MODLAND SUMMARY
SWRunning

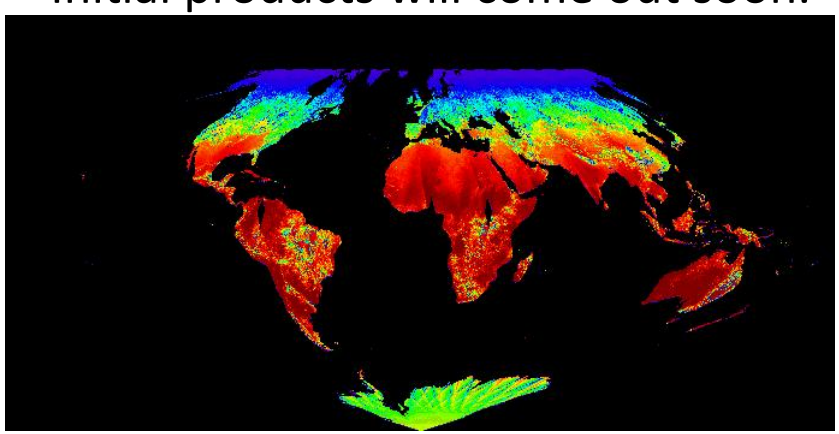
10 June 2016

NEW?? PRODUCTS WITH Collection 6

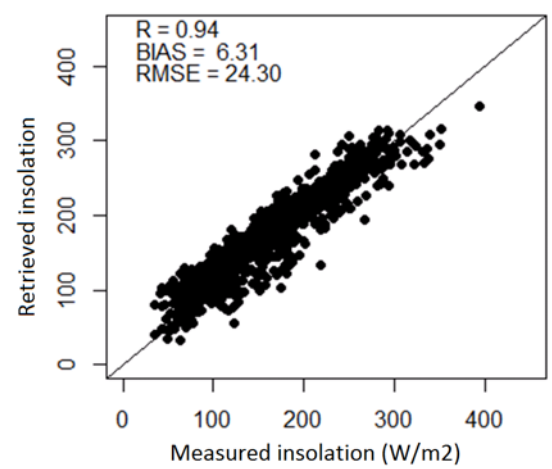
Collection 7???

High-resolution incident shortwave radiation and PAR products over land from MODIS

- New high spatial resolution insolation and PAR products
  - Needed by the terrestrial modeling community (~1˚ for existing datasets)
  - 3-hr, daily mean.
  - 5km tile-based and 0.05 ˚ CMG.
- Using a fast and robust LUT-based method.
  - Zhang et al. RSE 2014;
  - Three-year prototype products generated;
  - Extensively validated and inter-compared.
- Codes have been delivered and tested at MODAPS.
  - PGE and ESDT have been assigned;
  - Initial products will come out soon.



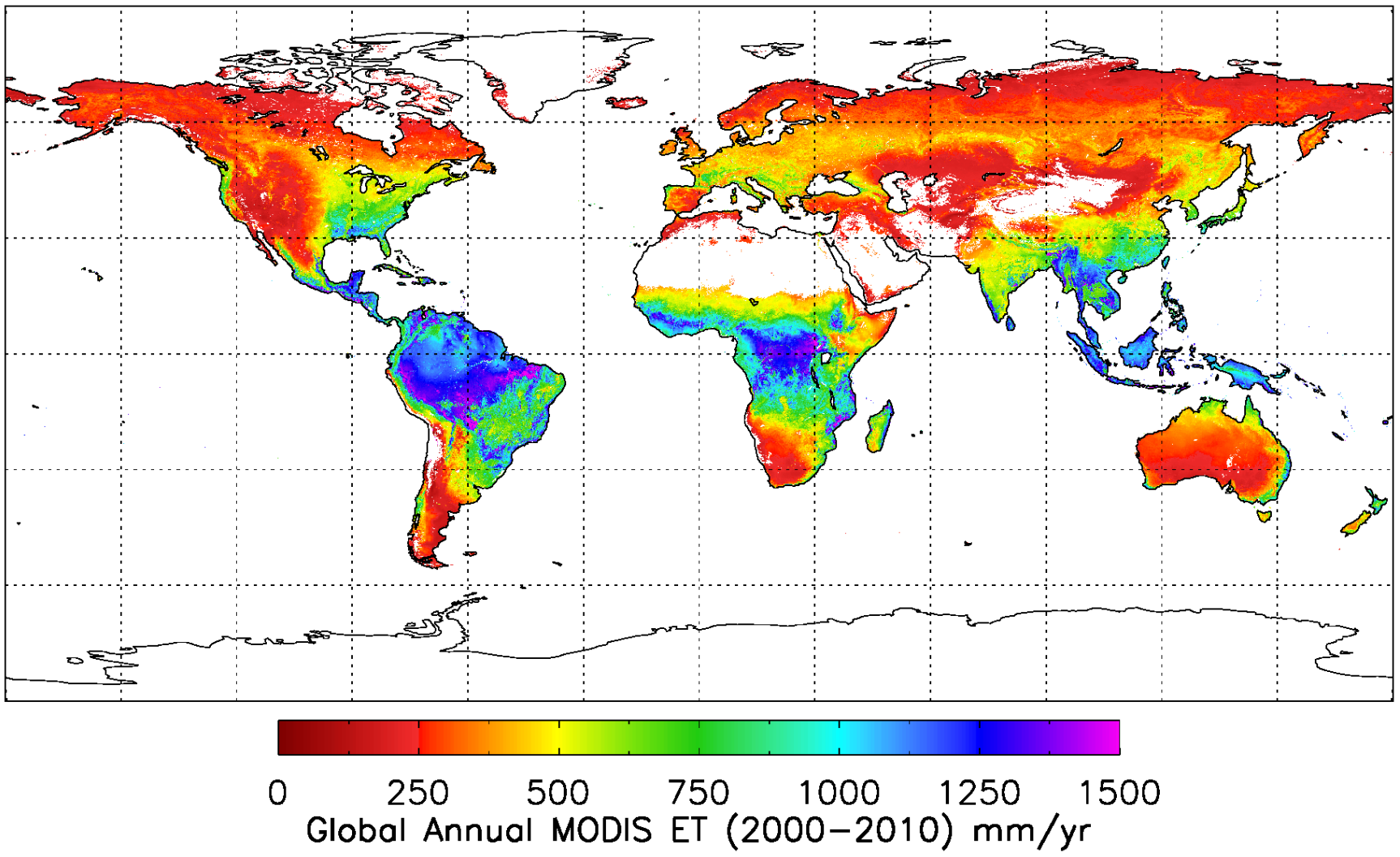
Example of daily DSR (MCD18C1) on Jan. 1st, 2010



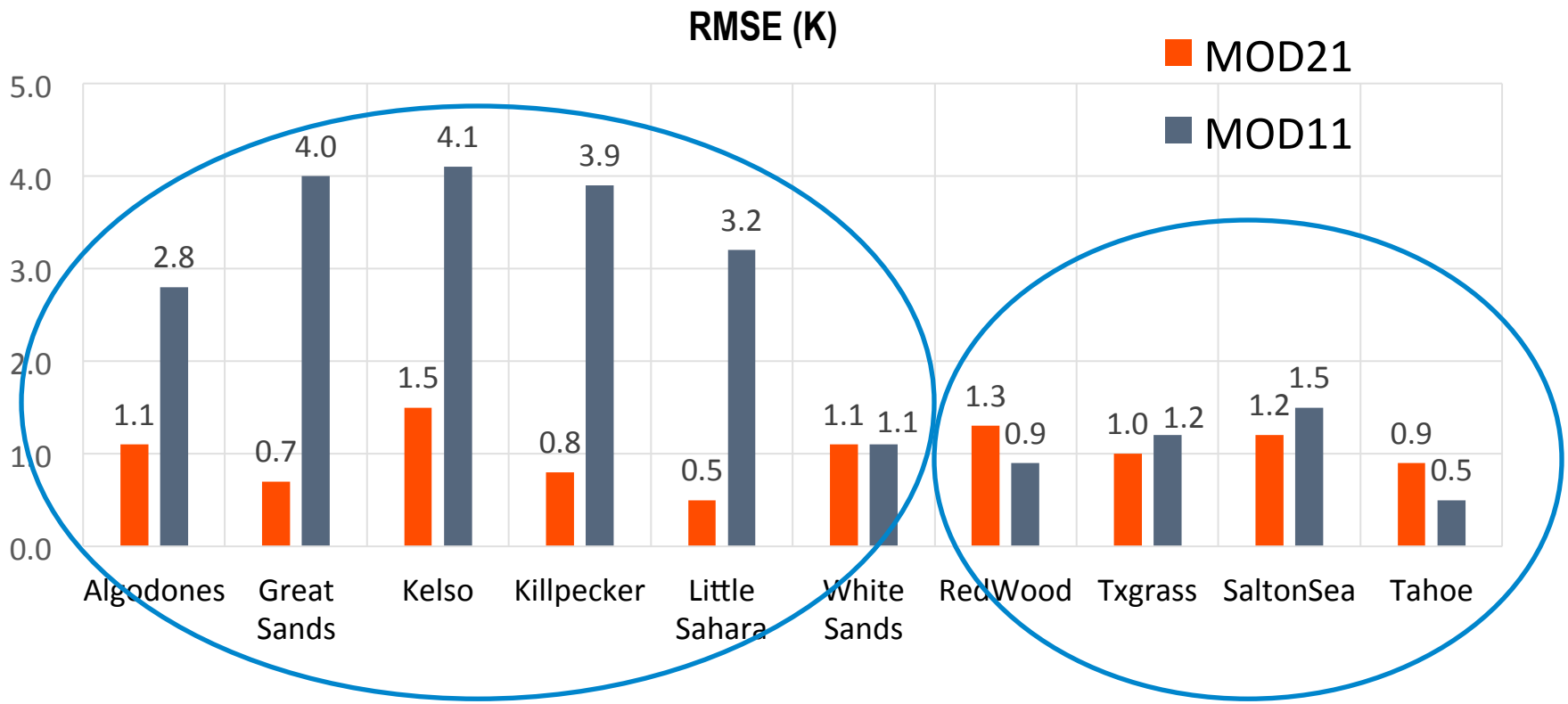
Validating monthly shortwave radiation

Global Annual 1-km ET over 2000-2010

Global average MODIS ET over vegetated land surface is 568.7 ± 358.2 mm yr^{-1}.



MODIS LST Validation Summary



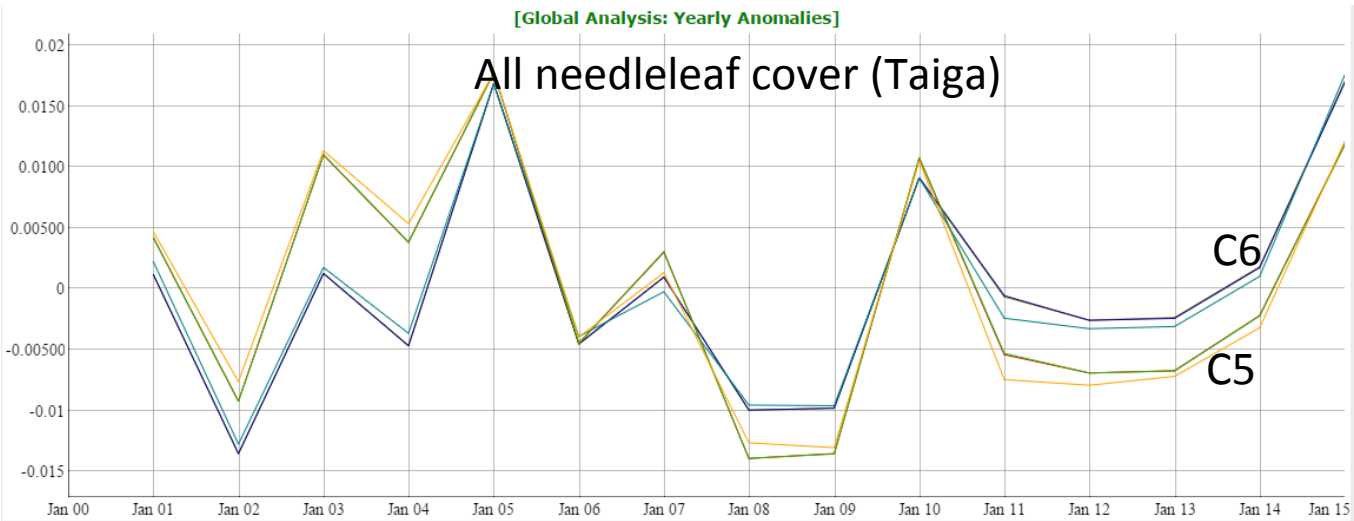
MOD11 larger uncertainty over bare regions (3-5 K)

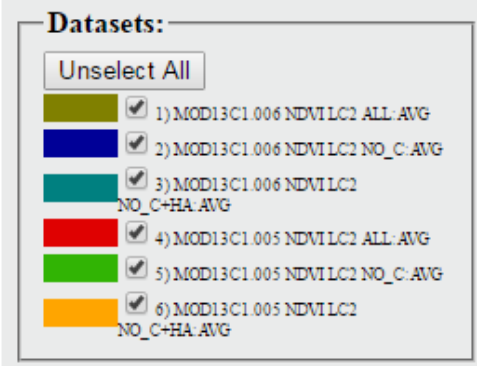
MOD11 more stable over graybodies (higher precision)

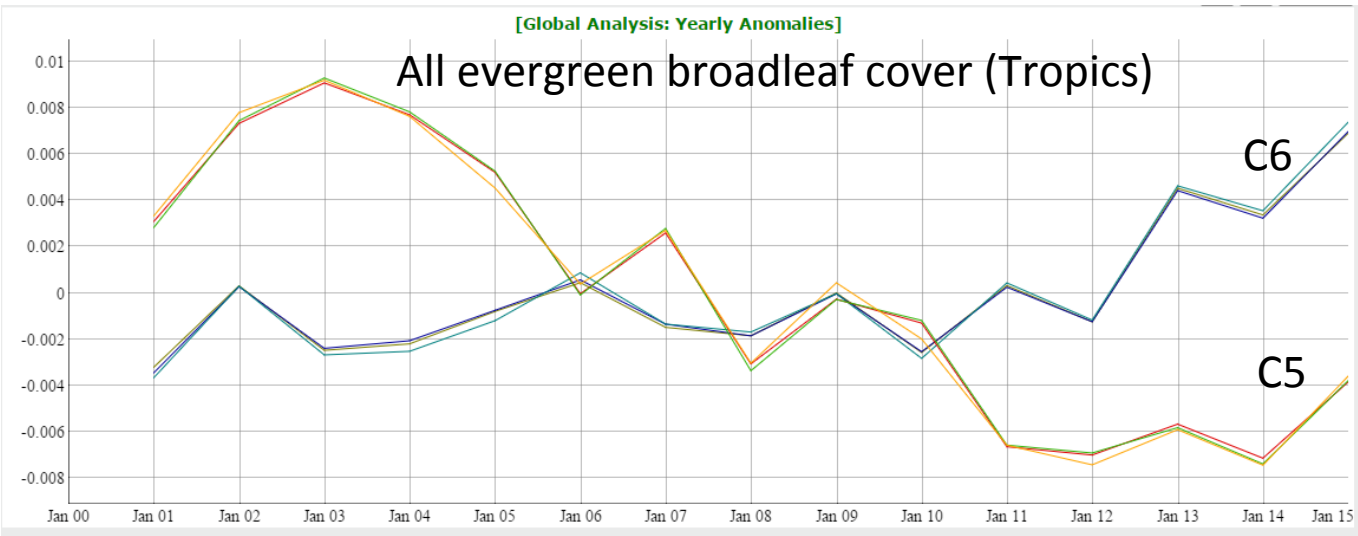
TIME SERIES TREND ANALYSES

- Requires huge attention to sensor and processing details

Specific Biomes Signal Anomalies/Trends

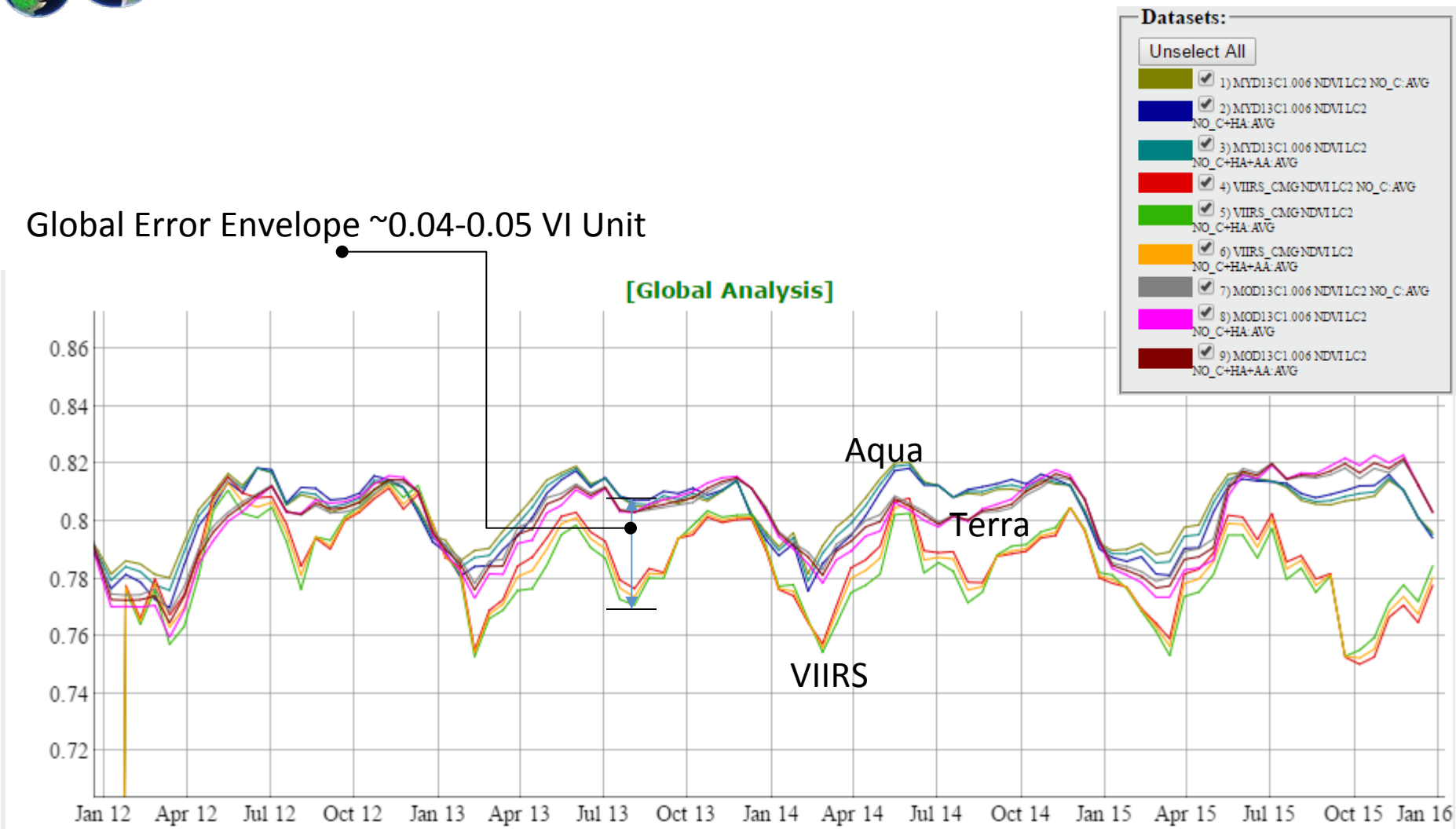






Consistent across all data filtering approaches.
Major differences between the two collections
Taiga:
C6 ~ C5 : no clear trend
Tropics
C6 : Greening
C5 : Browning

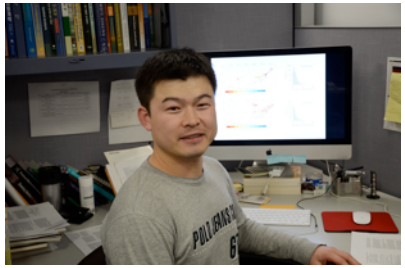
Terra-Aqua-VIIRS (Tropics)



MODISLAI & FPAR – 2016 UPDATE

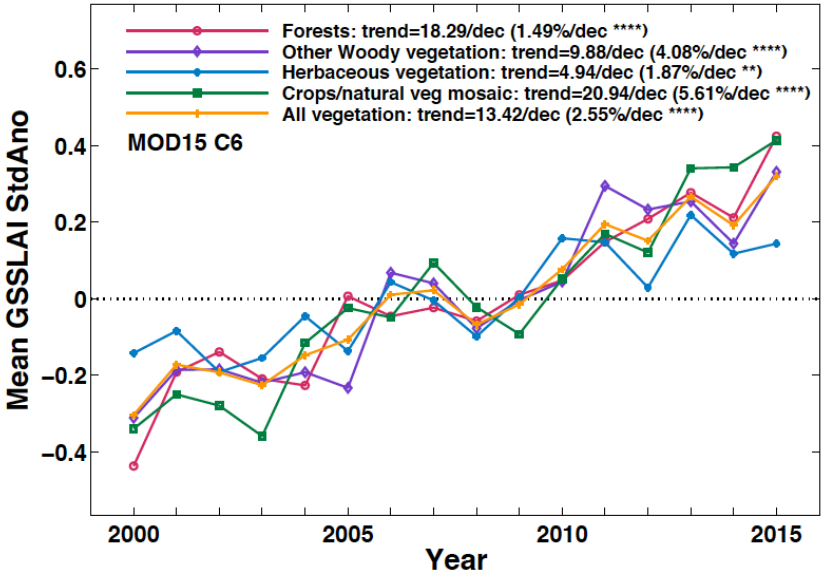
- Does MODIS see a "greener Earth"?

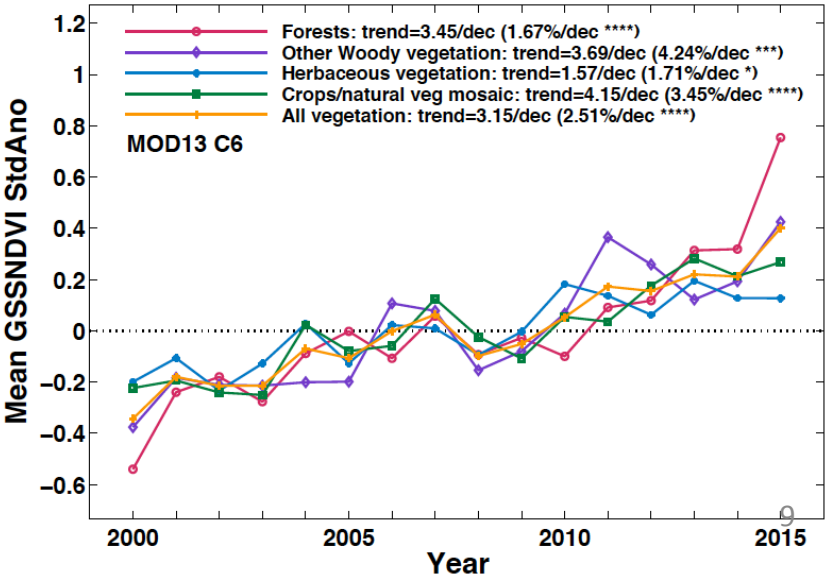
Taejin Park



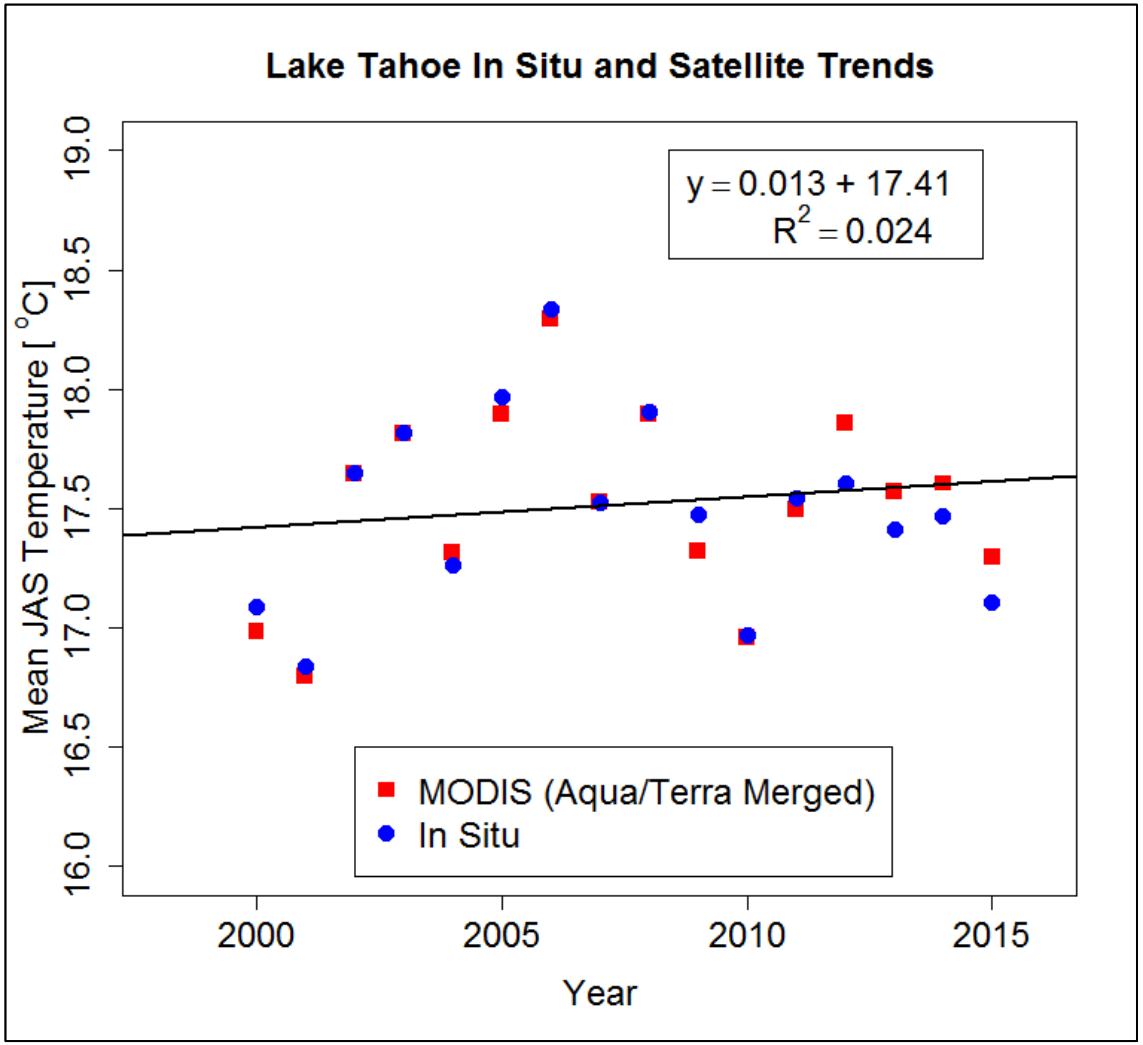
Kai Yan

Chi Chen





The Importance of Record Length



NEW SCIENCE

Index of /~wright/m × MODVOLC ×

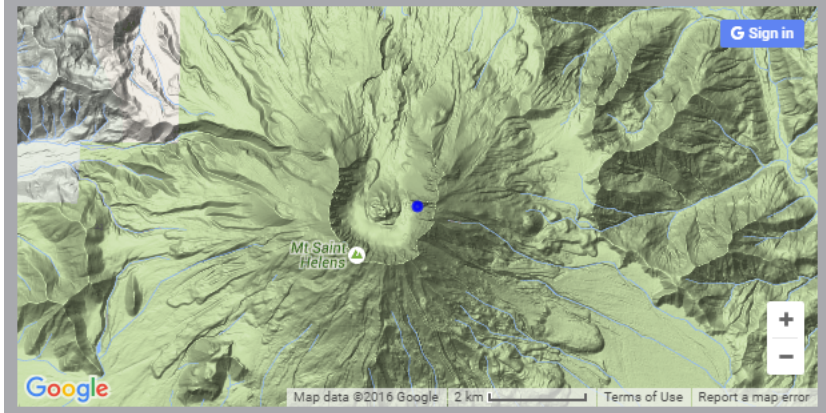
modis.higp.hawaii.edu/new/

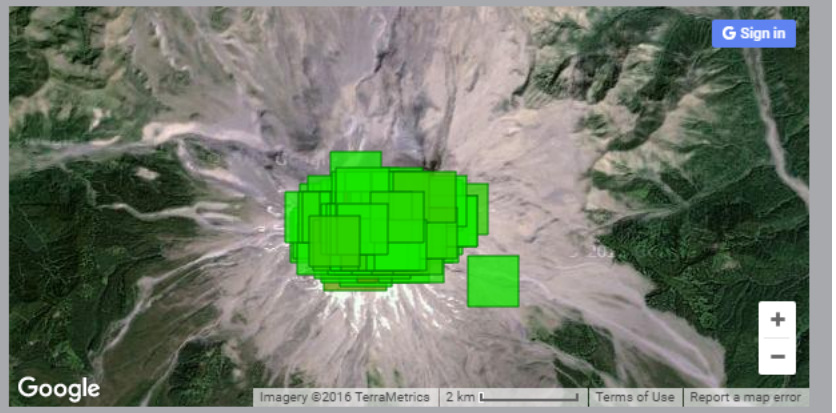
MODVOLC

near-real-time satellite monitoring of global volcanism using MODIS

HIGP

MODVOLC uses infrared satellite data acquired by NASA's MODIS instrument to monitor Earth's surface for the thermal emission signature of volcanic eruptions, wildfires, and anthropogenic heat sources (e.g. gas flares). Two MODIS sensors, one on the Terra satellite, one on the Aqua satellite, allow the entire Earth to be monitored every 48 hours. If an eruption is detected, its details are reported here, usually within 12-18 hours of the satellite passing over the volcano. You can search, plot, and download the data using the tools below. If you are unsure as to what you are looking at, this page provides links to published papers and other information that describe the data, and this website.





1. Which volcano are you looking for?

Volcano name:	St. Helens		
Lat/Long/Center	46.200	-122.180	0.071
Volcano ID:	1025		

2. What period of time?

Start date:	06/01/2004
End date:	6/8/2016

3. Which MODIS sensor?

- *Terra* ☑
- *Aqua* ☑

4. What time of day?

- *Daytime* ☑
- *Nighttime* ☑

5. Observation geometry?

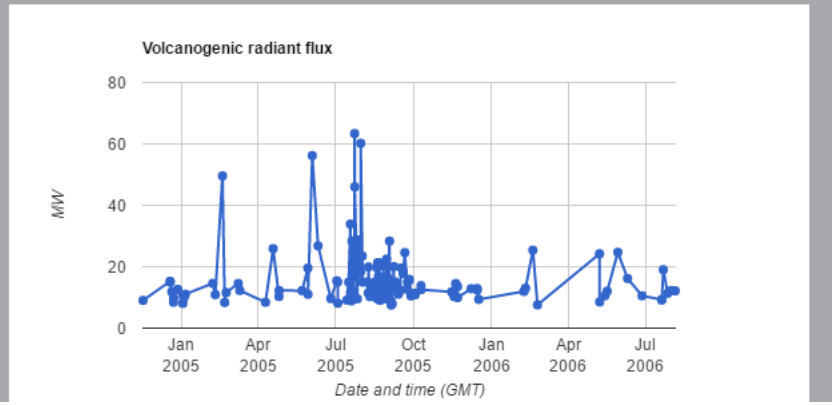
Sunglint angle:	12.
Scan angle:	

6. Which variable would you like to plot?

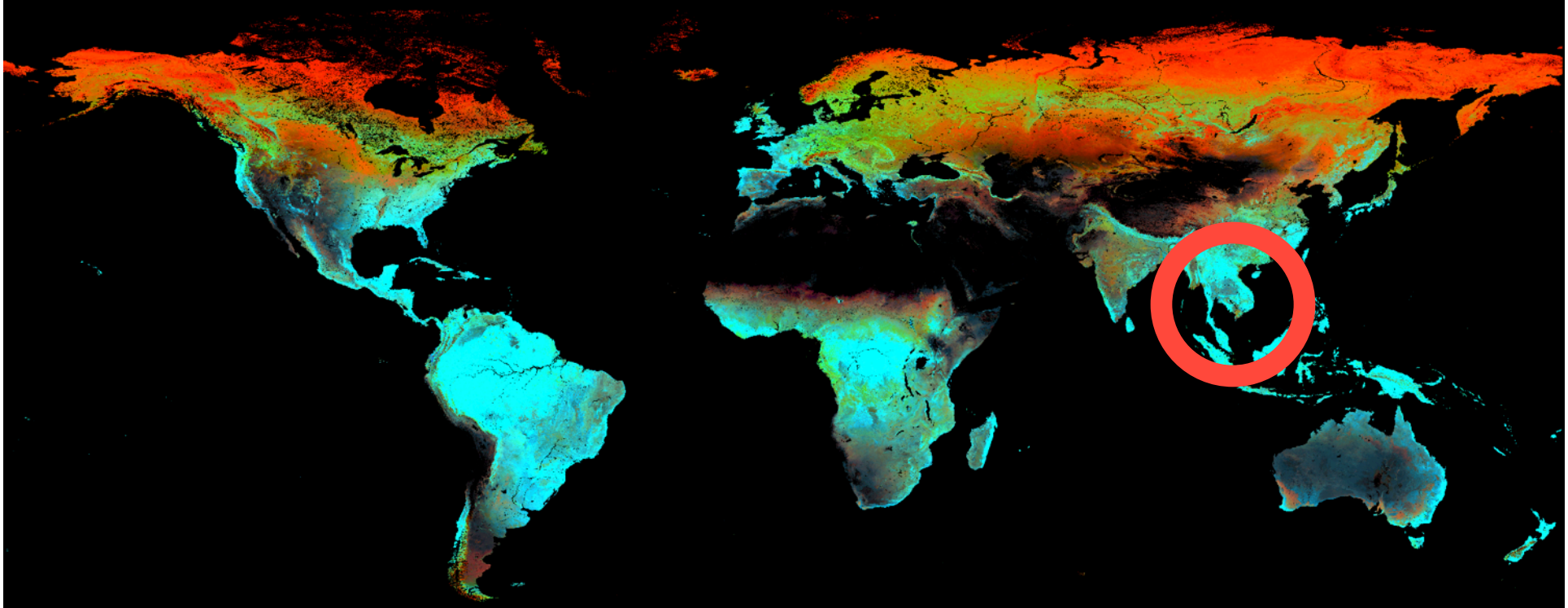
- *Number of hot-spot pixels* ☐
- *Radiant flux* ☑
- *3.959μm spectral radiance* ☐

7. Progress

8. View/Save data

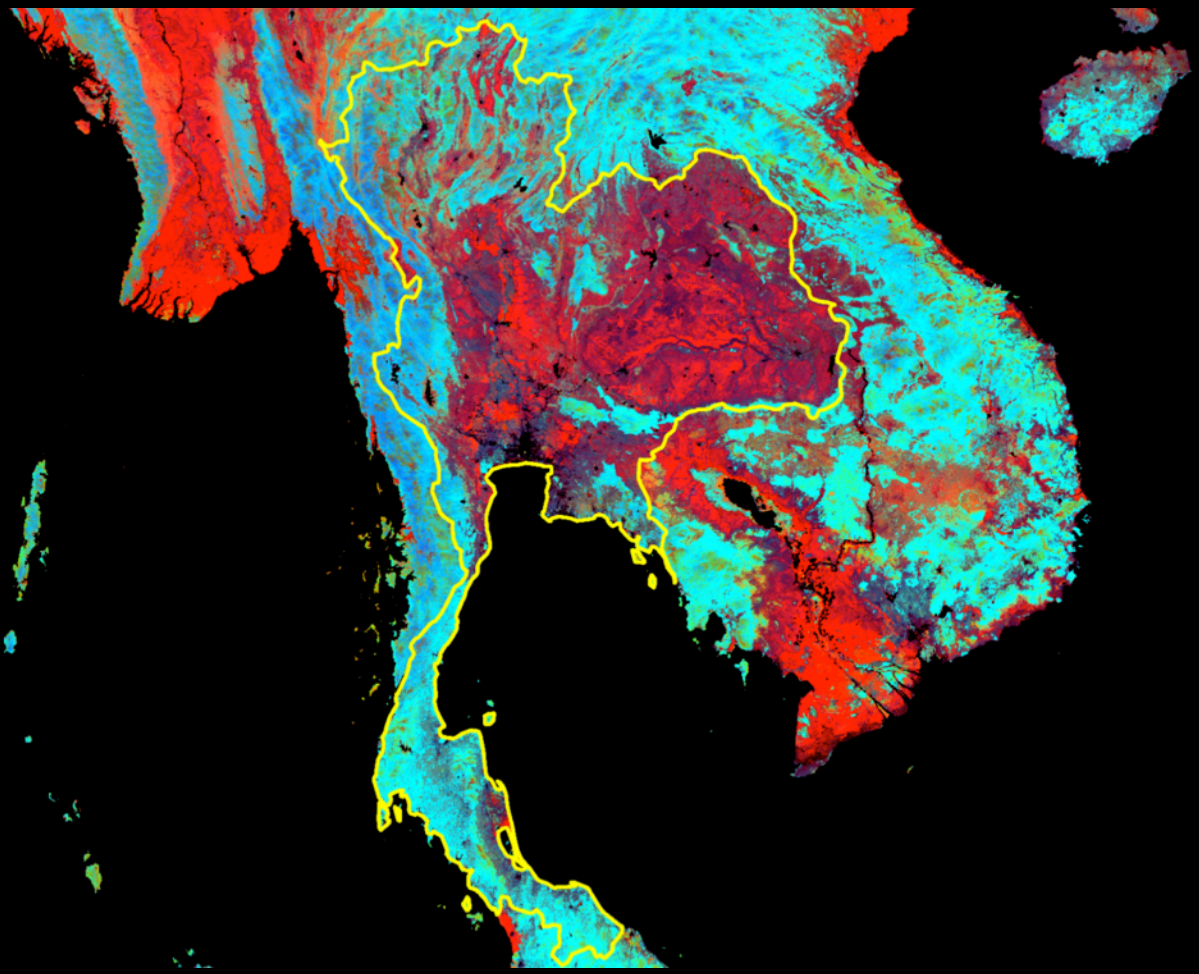


DHIs and global biodiversity



Composite FPAR DHIs

Composite FPAR DHIs



Evaluation of MODIS PRI Reference Bands

	Ref Bands		12	10	1	3	4
	Site	IGBP class	PRI (11,12)	PRI (11,10)	PRI (11,1)	PRI (11,3)	PRI (11,4)
Deciduous Broadleaf Forest	CA-Oas	DBF	0.03	0.58	0.84	0.49	0.21
	DE-Hai	DBF	0.16	0.20	0.82	0.61	0.01
	IT-Col	DBF	0.06	0.11	0.86	0.43	0.07
	IT-Ro1	DBF	0.05	0.26	0.40	0.39	0.00
	IT-Ro2	DBF	0.00	0.17	0.21	0.33	0.03
	US-Bar	DBF	0.10	0.56	0.89	0.70	0.00
	US-Ha1	DBF	0.03	0.43	0.72	0.55	0.00
	US-LPH	DBF	0.18	0.63	0.92	0.74	0.01
	US-MMS	DBF	0.20	0.55	0.85	0.76	0.08
Evergreen Broadleaf Forest	BR-Ban	EBF	0.01	0.00	0.02	0.00	0.03
	BR-Ma2	EBF	0.01	0.00	0.10	0.00	0.01
	BR-Sa1	EBF	0.00	0.08	0.06	0.19	0.12
	FR-Pue	EBF	0.18	0.00	0.34	0.26	0.20
	IT-Cpz	EBF	0.06	0.02	0.18	0.18	0.09
	PT-Esp	EBF	0.05	0.05	0.00	0.00	0.08
	PT-Mi1	EBF	0.10	0.17	0.20	0.23	0.04
Evergreen Needleleaf Forest	CA-Man	ENF	0.07	0.27	0.44	0.05	0.47
	CA-Obs	ENF	0.00	0.21	0.65	0.02	0.38
	CA-Ojp	ENF	0.11	0.17	0.47	0.00	0.44
	DE-Tha	ENF	0.27	0.05	0.59	0.35	0.25
	DE-Wet	ENF	0.32	0.17	0.41	0.16	0.37
	FI-Hyy	ENF	0.19	0.03	0.65	0.09	0.21
	IT-Lav	ENF	0.45	0.22	0.81	0.80	0.53
	IT-SRo	ENF	0.35	0.13	0.01	0.00	0.34
	NL-Loo	ENF	0.41	0.30	0.34	0.02	0.42
	SE-Nor	ENF	0.00	0.16	0.32	0.04	0.00
	US-Ho1	ENF	0.42	0.15	0.78	0.47	0.53
	US-Ho2	ENF	0.54	0.01	0.64	0.20	0.59
	US-Me2	ENF	0.31	0.19	0.23	0.02	0.34
	US-Me3	ENF	0.41	0.31	0.41	0.05	0.44
	US-NC2	ENF	0.00	0.58	0.76	0.73	0.09
	US-Wrc	ENF	0.21	0.00	0.36	0.07	0.26
Grassland	AT-Neu	GRA	0.16	0.00	0.49	0.31	0.41
	DE-Meh	GRA	0.05	0.35	0.65	0.57	0.01
	HU-Bug	GRA	0.16	0.15	0.02	0.01	0.21
	IT-MBo	GRA	0.00	0.16	0.82	0.54	0.12
Shrub/ Savanna	IT-Pia	OSH	0.25	0.29	0.44	0.39	0.17
	ES-LMa	SAV	0.01	0.19	0.32	0.25	0.01
	US-SRM	WSA	0.01	0.15	0.20	0.05	0.00
	US-Ne3	CRO	0.10	0.43	0.47	0.49	0.15
Wetlands	US-Atq	WET	0.08	0.10	0.10	0.12	0.05
	US-Ivo	WET	0.12	0.01	0.00	0.00	0.01
	CA-WP1	WET (MF)	0.05	0.68	0.81	0.54	0.34

Table shows R^2 with Daily GEP
Color coded as:

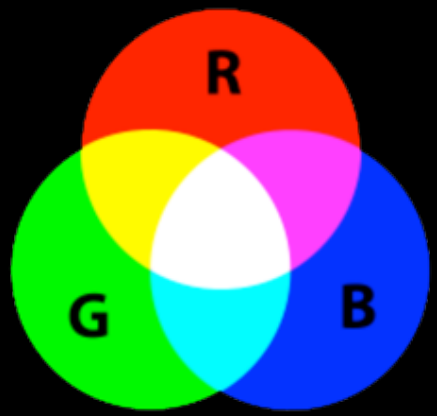
$R^2 \geq 0.5$ - Yellow

$R^2 \geq 0.7$ - Red

$$PRI(11,ref) = \frac{(R_{11} - R_{ref})}{(R_{11} + R_{ref})}$$

PRI(11,1) = Chlorophyll-Carotenoid Index (CCI)

Extracting Phenology Data From Webcam Images



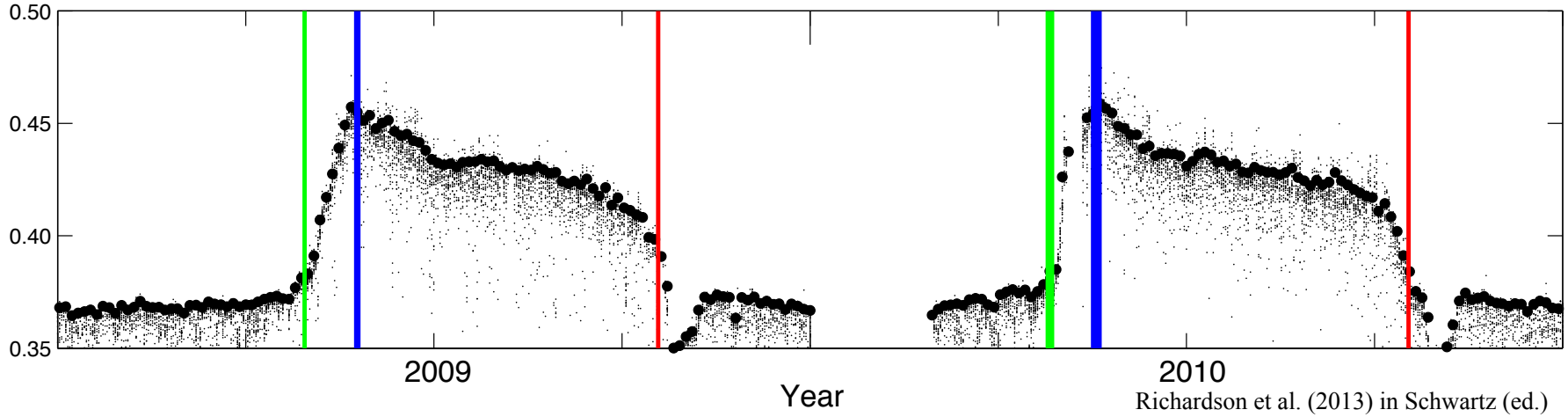
RGB Color Model

RGB Triplet:

$$(R_{DN}, G_{DN}, B_{DN})$$

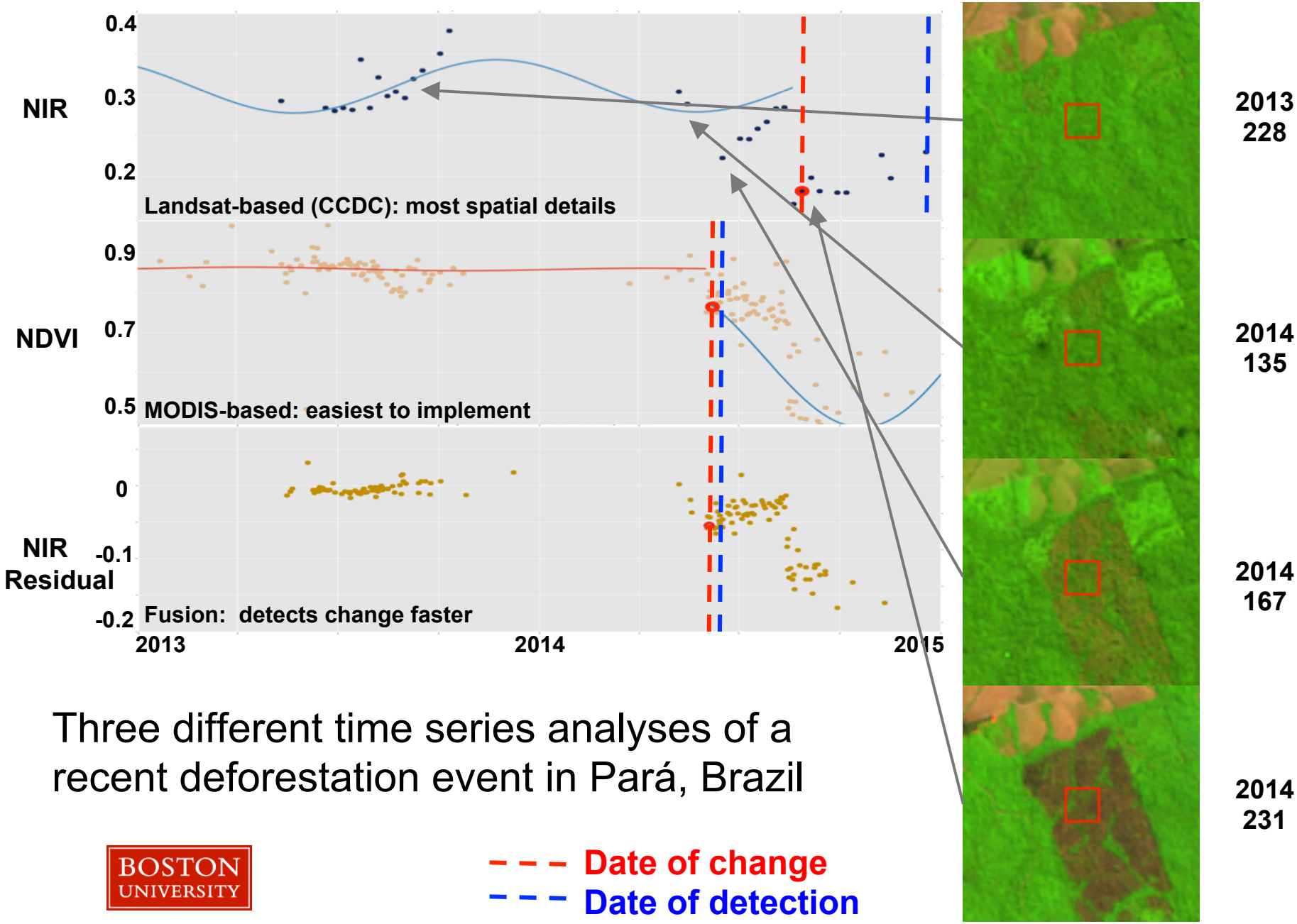
Canopy "Greenness" (GCC)

$$= \frac{G_{DN}}{R_{DN} + G_{DN} + B_{DN}}$$



Richardson et al. (2013) in Schwartz (ed.)

POLICY RELEVANT SCIENCE



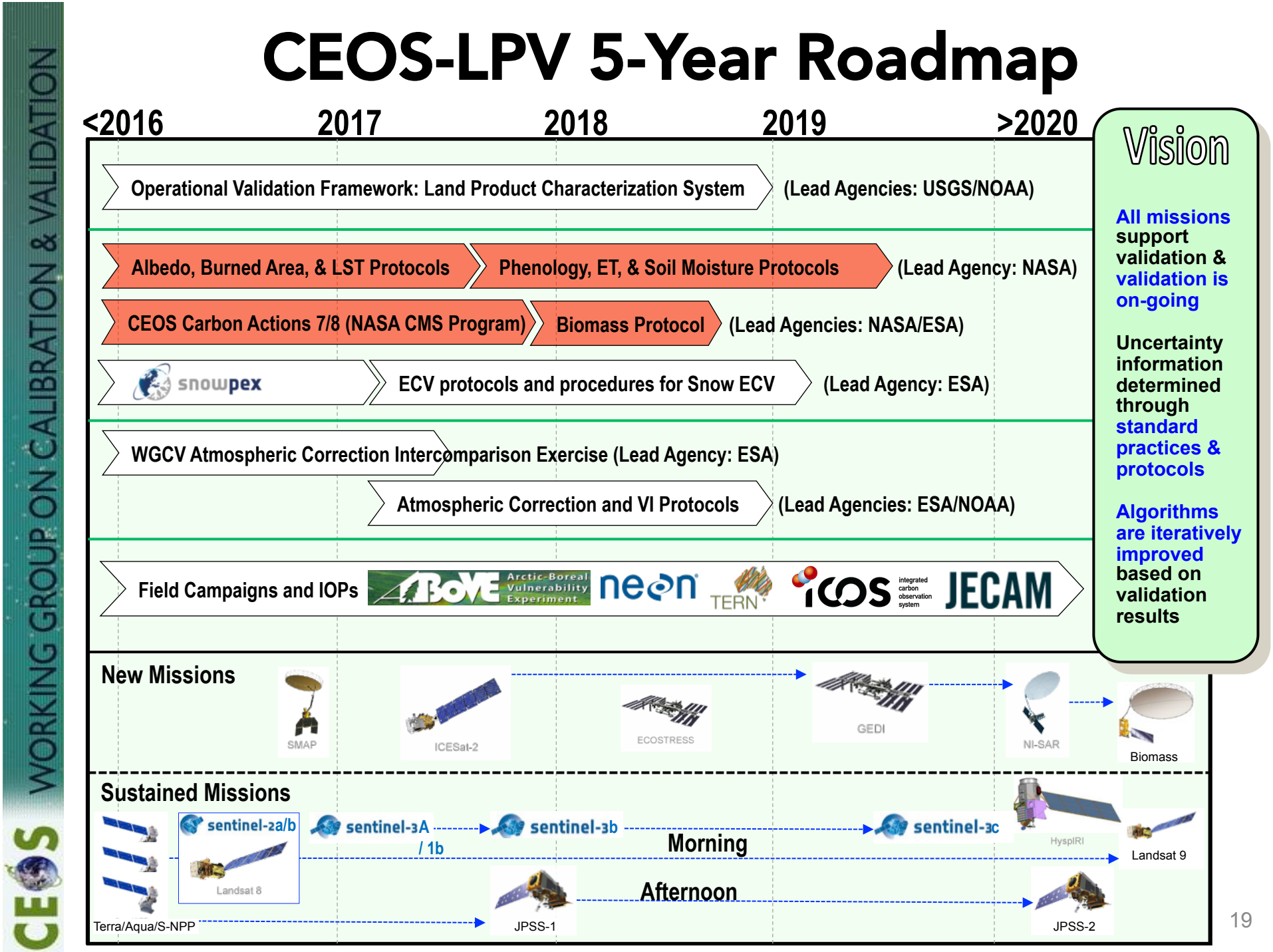
Three different time series analyses of a recent deforestation event in Pará, Brazil

BOSTON UNIVERSITY

Date of change

Date of detection

CEOS-LPV 5-Year Roadmap



MY FINAL THOUGHT

- Datasets now long enough to look for global change trends, requiring huge attention to processing details
- BUT old sensors degrading, and crosswalks to new sensors a challenge
- AND bigger user community, including policy

SO OUR WORK IS GETTING HARDER, NOT EASIER!!