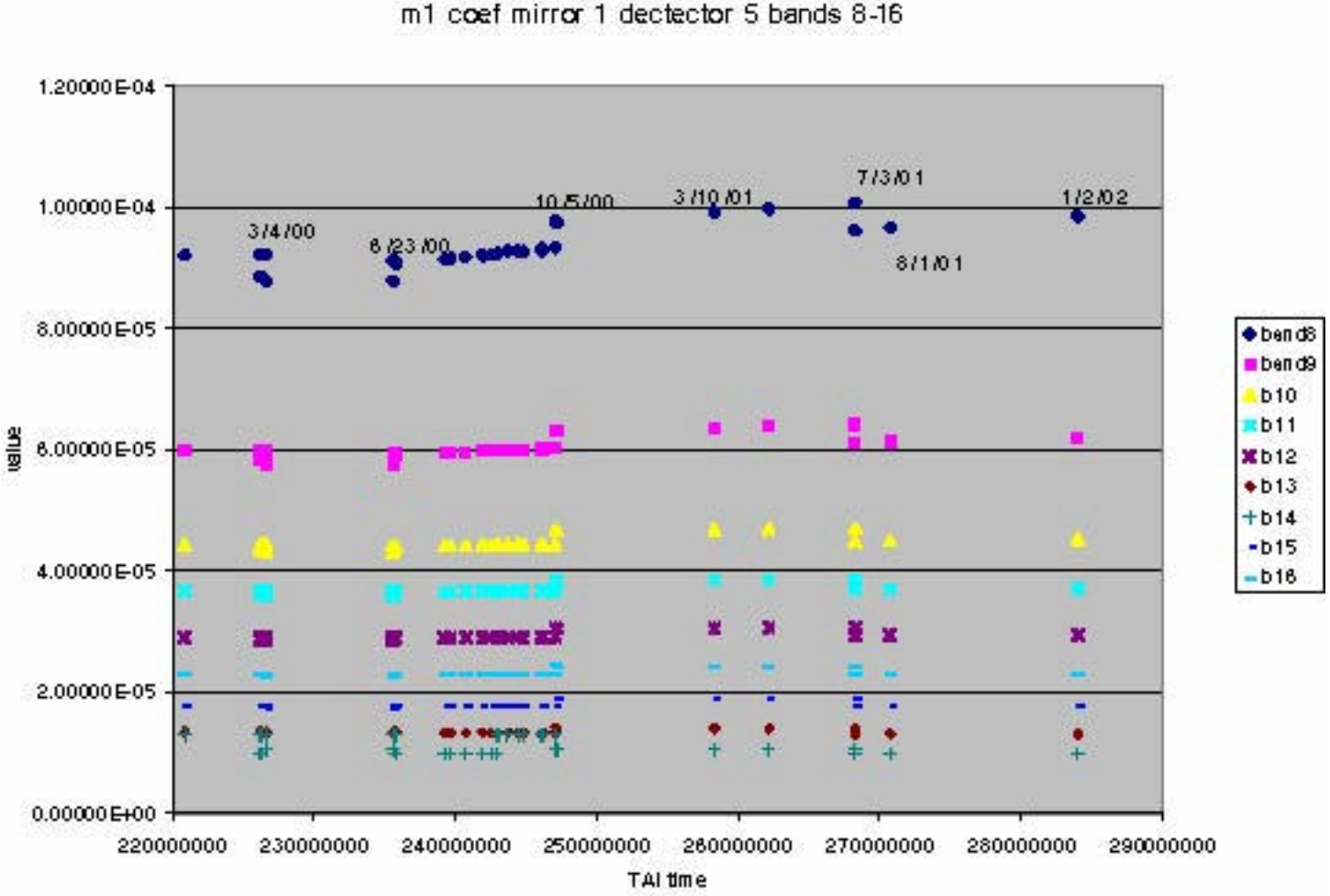
Initial electronics offset adjustments

551 nm Time series

Time series assuming no adjustments



M1 calibration coefficient vs. time



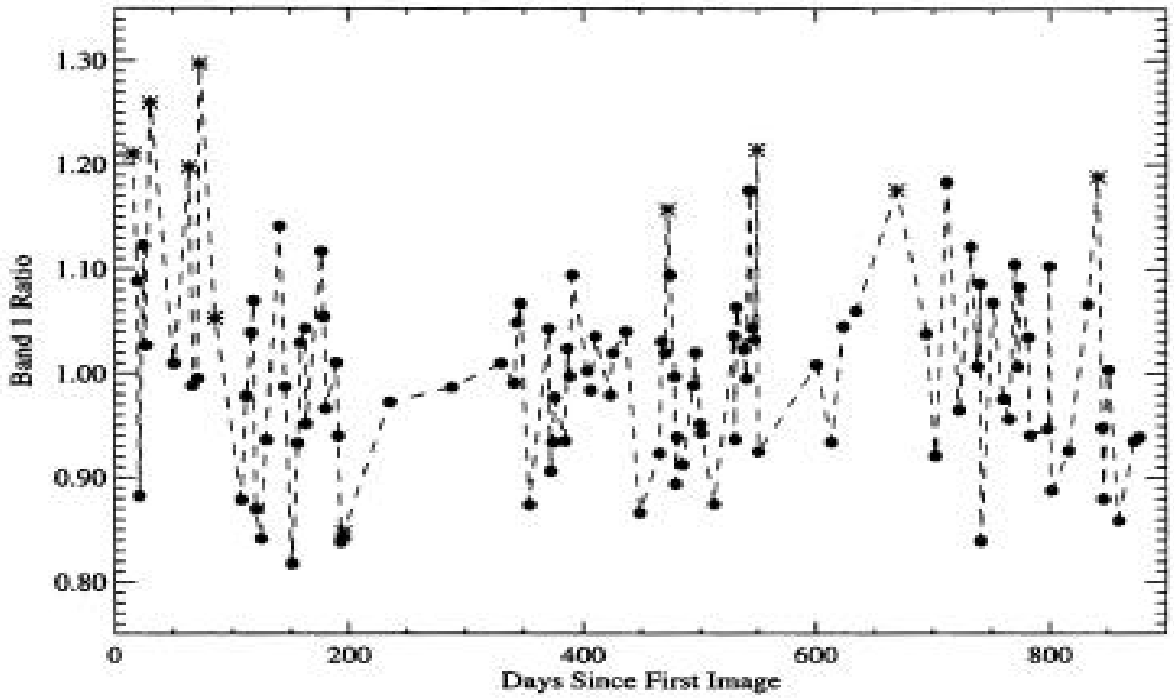
MODIS/MOBY

ratio, 412 nm

Time periods do not overlap

SeaWifs/MOBY

ratio, 412 nm



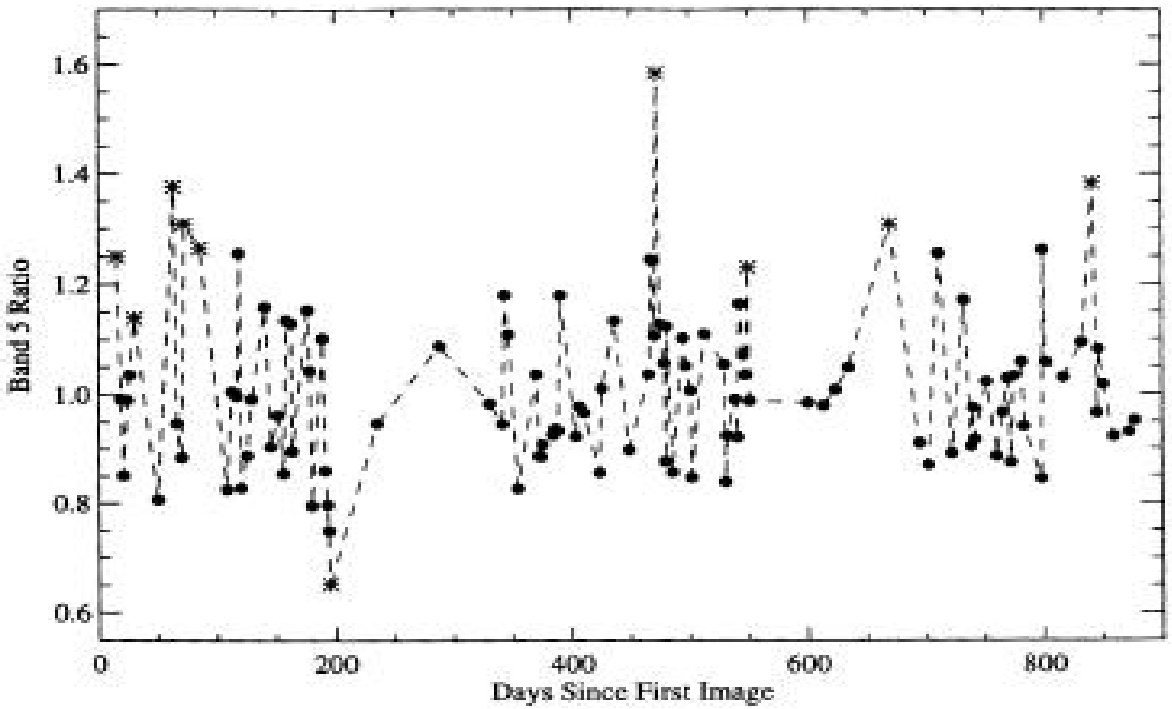
MODIS/MOBY

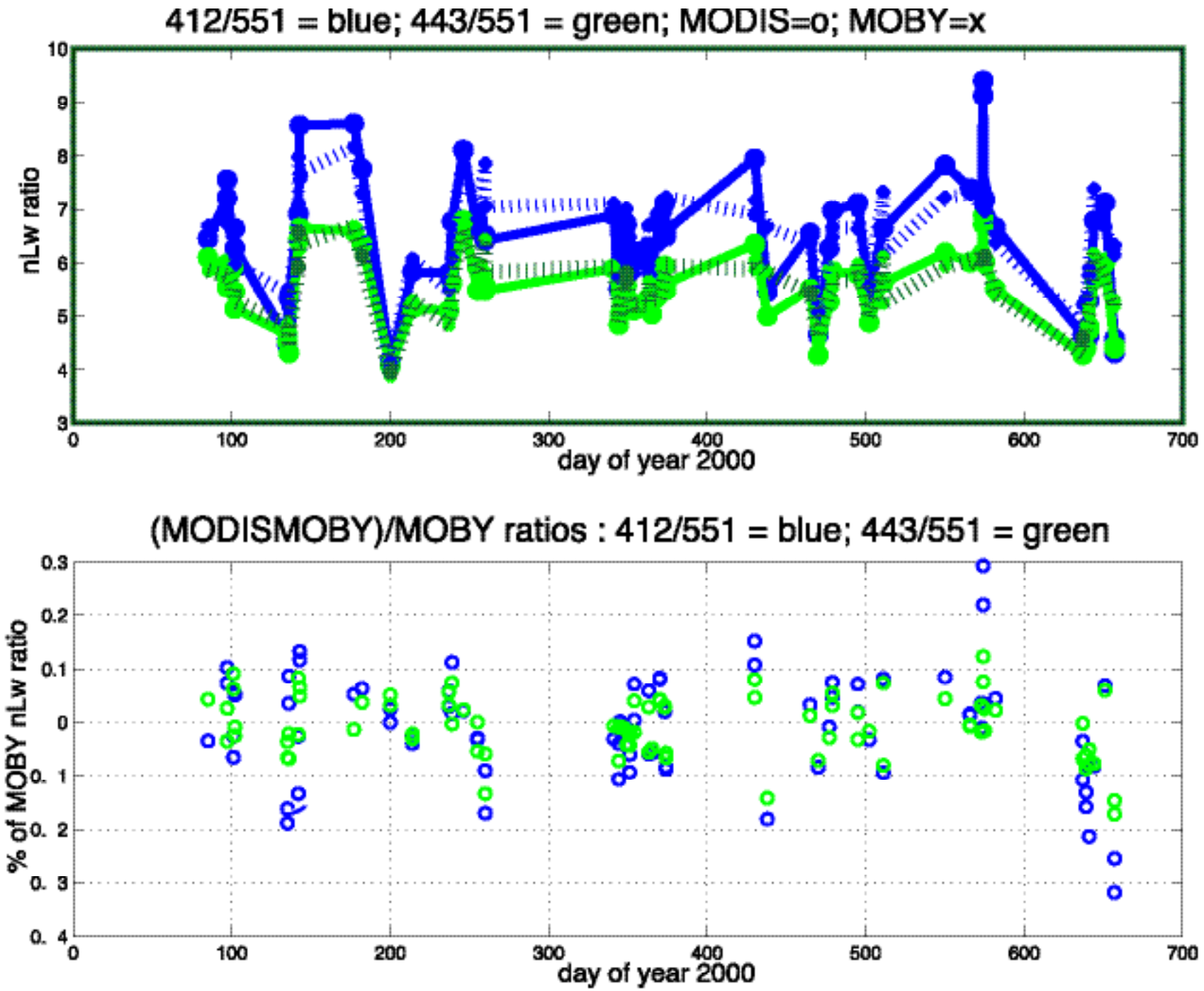
ratio, 551 nm

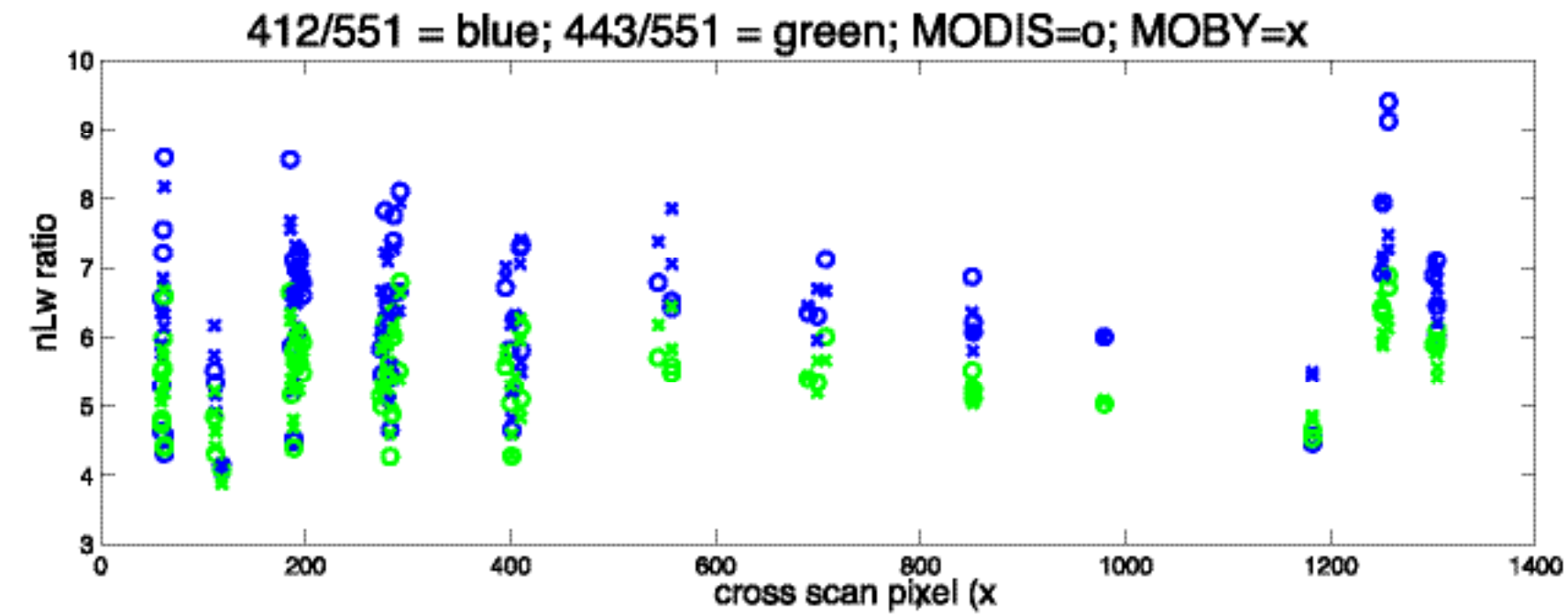
Time periods do not overlap

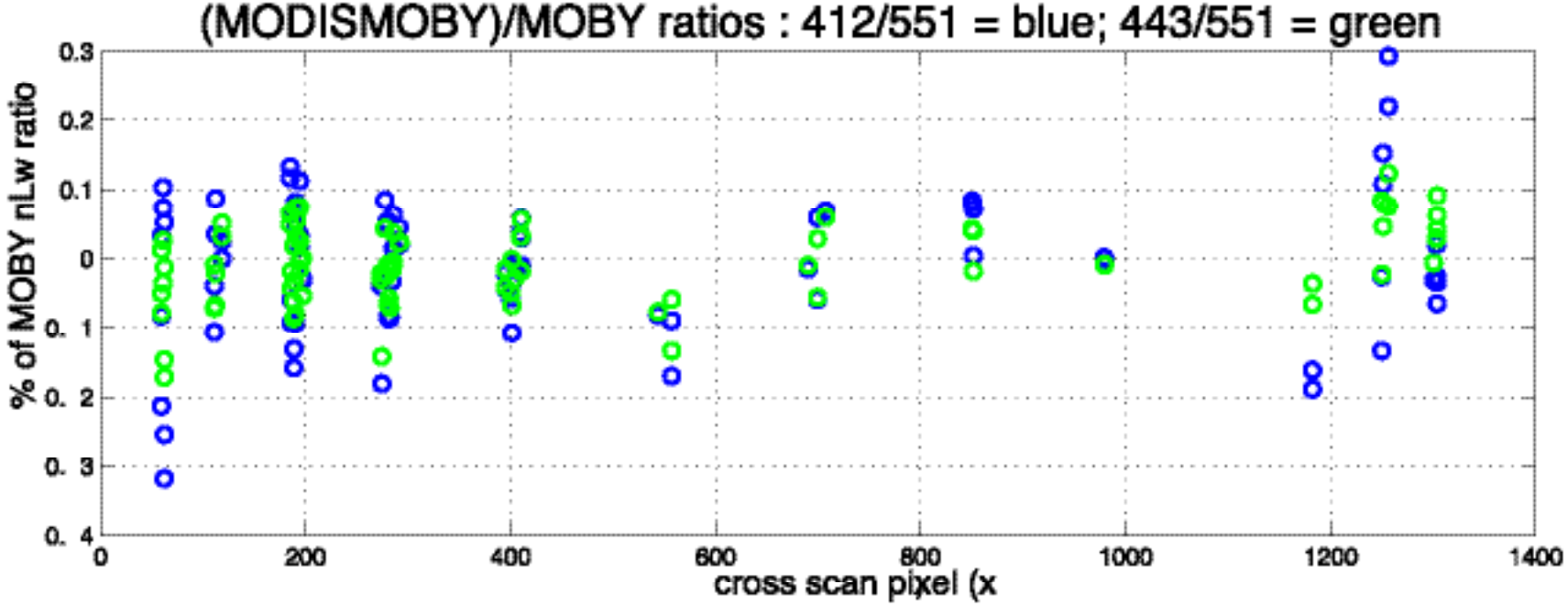
SeaWifs/MOBY

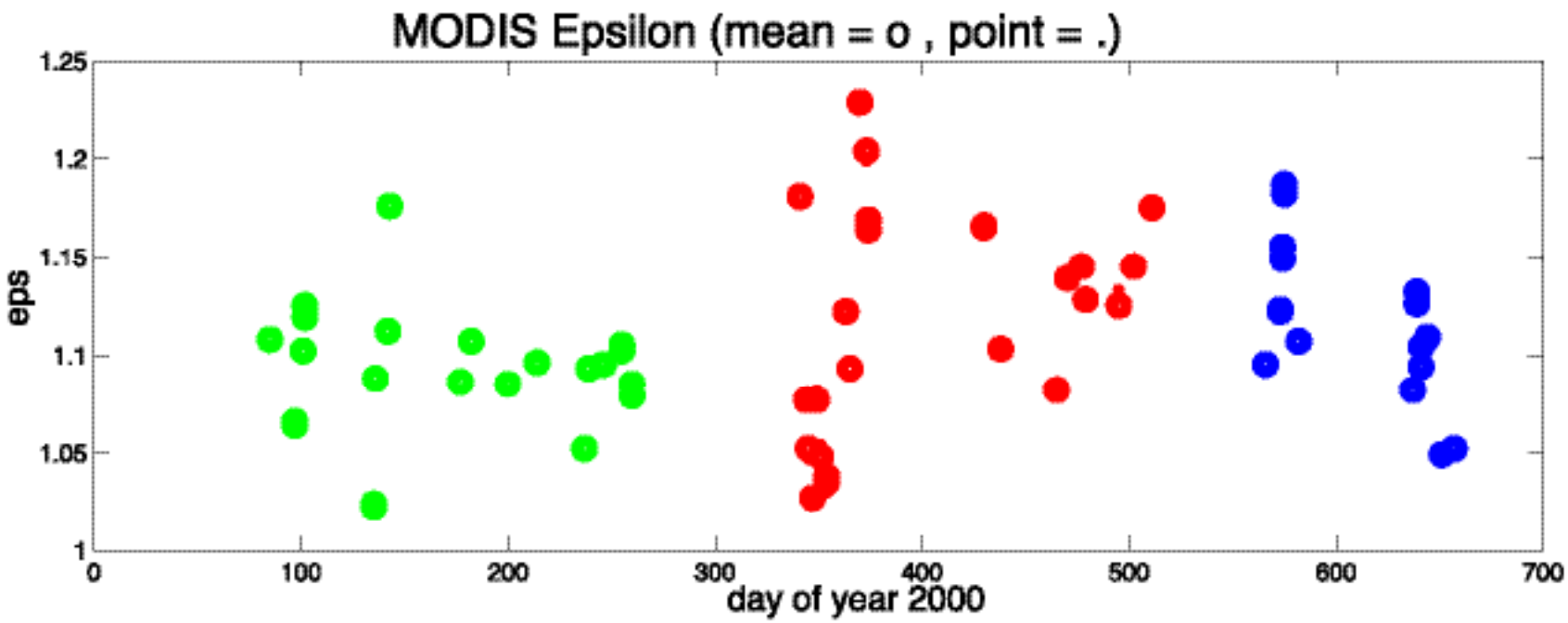
ratio, 550 nm

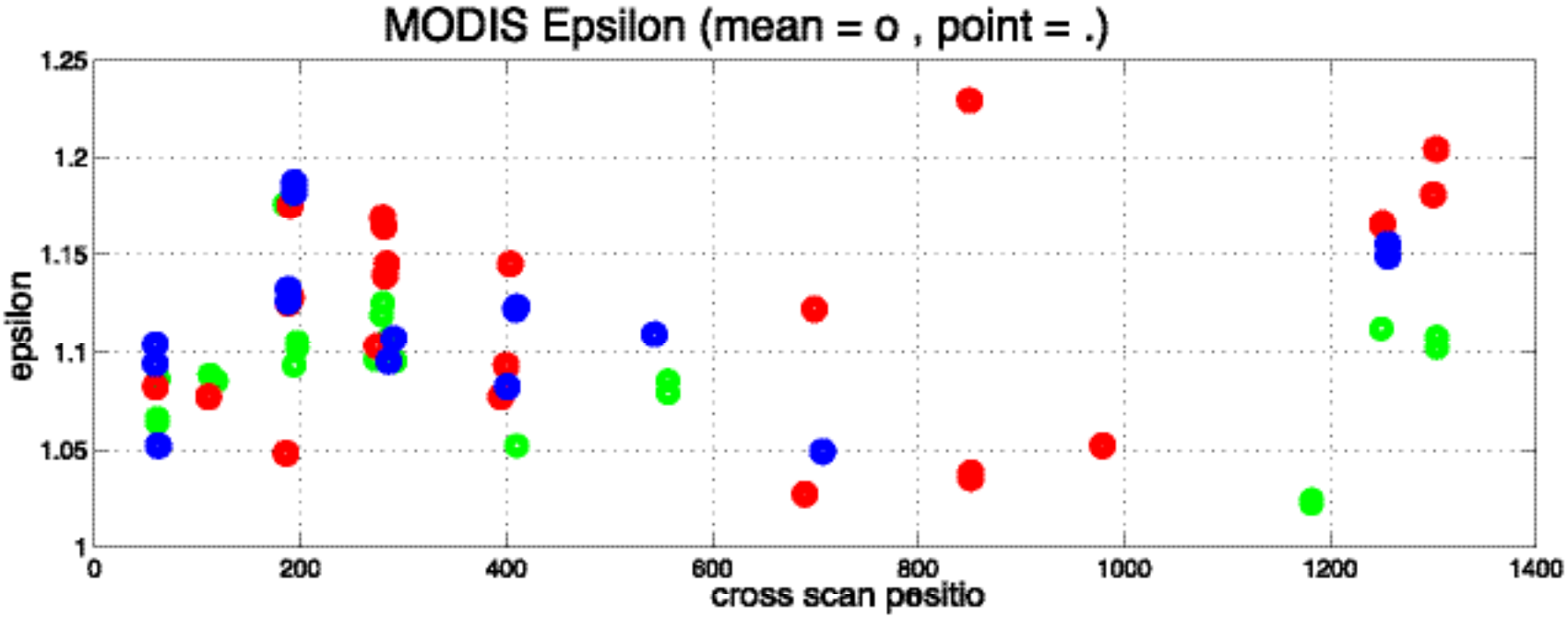



412/551 = blue; 443/551 = green; MODIS=o; MOBY=x
nLw ratio
day of year 2000
(MODISMOBY)/MOBY ratios : 412/551 = blue; 443/551 = green
% of MOBY nLw ratio
day of year 2000


412/551 = blue; 443/551 = green; MODIS=o; MOBY=x
nLw ratio
cross scan pixel (x


(MODISMOBY)/MOBY ratios : 412/551 = blue; 443/551 = green
% of MOBY nLw ratio
cross scan pixel (x


MODIS Epsilon (mean = o , point = .)
eps
day of year 2000
1.25
1.2
1.15
1.1
1.05
1
0
100
200
300
400
500
600
700


MODIS Epsilon (mean = o , point = .)
epsilon
cross scan positio
1.25
1.2
1.15
1.1
1.05
1
0
200
400
600
800
1000
1200
1400

MODIS Ocean Visible Band and SST Performance

MODIS Band	Wavelength (nm)	RMS (% of nLw) Bias ~ 1%
8	412	12
9	443	8
10	488	7
11	531	8
12	551	9
22-23	SST4	Seasonal bias <0- 0.6K Std. Dev < 0.25K
31-32	SST	Bias 0.15K Std. Dev <0.25K

Outstanding issues

- **Incremental improvement in Mirror Side correction, needs to be updated on a monthly basis - specifically side 1 to 2, proper L1 side recognition**
- **Extend MOBY, MOCE, MAERI - MODIS comparisons to better quality errors in retrieved radiance**
- **Continue to test time dependent correction tables against MODIS-*in situ* time series, update tables as required**
- **Future algorithm improvements (*e.g.* BRDF, separate mirror side polarization correction, absorbing aerosols, NIR band surface reflectance and cross-scan behavior**
- **Test methods to determine correction coefficients, QA, … across instrument events as preparation for Aqua**
- **Improve correction model for time dependence of (mirror side, RVS, detector) corrections**
- **Detector-detector, mirror side corrections not always stable granule to granule**
- **Evaluate epsilon magnitude, set relative band 15,16 gain**
- **SST4 bias vs. time - quantify and remove**
- **Remove 0.15C bias in SST**
- **6xx nm band calibration [Blue items to be completed during Jan, 02]**