



NASA's VIIRS Active Fire and Burned Area Products

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2019 MODIS/VIIRS Science Team Meeting

College Park, MD

VIIRS Fire Products

- Active Fire
 - 750-m VNP14
 - 375-m VNP14IMG
- Burned Area
 - “500-m” VNP64A1

Status of VIIRS Active Fire

VIIRS VNP14 Product Family

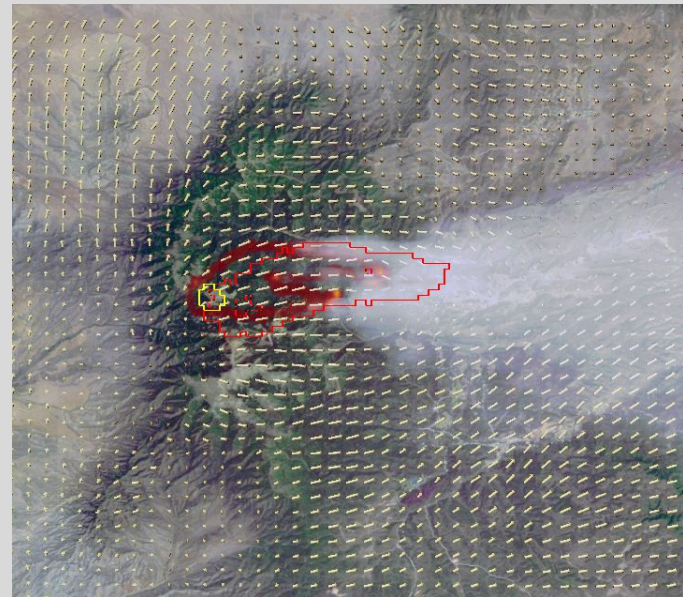
- VNP14: L2 750-m
- VNP14IMG: L2 375-m
- VNP14A1: Daily L3 1 km SIN Grid

Status and Updates:

- Adapted from MODIS fire detection algorithm
- 375-m product much more sensitive to small fires
- 375-m NRT product produced in LANCE and distributed by FIRMS

Known Issues:

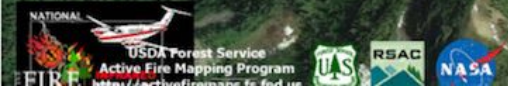
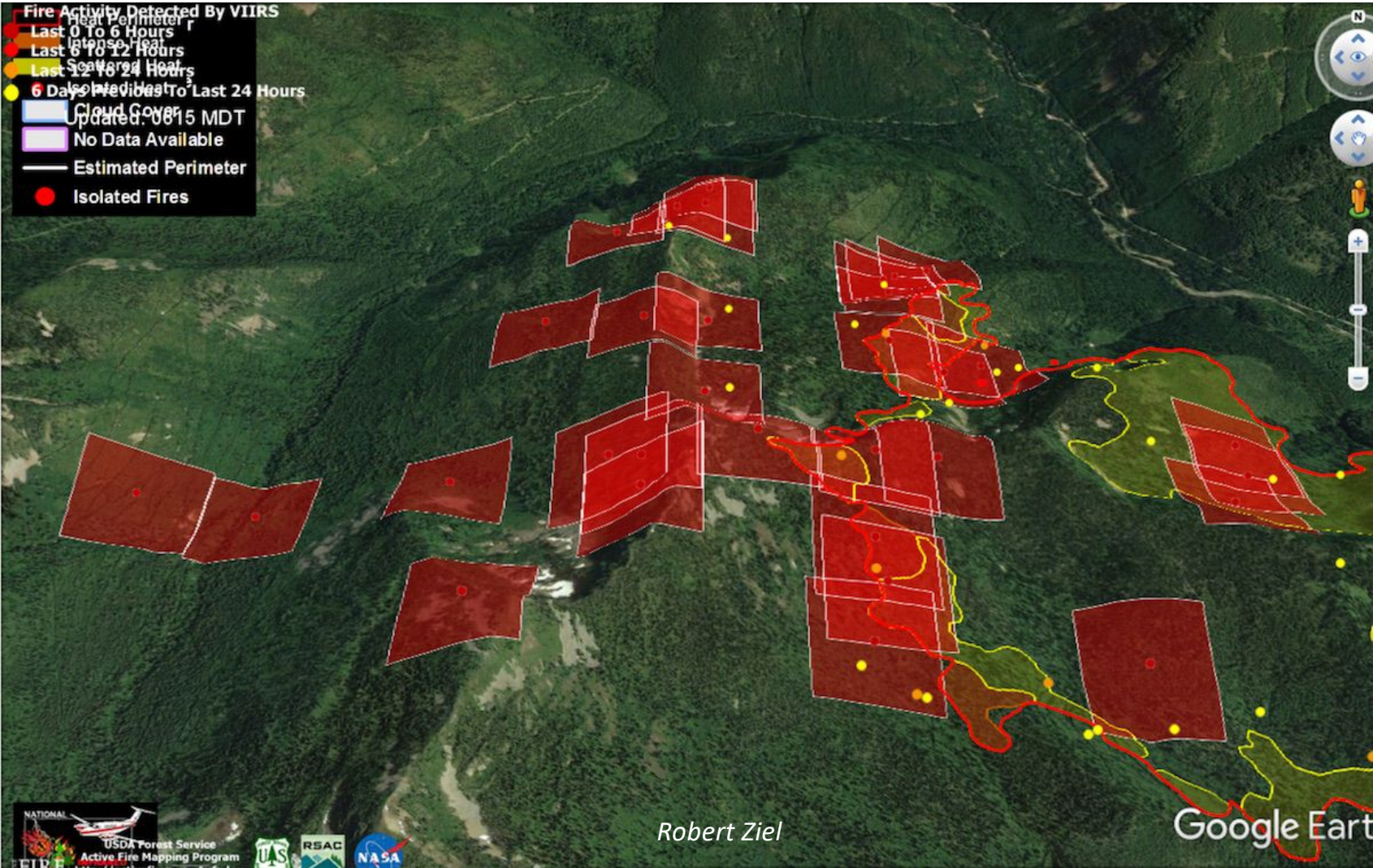
- M13 atmospheric absorption
- C1: Improperly flagged uncalibrated/poorly calibrated radiance data (fixed in C2)
- Hot smoke plume commission errors (rare)



Yellow perimeter: VIIRS fire perimeter used for model initialization. **Red perimeter:** VIIRS fire perimeter 12 h later.

VIIRS 375-m fire product now allows robust predictive fire modeling to be performed in NRT using CAWFE model (J. Coen, NCAR).

- Fire Activity Detected By VIIRS
- Red Perimeter
- Last 0 To 6 Hours
- Last 6 To 12 Hours
- Last 12 To 24 Hours
- Last 24 To 48 Hours
- Last 48 To 72 Hours
- 6 Days or More To Last 24 Hours
- Cloud Cover Updated: 0815 MDT
- No Data Available
- Estimated Perimeter
- Isolated Fires



Robert Ziel

Google Earth

VIIRS Burned Area Product Status

- Adapted MCD64 burned area production code to use VIIRS data
 - Product continuity
 - Retained 500-m MODIS grid for compatibility
- Tuned* operational code running in Land SIPS
 - Collection 1 product generated and released for selected tiles
 - Collection 2 reprocessing imminent

MODIS Collection 6 Burned Area Products

MCD64A1	500-m Monthly*
MCD64A1-based GIS Products (SCF)	Shapefiles + 500-m GeoTIFF
MCD64CMQ (SCF)	0.25° Monthly

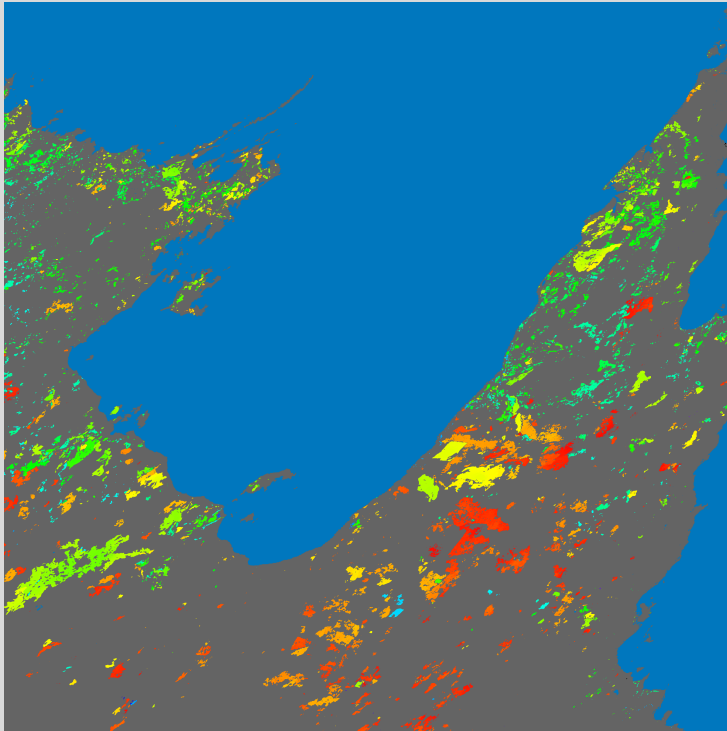
VIIRS Burned Area Products

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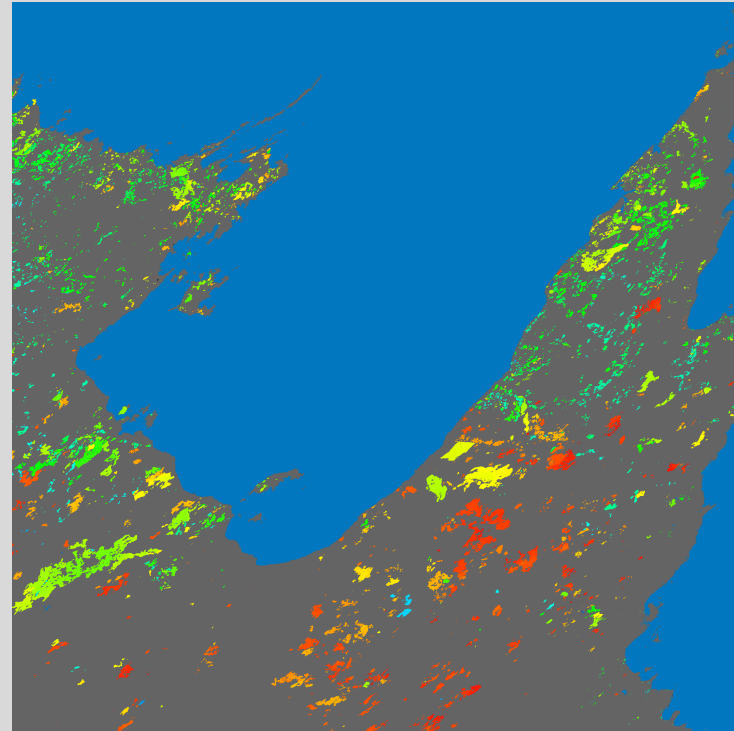
*daily temporal resolution

2017 Cumulative Burned Area
MODIS Tile h31v10 (Northern Australia)

MODIS

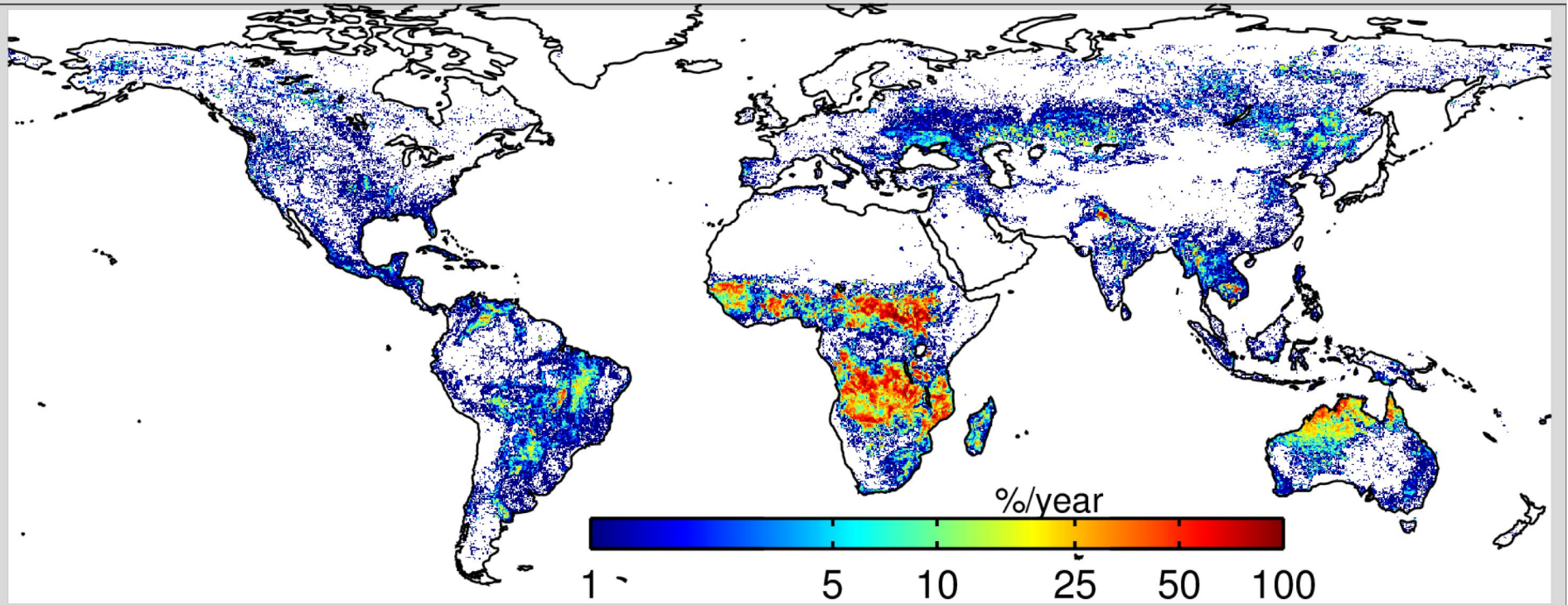


VIIRS



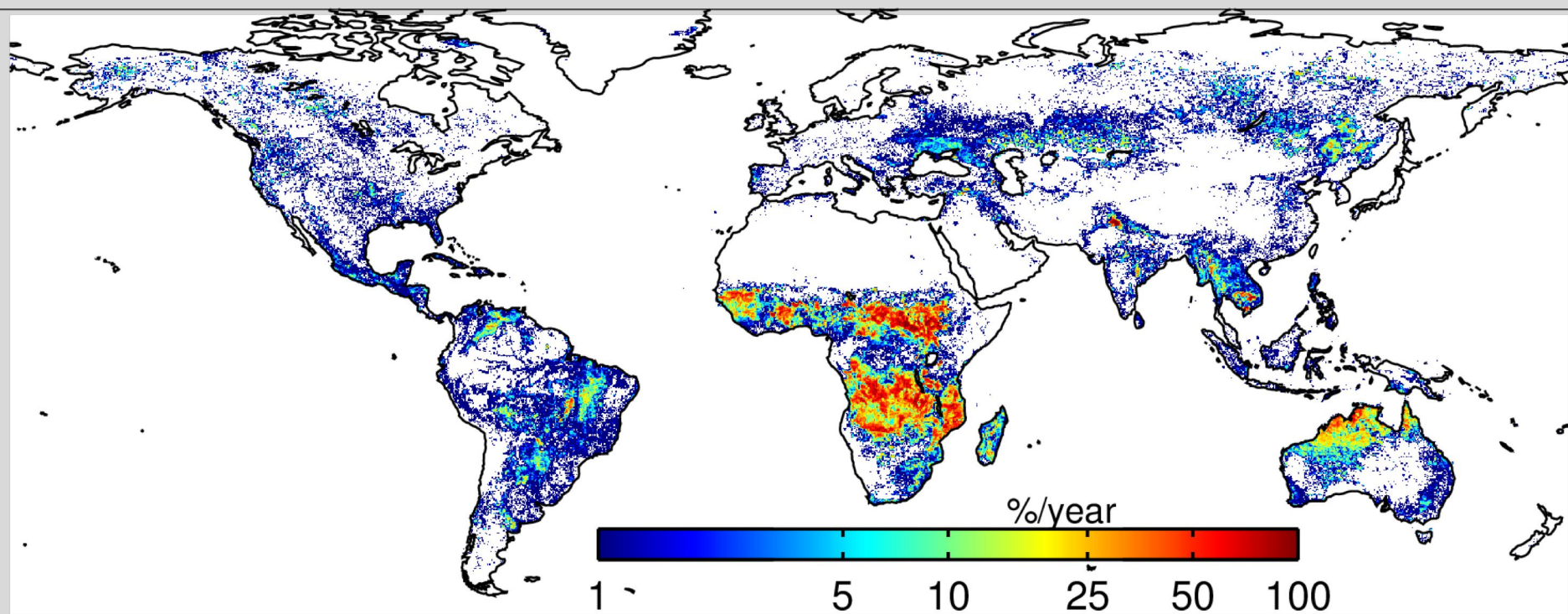
C6 MODIS MCD64A1

Jan. 2015 – Dec. 2018 Mean Annual Burned Area

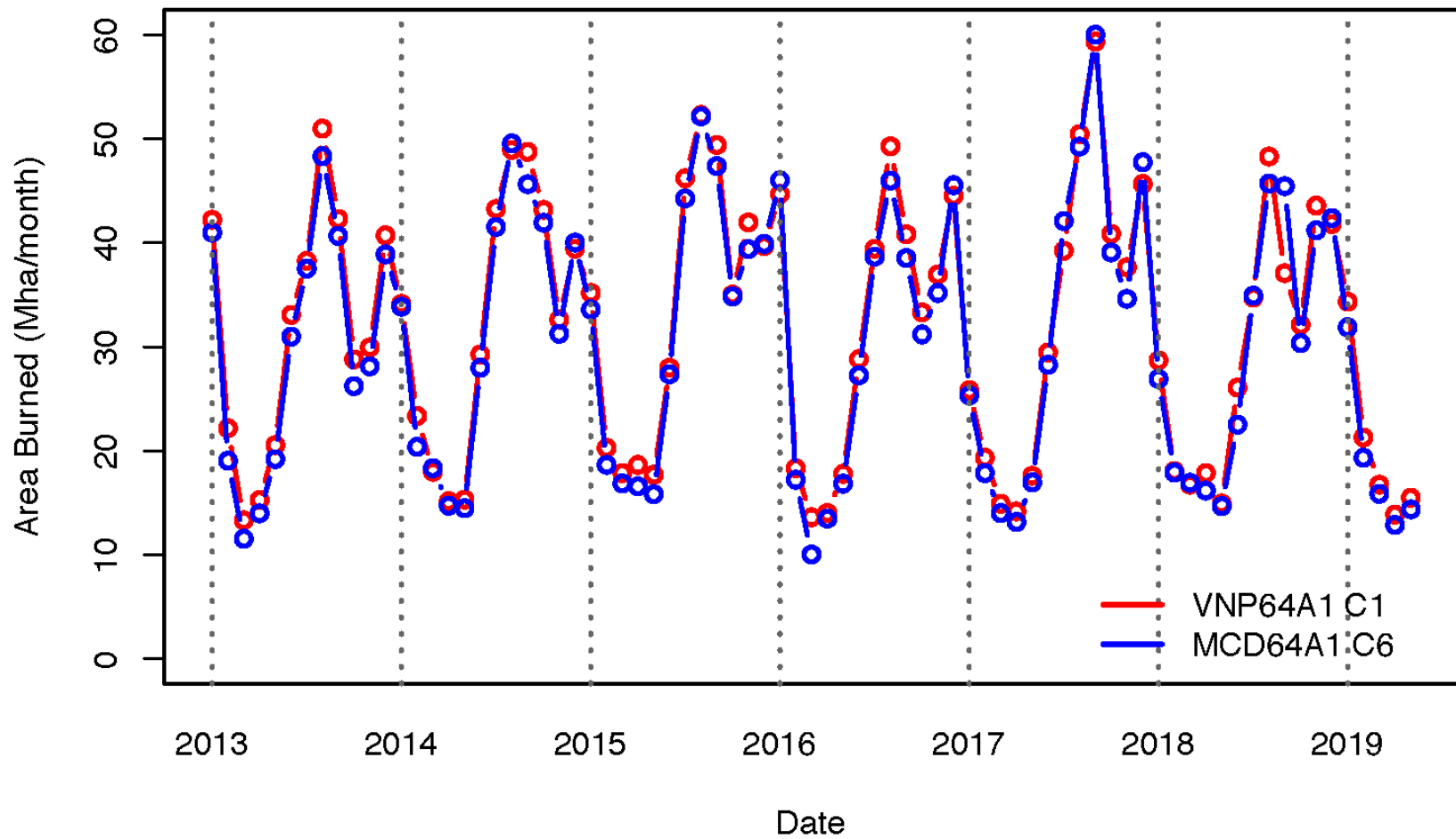


C1 VIIRS VNP64A1

Jan. 2015 – Dec. 2018 Mean Annual Burned Area



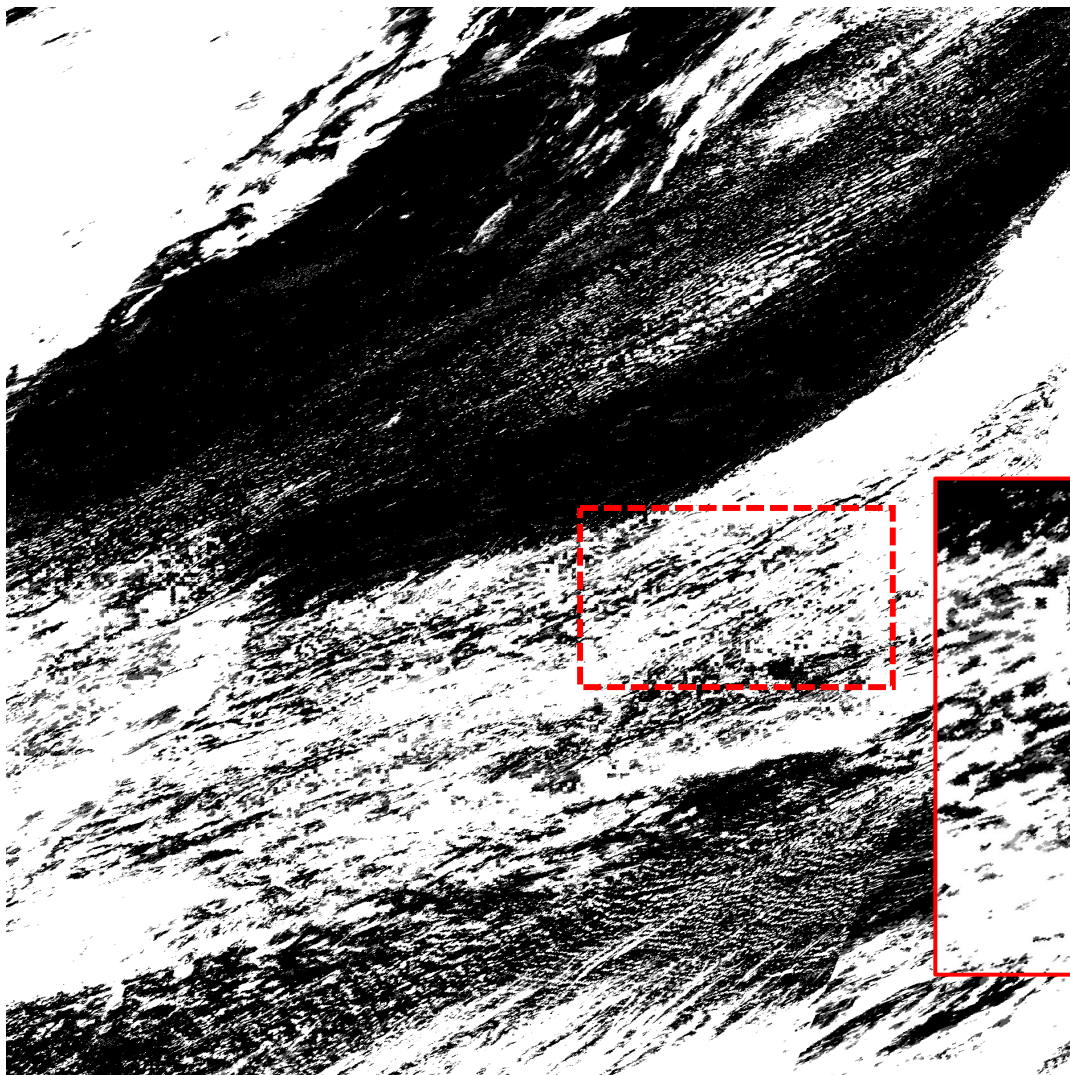
Monthly Global Burned Area



Factors Impacting MCD64A1/VNP64A1 Product Consistency

- Band placement (different spectral response)
- Sensor swath width → coverage
- Native (swath pixel) resolution + VIIRS pixel aggregation
- “1-km” (926-m) sinusoidal grid resampling effects
- No VIIRS morning overpass
- Upstream surface reflectance product differences
 - **cloud mask**, snow mask, QA bits
- Land/sea mask
- Other(s)?

Tune algorithm to help compensate for these differences.



C1 Cloud Mask Example

VNP09GHKM.A2016232.h12v03.001.2019133144101

black	confident clear
dark grey	probably clear
light grey	probably cloudy
white	confident cloudy



h12v03
2016 183

Δ VI layer from
MCD64A0
intermediate
product

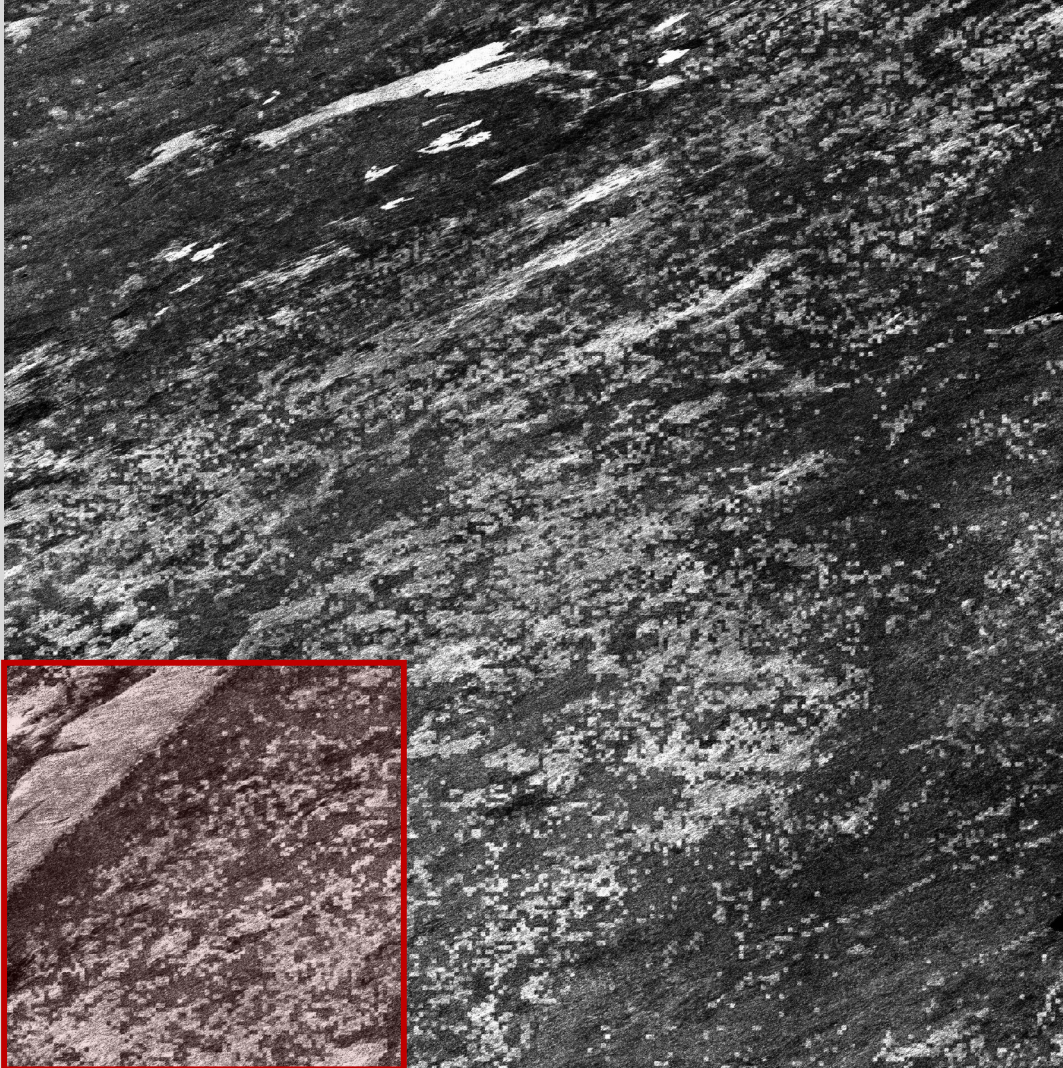
MODIS



h12v03
2016 183

Δ VI layer from
VNP64A0
intermediate
product

VIIRS



Zoom in

h12v03
2016 183

Δ VI layer from
VNP64A0
intermediate
product

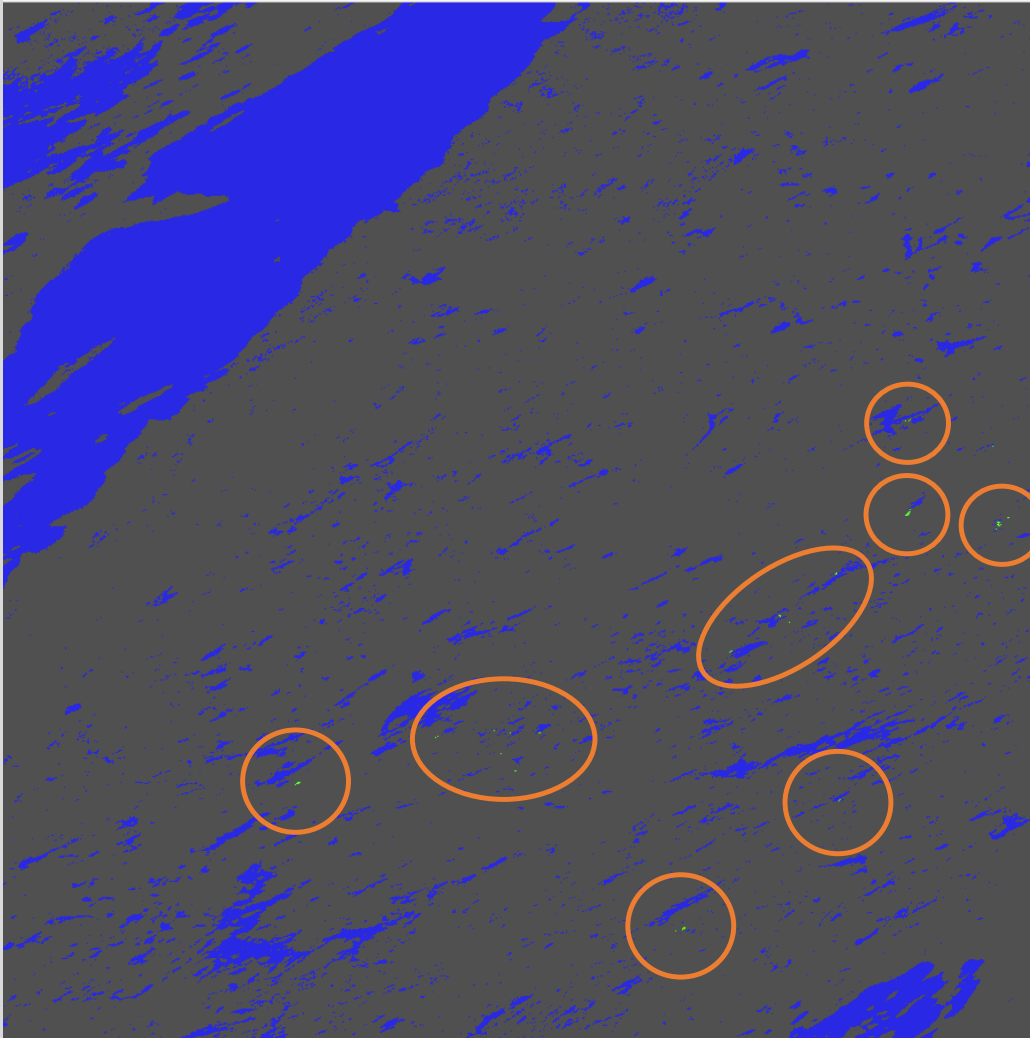
VIIRS



VNP64A0
 ΔVI

Square artifacts are a cumulative result of 5 km \times 5 km artifacts in upstream VNP09GHKM cloud mask layer.

VIIRS



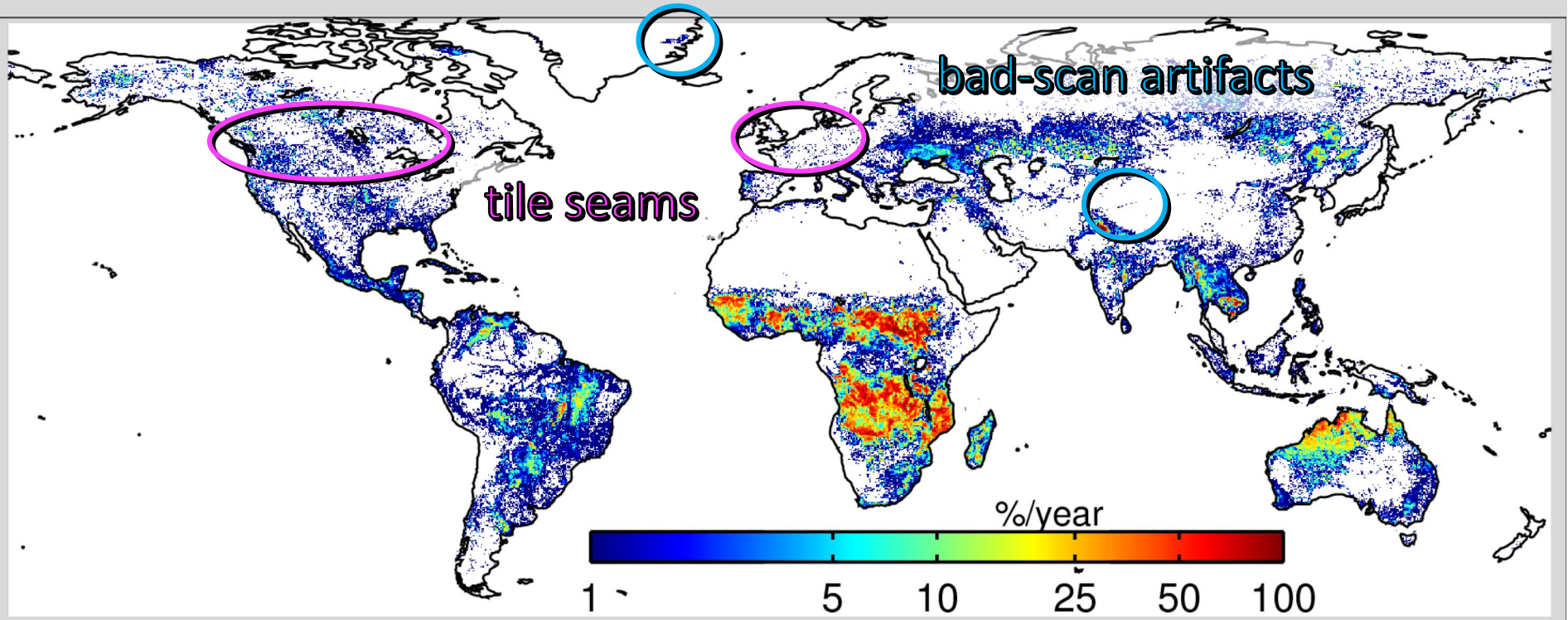
VNP64A1 Day of Burn

Commission errors
outlined in orange;
note proximity to
edges of square
artifacts in ΔVI layer.

**No burned grid cells
in corresponding
MCD64A1 product.**

VIIRS VNP64A1

Jan. 2015 – Dec. 2018 Mean Annual Burned Area



VNP64A1 Distribution Plan

- October 2019: Release sample of C1 VNP64A1
 - Two tiles
- Late 2019/early 2020: C2 reprocessing
 - Upstream improvements
 - Improved C2 VNP35 cloud mask
 - Improved L1B radiance product → no more spurious M13 scans
 - Re-tune VNP64A1
- Spring 2020: Release full suite of C2 VNP64A1 products
 - HDF, GeoTIFF, Shapefiles, CMG

Release	Burned Area Data Set	Global/Regional
TBD	Fire CCI OCLI+SLSTR	G
2019	Fire CCI MODIS v5.1	G
2019	Fire CCI LT v1.0	G
2018	Fire CCI SFD v1.1 (Africa)	R
2018	Fire CCI SA v1.0 (South America)	R
2018	Fire CCI MODIS v5.0	G
2018	GABAM Long et al.	G
2018	RAPT Mithal et al. (Tropical Forest)	R
2017	USGS BA ECV	R
2017	Fire CCI (Indonesia)	R
2017	NASA MODIS MCD64A1 C6	G
2016	Fire CCI v4.1 MERIS	G
2015	GFED4.1s	G
2014	Fire CCI v3.1 MERIS	G
2013	NASA MODIS MCD45A1 C5.1	G
2012	NASA MODIS MCD64A1 C5.1 / GFED4	G
2010	GFED3	G
2008	NASA MODIS MCD45A1 C5	G
2008	GIO-GL1	G

Contributing Factors

- Google Earth Engine
- Machine Learning
- Rise of rapid-publication journals
 - MDPI (e.g., *Remote Sensing*)
 - Peer review often compromised

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