

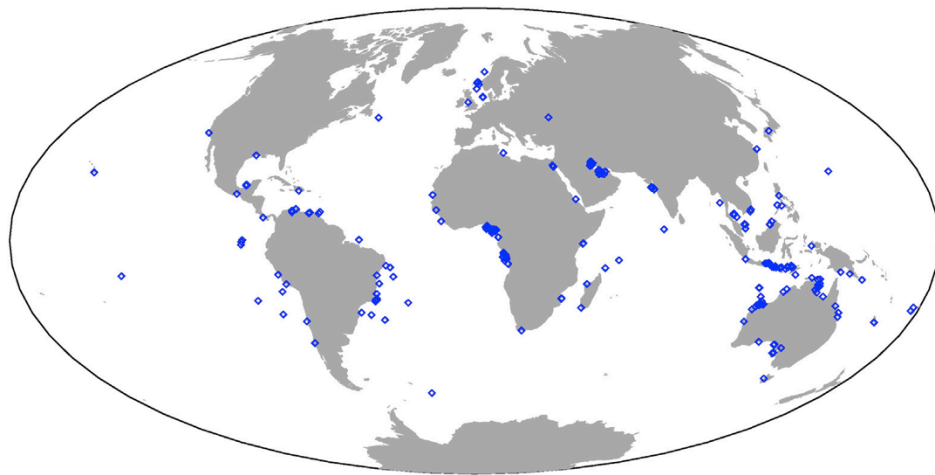
MODIS & VIIRS Active Fire

Louis Giglio & Wilfrid Schroeder

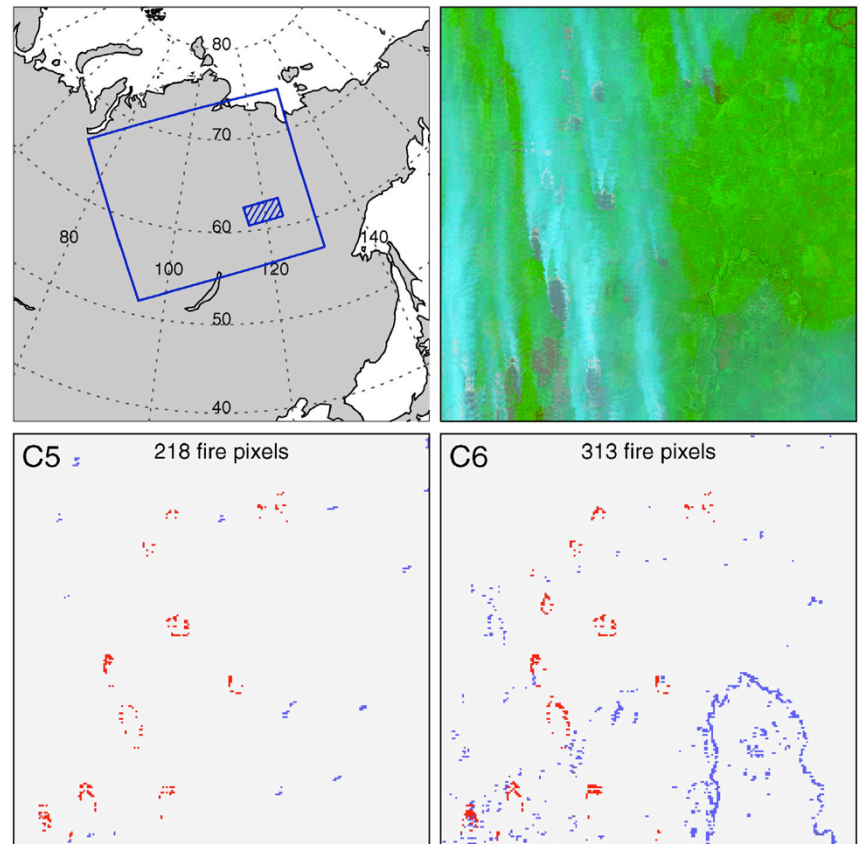
*Department of Geographical Sciences
University of Maryland*

MOD14/MYD14 C6 Update

- Processing expanded over water pixels to account for gas flares
- Targeted fire detection performance improvements
 - Fewer false alarms associated with tropical deforestation
 - Lower omission errors associated with large fires
- Comprehensive global validation of MOD14 data

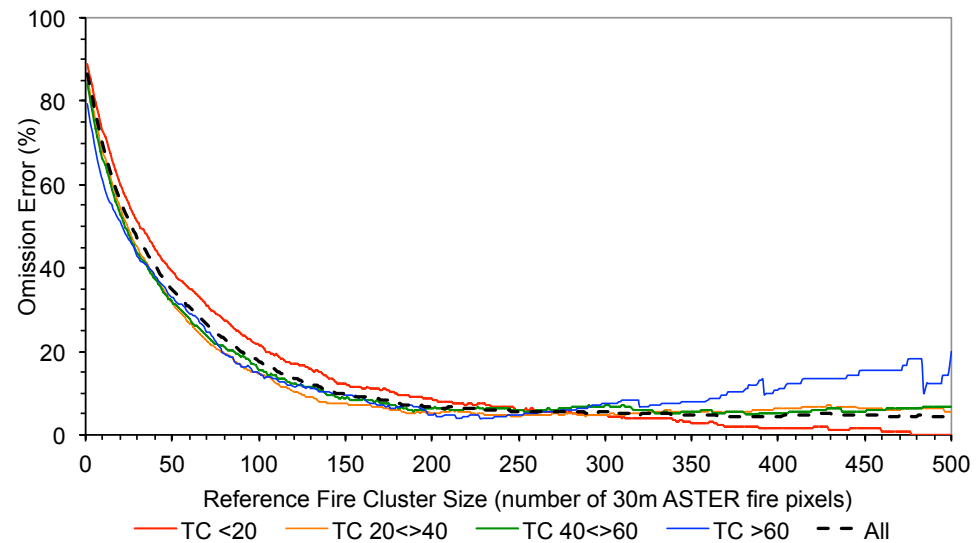
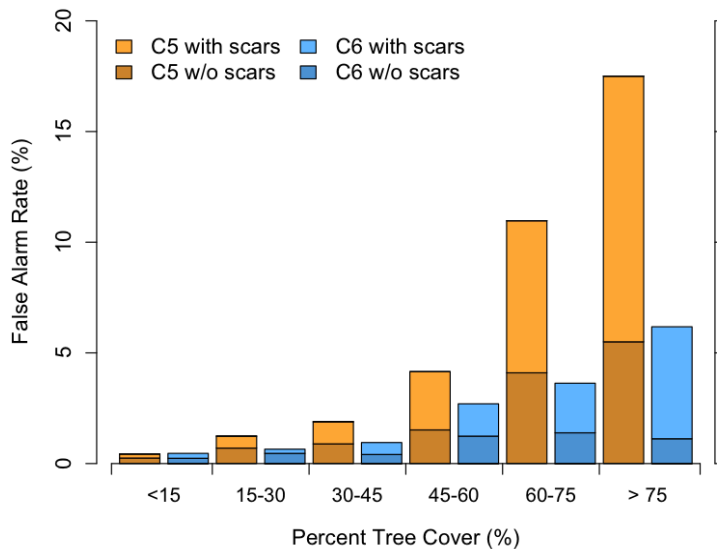


January 2007



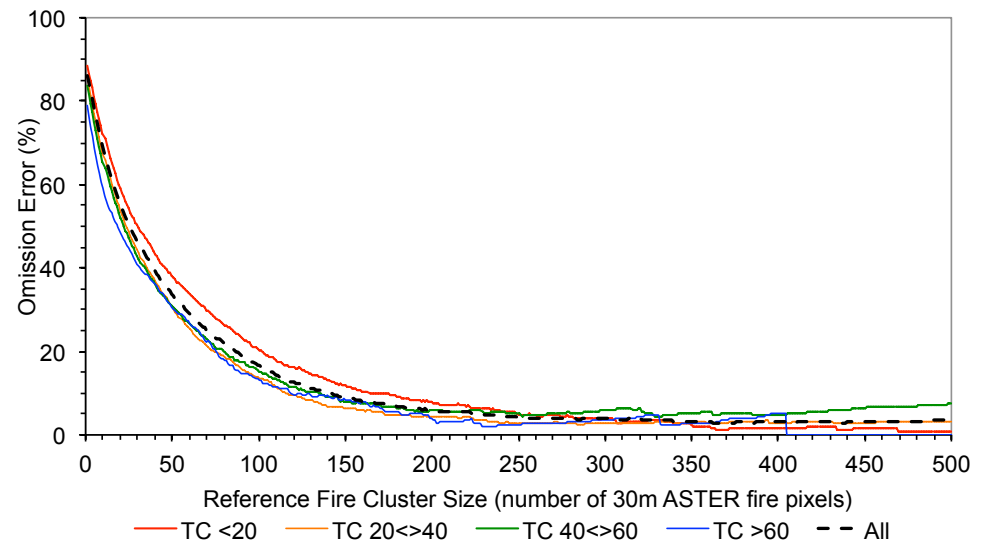
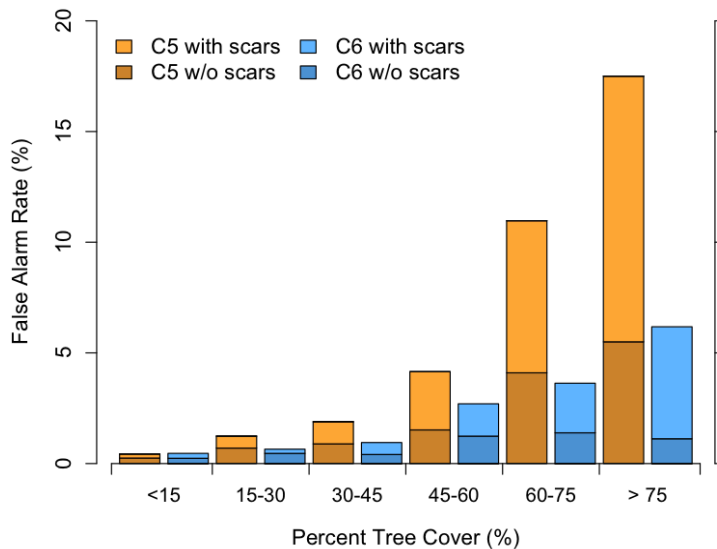
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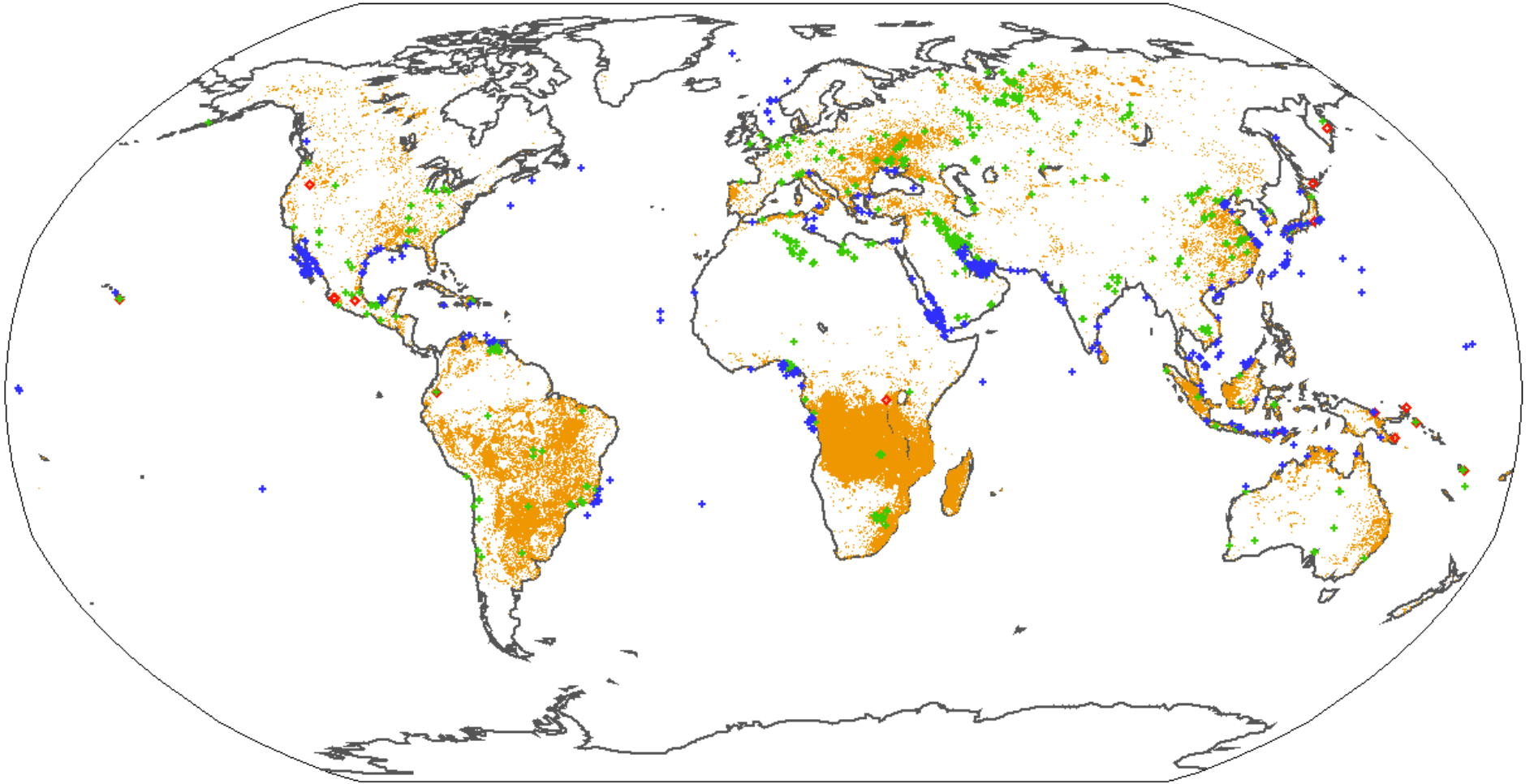


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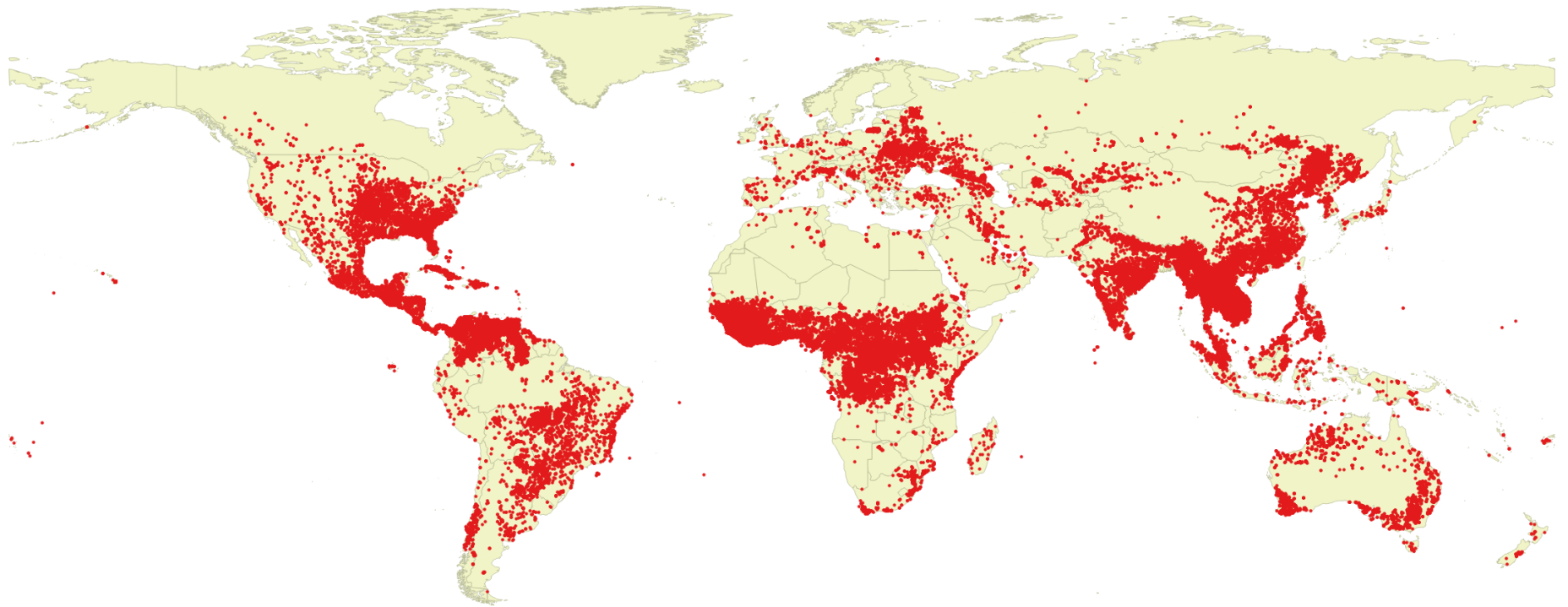
August 2013 MCD14ML Product



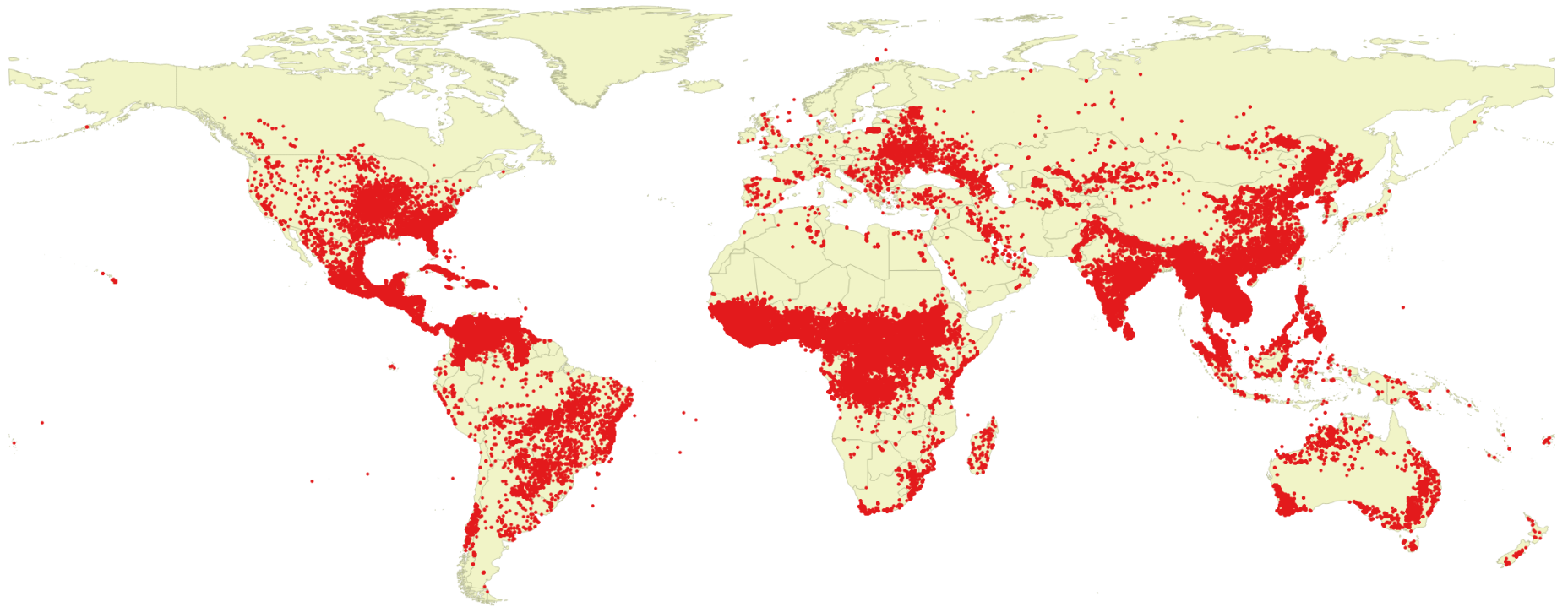
VIIRS Active Fire Products Update

- Baseline **750 m active fire product** built on MODIS Collection 6 algorithm
 - Small customization performed in order to account for unique L1B data (plenty of reactive maintenance)
 - Fire detection and characterization (fire radiative power)
 - Output format supporting MODIS-VIIRS data continuity
- Alternative **375 m active fire product** developed
 - Unique algorithm optimizing use of channel I4 (MIR) data (frequent saturation, folding)
 - First version produced fire detections only
 - Latest version providing fire detection and FRP
 - Hybrid approach using 375 and 750 m data
 - Output format supporting MODIS-VIIRS data continuity

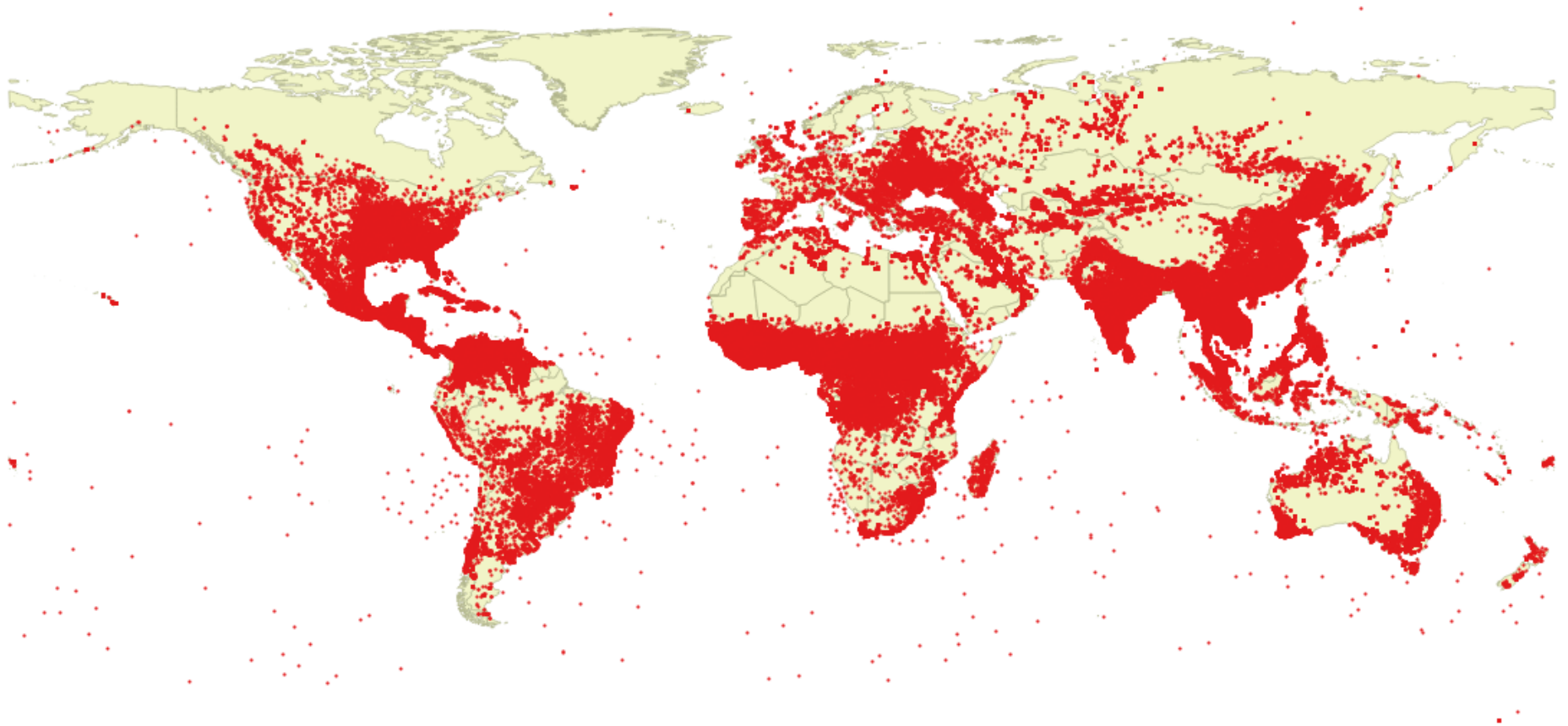
MYD14 Fire Pixels (March 2016) Collection 6



VIIRS 750 m Fire Pixels (March 2016)
VAFIRE_L2D

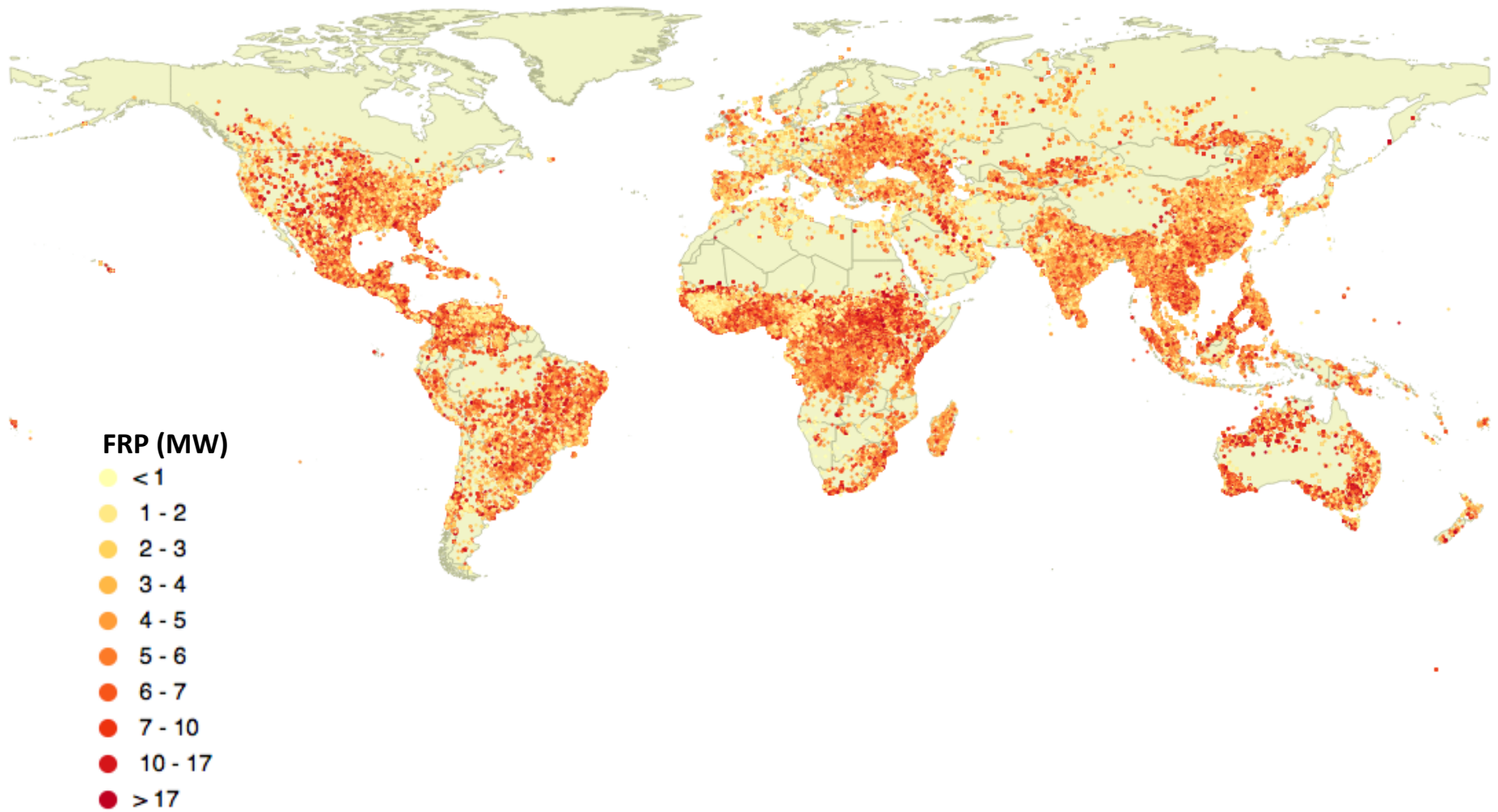


VIIRS 375m Fire Pixels (March 2016) **'Collection 1'**

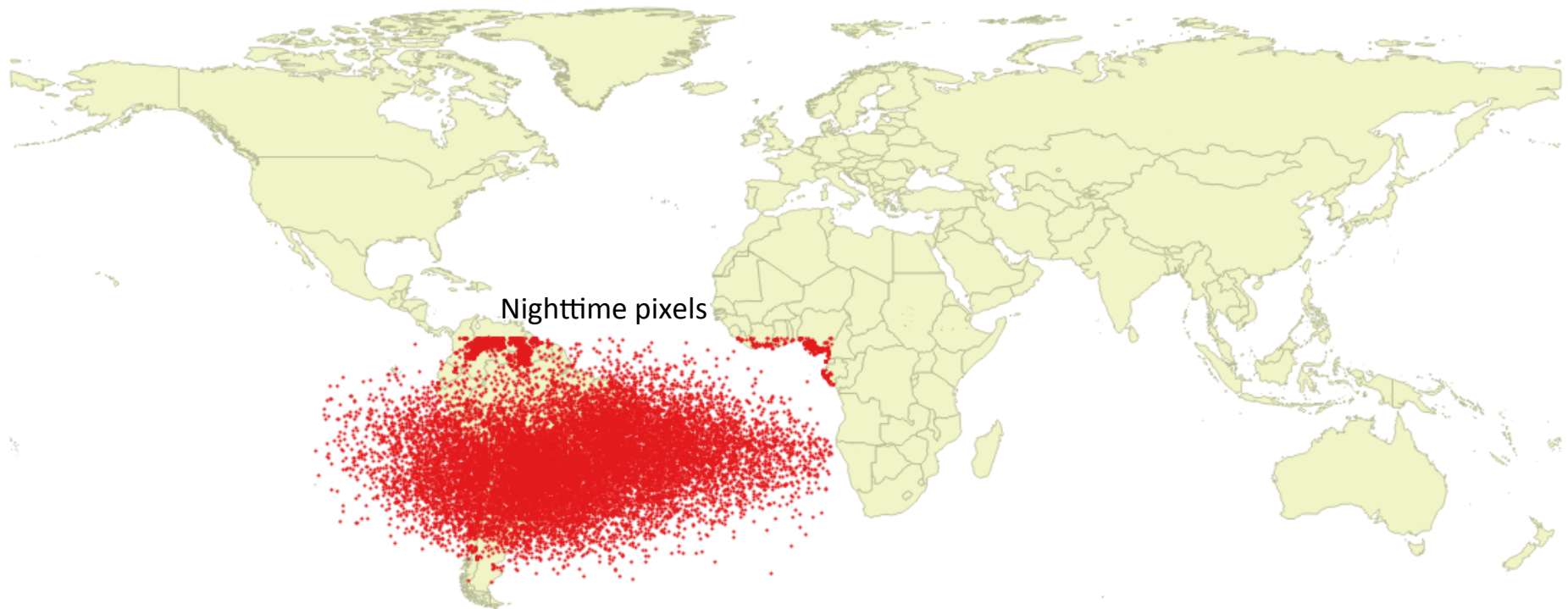


Data noise causing spurious detections

VIIRS 375m (hybrid) Fire Pixels (March 2016) 'Collection 2'

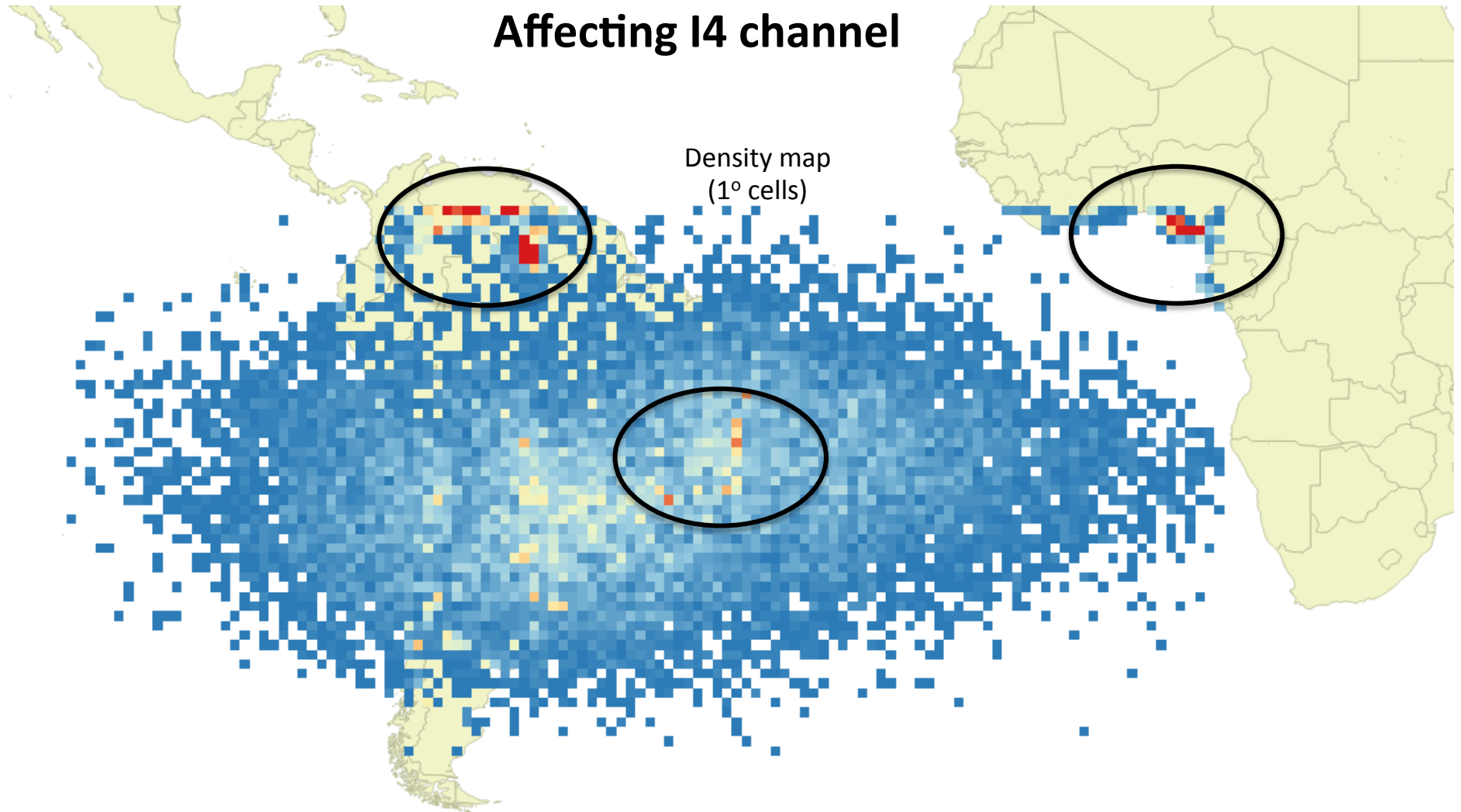


VIIRS 375m (March 2016)
South Atlantic Magnetic Anomaly
Affecting I4 channel



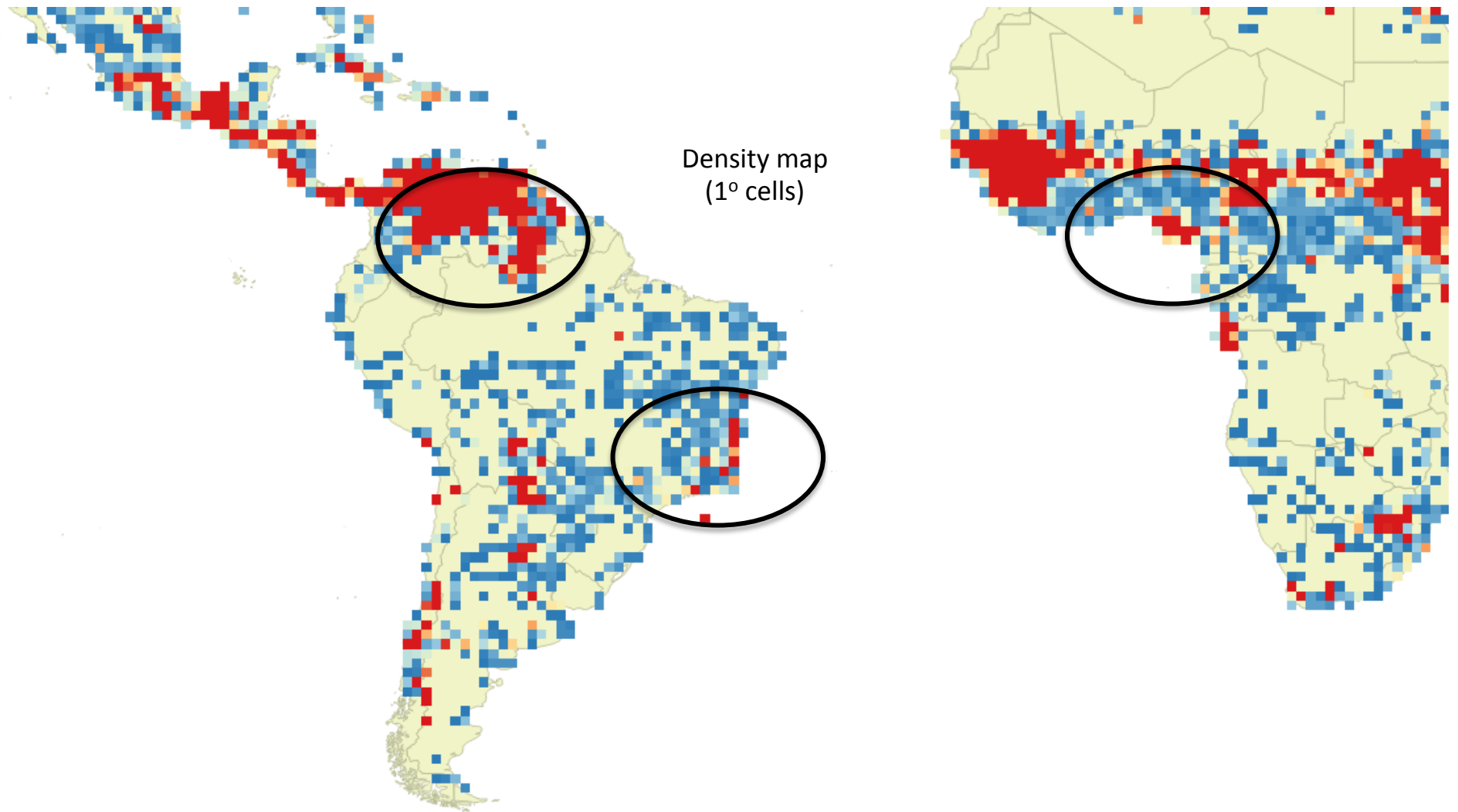
Using dedicated spurious detection filter
based on I4+M13 (unaggregated)

VIIRS 375m (March 2016)
South Atlantic Magnetic Anomaly
Affecting I4 channel



Valid small/low intensity fires being removed along with spurious pixels

VIIRS 375m (March 2016) Nominal Confidence Night Pixels



NOAA Operational VIIRS Fire Product Status

- Tailored version of the 750 m fire algorithm operational within the Suomi NPP Data Exploitation (NDE) system since March 15, 2016
- Included in CLASS release 7.1 (~June 15th); all data will be backfilled by late summer
- Long-term quality monitoring ongoing (including both NDE and IDPS products)
 - https://www.star.nesdis.noaa.gov/jpss/EDRs/products_activeFires.php
- Ongoing integration into NOAA operational and experimental systems e.g.
 - Hazard Mapping System, eIDEA , NWS/AWIPS-II, High Resolution Rapid Refresh
- IDPS production, long-term monitoring and maintenance continues until all downstream products are migrated into NDE / NOAA ESPC Enterprise system
- Other ongoing activities:
 - JPSS-1 testing / preparations
 - preparations for VIIRS SDR reprocessing
 - code integration into CSPP (Community Satellite Processing Package)
 - evaluation / preparations for I-band / hybrid product transition to NOAA operations
 - end user interaction / support through the NOAA JPSS Fire and Smoke Initiative

VIIRS Active Fire Final Remarks (1 of 2)

- Level 2 code packages delivered
 - 750 m algorithm implemented for Land SIPS, IPOPP, and NOAA/NDE system
 - Algorithm published in RSE (doi:10.1016/j.rse.2016.02.054)
 - ATBD available (NOAA template)
 - 375 m algorithm implemented for Land SIPS, LANCE, IPOPP
 - Algorithm published in RSE (doi:10.1016/j.rse.2013.12.008)
 - User's guide available
 - New 375/750 m algorithm to be ported to Land SIPS once new L1B is finalized/stable
 - VIIRS-FIRE portal @UMD being reformulated to help guide users to both data and documentation

VIIRS Active Fire Final Remarks (2 of 2)

- New L1B format impacting implementation schedule
 - Team did not budget for this activity
 - Disproportionate amount of time/energy invested in reactive maintenance in response to L1B changes (dating back to day 1 of S-NPP operations)
 - Algorithm refinement & data reprocessing delayed
 - Science data users can't find usable data record
 - Current time series based on outdated (Mx7.2) SDR
 - Impacting science investigations and publications
 - Numerous user complaints concerning archive configuration and (lack of) documentation

Yarnell Hill Weather-Fire Simulation Using CAWFE and VIIRS 375m Initial Fire Perimeter

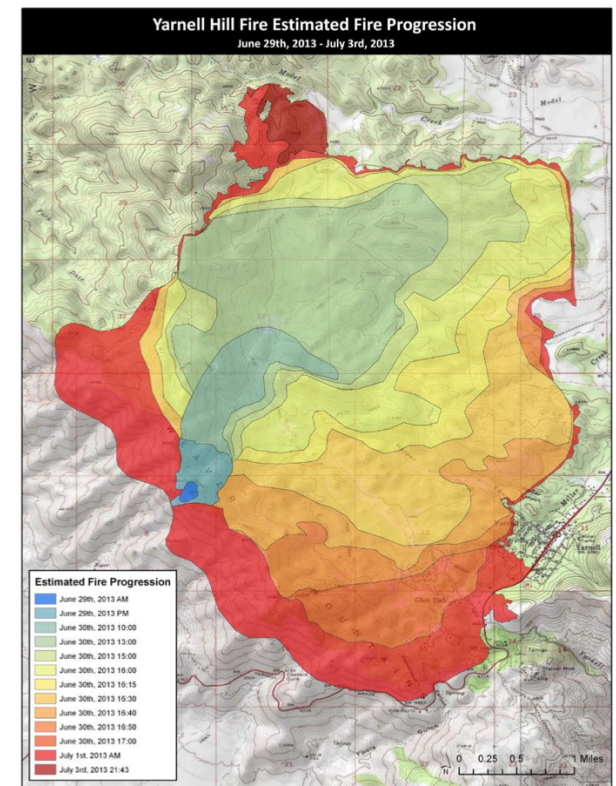
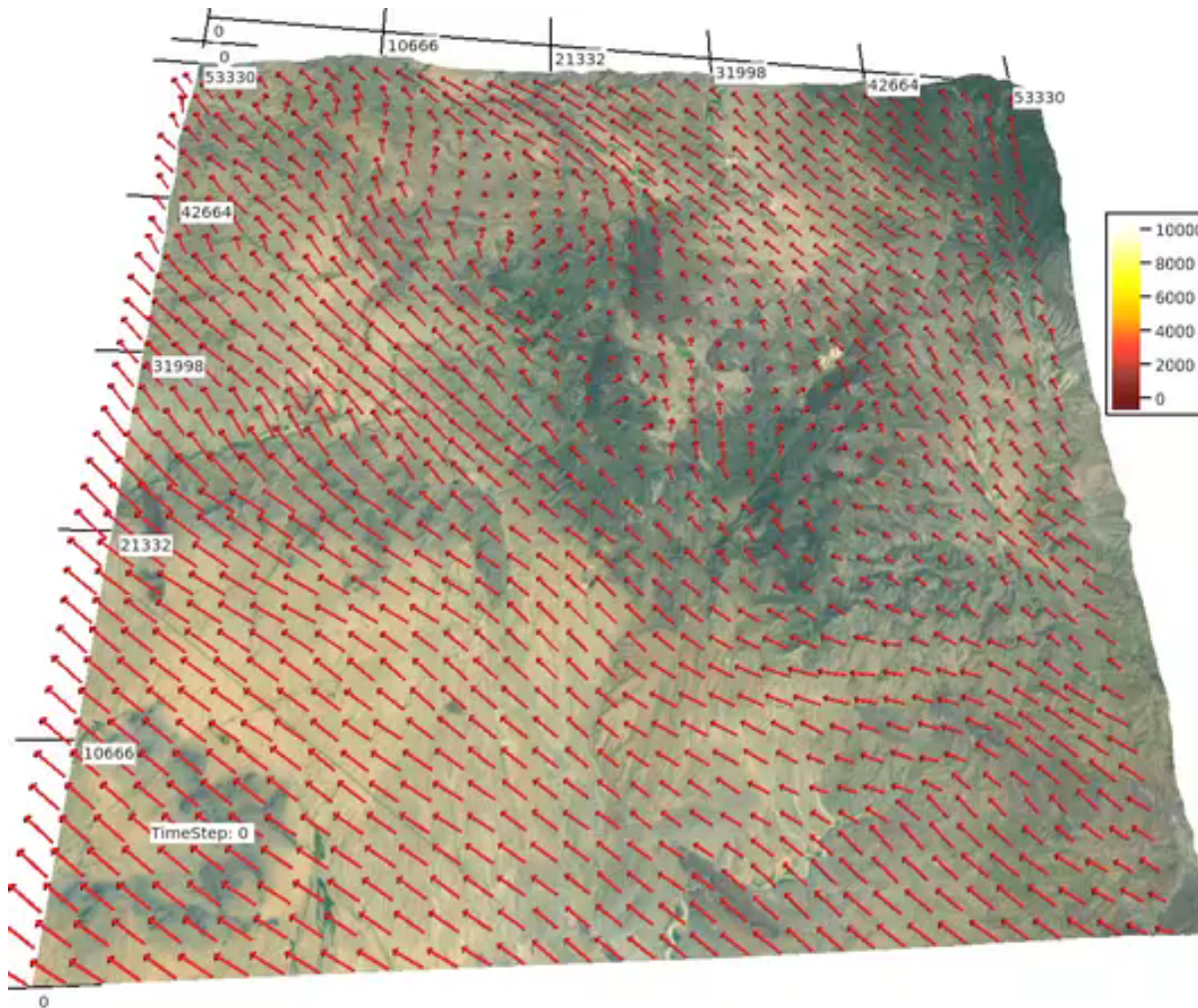
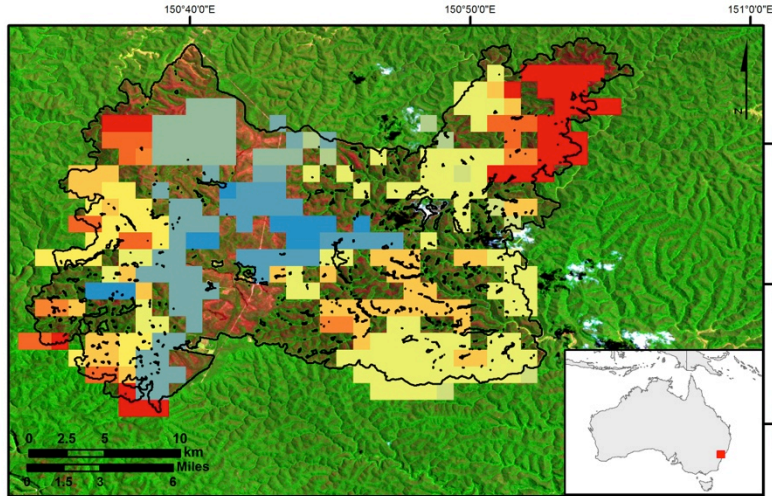


Figure 22. Yarnell Hill Fire Progression Map, June 29 through July 3, 2013.

Improved Satellite Mapping of Active Fires Using VIIRS 375m Data

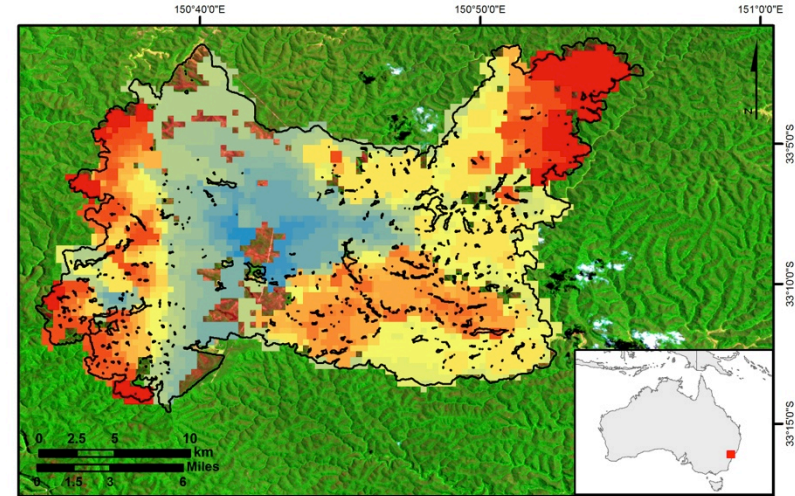
Aqua/MODIS 1km



MODIS-Aqua 1km

Date_Time (UTC)	20131027 04:30	20131103 04:35	20131107 04:10
20131024 04:00	20131028 03:35	20131104 03:40	20131108 04:55
20131025 04:40	20131028 04:05	20131105 04:25	20131109 04:00
20131026 03:55	20131102 03:55	20131106 03:30	

S-NPP/VIIRS 375m



VIIRS 375m

Date_Time (UTC)	20131026 15:12	20131103 03:05	20131106 03:50
20131023 14:27	20131027 03:37	20131103 04:42	20131106 15:07
20131024 04:29	20131027 14:54	20131103 14:23	20131107 03:26
20131024 14:10	20131028 14:36	20131103 16:05	20131107 14:49
20131024 15:52	20131031 03:58	20131104 04:25	20131108 04:51
20131025 04:12	20131101 14:58	20131104 15:42	20131108 14:26
20131025 15:29	20131102 03:23	20131105 04:07	20131109 04:34
20131026 03:54	20131102 14:40	20131105 15:24	

MODIS & VIIRS Burned Area

Louis Giglio¹, Luigi Boschetti², David Roy³,
Krishna Vadrevu¹, Chris Justice¹

¹University of Maryland, ²University of Idaho,

³South Dakota State University

Burned Area Overview

- MODIS Collection 6
 - Switch from MCD45 to MCD64 algorithm
 - 500-m monthly product
 - Date of burn mapped to the nearest day
- VIIRS
 - Adapt MCD64 code to use VIIRS data
 - 500-m monthly product

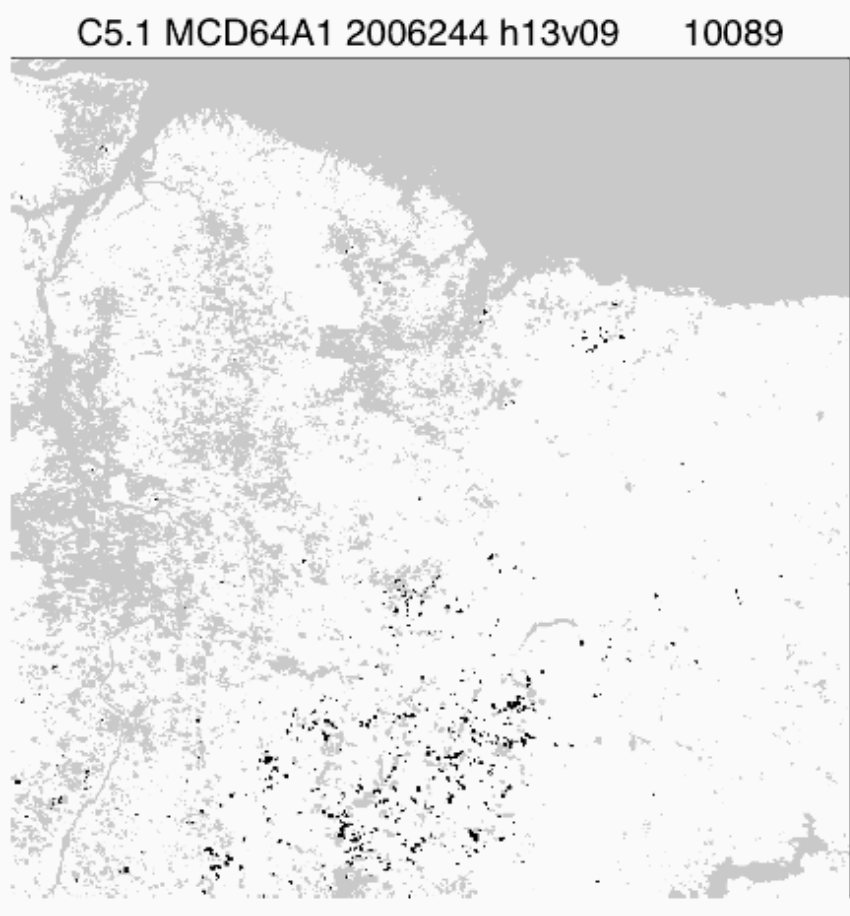
MODIS C6 Burned Area Product Status

- Code deliveries
 - MCD64A0: June 2015 (v 6.0.0)
 - MCD64A1: March 2016 (v 6.0.2)
- Final delivery expected soon
 - Tuning selected parameters using Landsat reference scenes in four MODIS tiles
 - Tuning selected parameters for single MODIS
 - Terra-only era + contingency operation

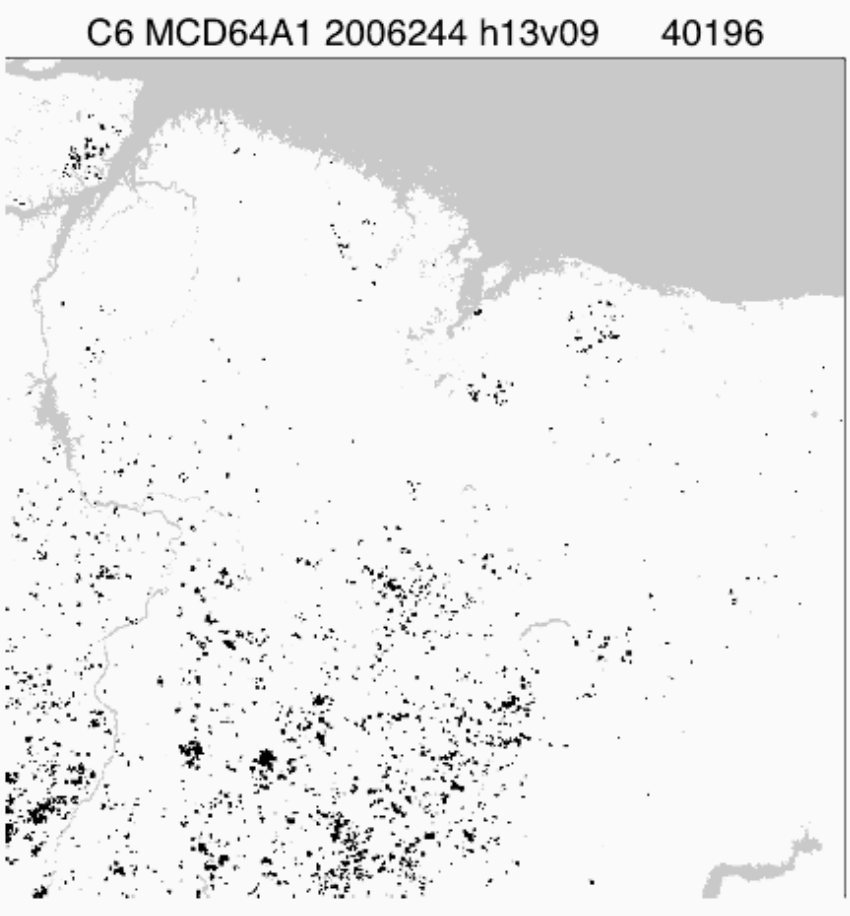
MODIS C6 Burned Area Early Results

- Overall increase in burned area relative to C5
 - 9% to 22% globally pending final tuning
 - Modest loss of burned area in boreal tiles
 - Huge number of new small lakes in C5.1 MCD12Q1
 - Sporadic “dark” grid cells in surface reflectance input
- Improved (i.e., smaller) temporal uncertainty
- Final contextual relabeling phase now guided by neighbor statistics derived from training data
 - True small burns much less likely to be discarded
- Mapping of cropland burning somewhat **cosmetically** improved
 - Timing can still be off due to confusion with harvest

September 2006, MODIS tile h13v09 (eastern Brazil)



C5.1 MCD64A1



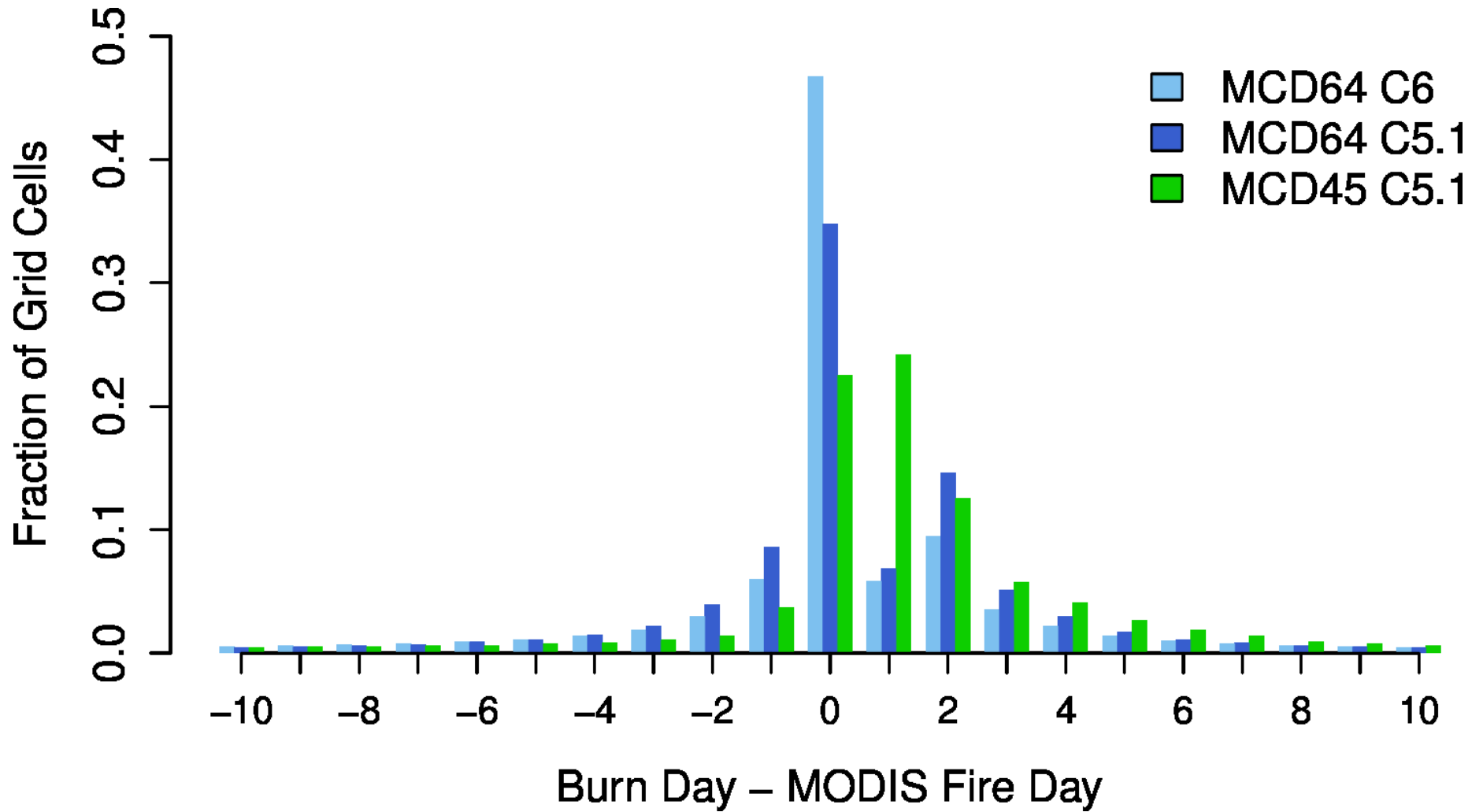
C6 MCD64A1

Preliminary!

Regional 2006 Burned Area Totals ($\times 10^4 \text{ km}^2 = \text{Mha}$)

	Region	C5.1	C6	
	Global	341.8	374.6	9.6%
	Boreal North America	1.9	1.8	-5.8%
Temperate	North America	2.7	3.3	23.9%
	Central America	1.5	2.2	47.2%
	NH South America	2.2	4.2	89.7%
	SH South America	11.5	20.5	78.7%
	Europe	0.6	0.7	18.7%
	Middle East	0.7	1.2	67.2%
	NH Africa	114.5	113.8	-0.6%
	SH Africa	121.9	129.0	5.8%
	Boreal Asia	4.5	6.1	34.7%
	Central Asia	18.0	23.4	30.0%
	Southeast Asia	5.9	9.4	59.3%
	Equatorial Asia	2.8	3.1	11.8%
	Australia and NZ	53.2	55.7	4.8%

Temporal Uncertainty (Global, 2006)



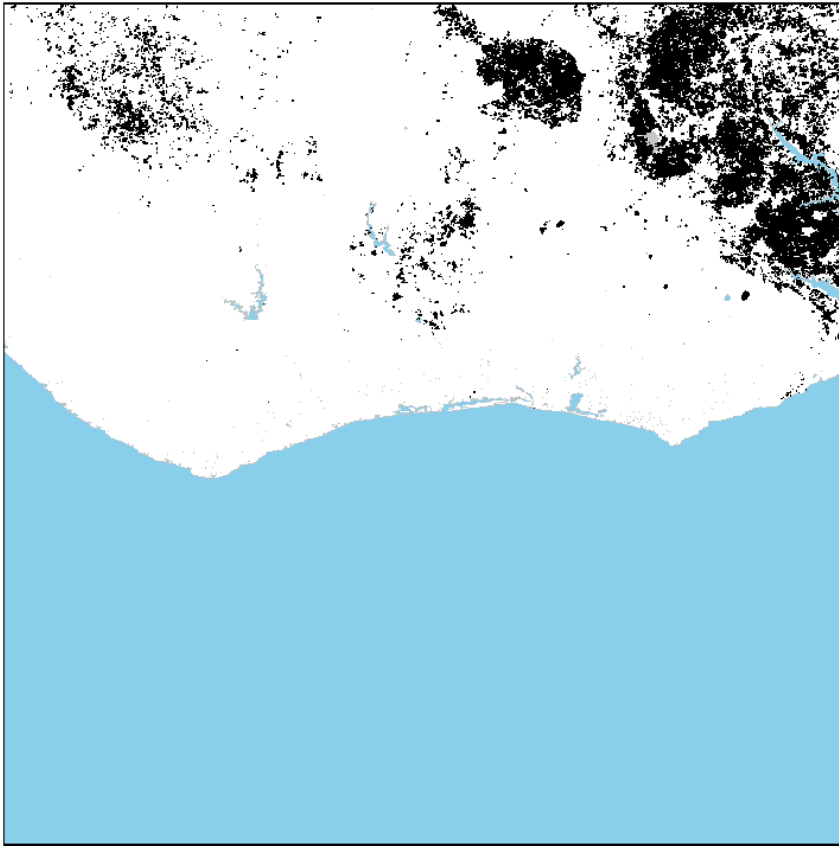
VIIRS Burned Area Product Status

- Expect 500-m HDF5 surface reflectance input products in August 2016
- Expect 1-km tiled version of 750-m VIIRS fire product in similar time frame
- Current plan for March 2017 delivery is rapidly becoming unrealistic
 - Switch to HDF5 impacting implementation schedule

VIIRS VNP64A1 Prototype

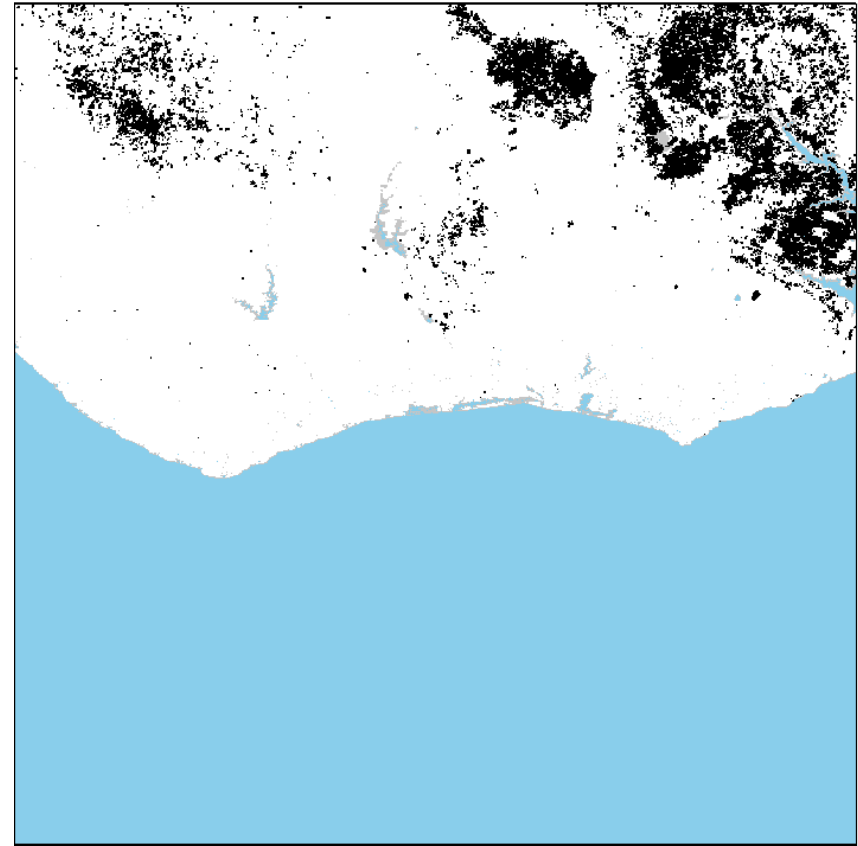
MODIS

MCD64A1 h17v08 2015 305-365 222530

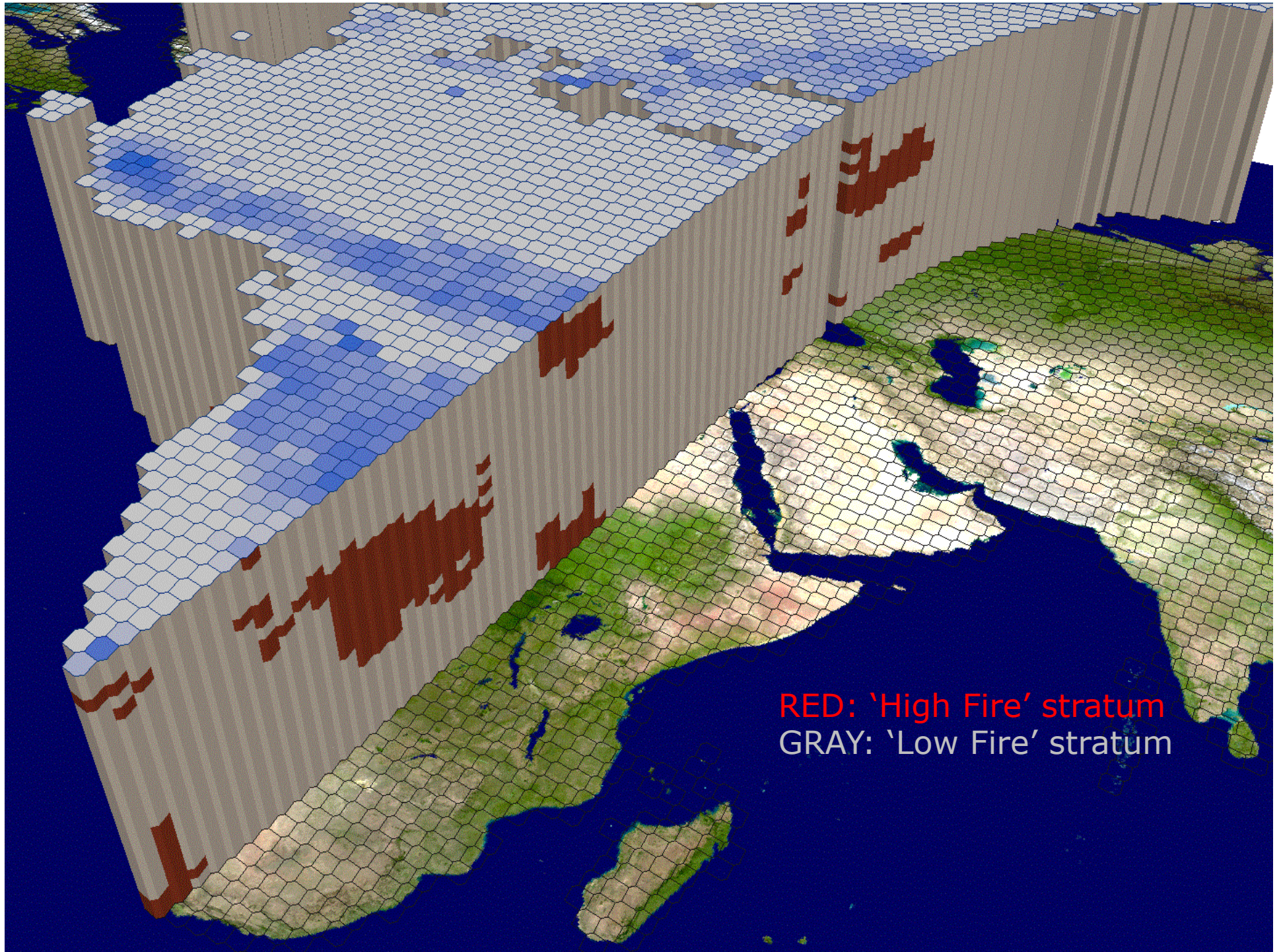


VIIRS*

VNP64A1 h17v08 2015 305-365 201302



*1-km NPP_DSRFIP_L3 daily surface reflectance product used as stand-in for 500-m VIIRS daily surface reflectance.



RED: 'High Fire' stratum
GRAY: 'Low Fire' stratum

Coefficient of variation of the global annual area burnt as a function of the total number of samples

