NASA VIIRS and MODIS Fire Products Update

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2022 GOFC Fire IT Meeting

Stresa

MODIS Fire Product Status

- Active Fire (MOD14/MYD14) + Burned Area (MCD64A1)
- Collection 6 (C6) production commenced in 2015 (AF) and 2016 (BA)
- C6 production to end December 2022
- C6 → C6.1 transition
  - Polarization correction
  - C6.1 reprocessing commenced in 2019 (now complete)
  - No change in AF product
  - Small differences in BA product
- Collection 7 planned for late 2023 *(likely wildly optimistic)*
- MODIS end-of-life plans being reconsidered (range 2023-2025)

VIIRS Fire Product Status

- Active Fire: 375-m VNP14IMG + 750-m VNP14
- Burned Area: “500-m” VNP64A1
- Collection 1 remains current long past its expected lifetime
- Significant improvements made for Collection 2
  - NOAA-like SDR → NASA Level 1B transition
- Collection 2 Land reprocessing massively delayed
  - Originally **spring 2020 (!)**, now summer 2022
  - New VIIRS Land products + S-NPP/NOAA-20 cross-calibration + NASA IT security mandates + GitLab transition

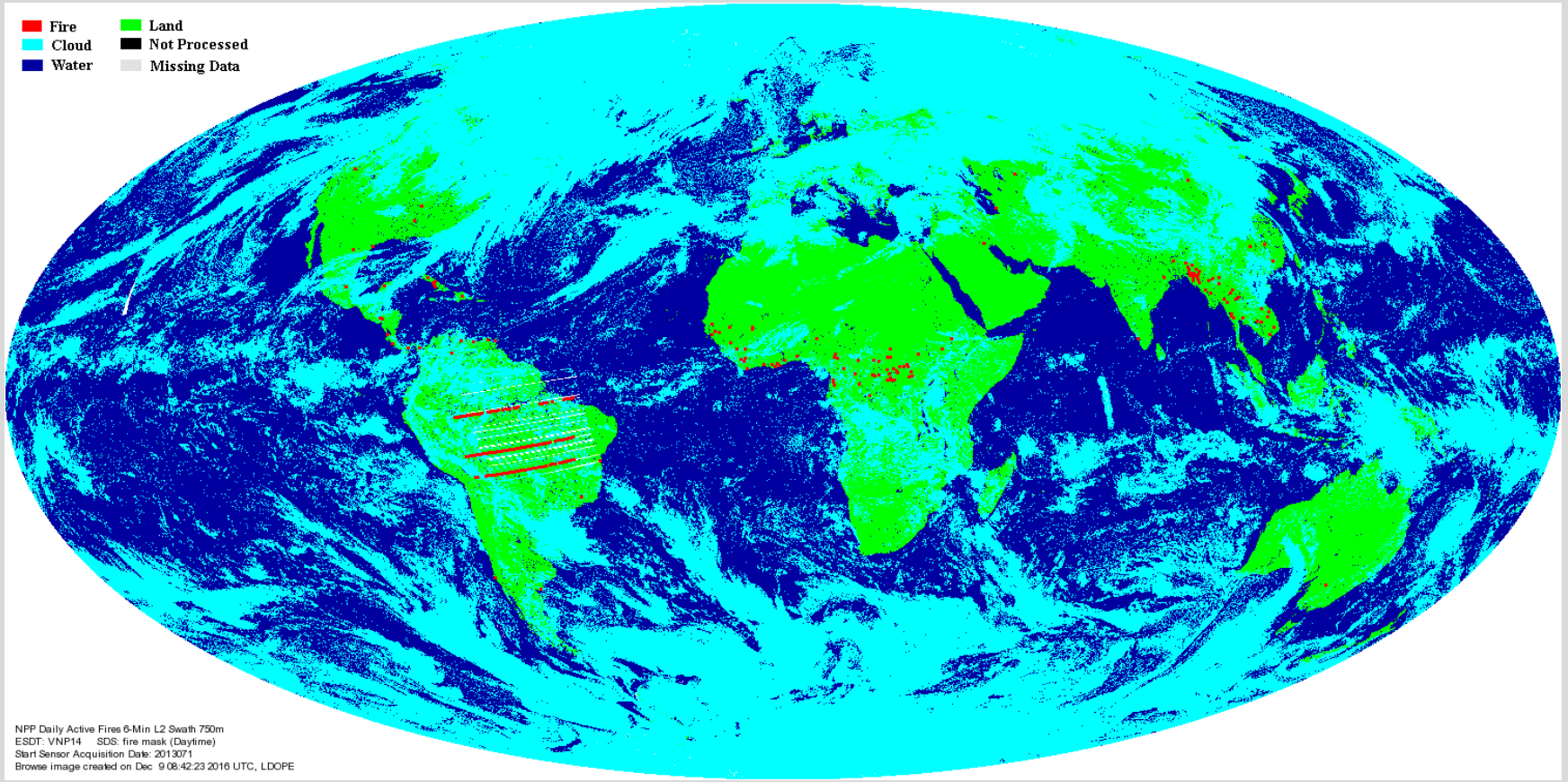
VIIRS Active Fire (VNP14/VNP14IMG)

Product Overview

- Level 2 swath + Level 3 gridded
- 375-m product is a significant improvement over MODIS and is used widely
- 750-m produce retained for continuity (more like MODIS)

Limitations and Strengths

- SDR-induced bad scans in C1 product – fixed for C2 but reprocessing still pending
- No morning VIIRS overpass
- Sub-optimal M13 location (tweaked for later VIIRS)
- Responsivity across swath is much more uniform
- Unprecedented sensitivity to small fires



Collection-1 750-m VIIRS VNP14 active fire product

12 March 2013

Arcs of false fire pixels caused by spurious M13 scans.

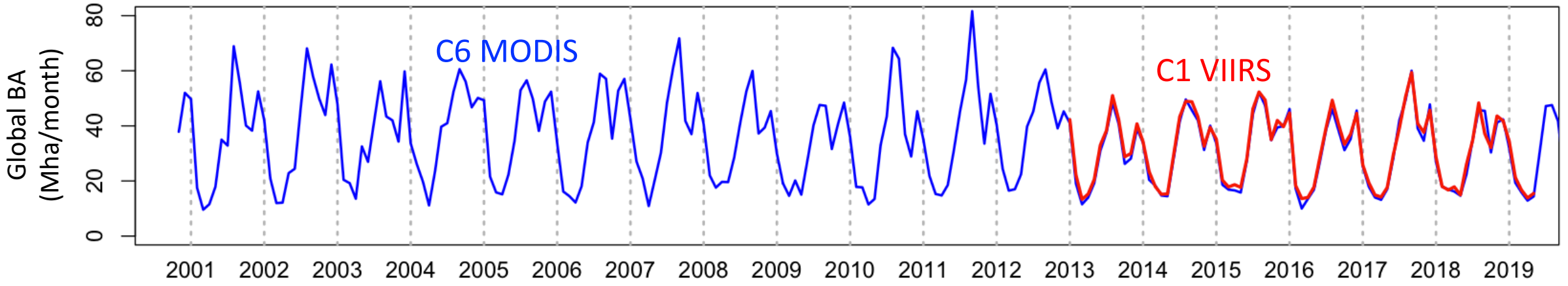
S-NPP VIIRS Burned Area (VNP64A1)

Product Overview

- Monthly global burned area with date of burn mapped to nearest day
- Adapted MODIS MCD64A1 production code to use VIIRS data
- Retained 500-m MODIS grid for compatibility
- Limited C1 release due to artifacts in C1 cloud mask (fixed for C2)

Limitations and Strengths

- No morning VIIRS overpass
- 750-m (vs. 500-m) imagery – I-bands not designed for BA mapping
- Nevertheless, highly consistent with MODIS MCD64A1 product



MODIS Burned Area Products

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

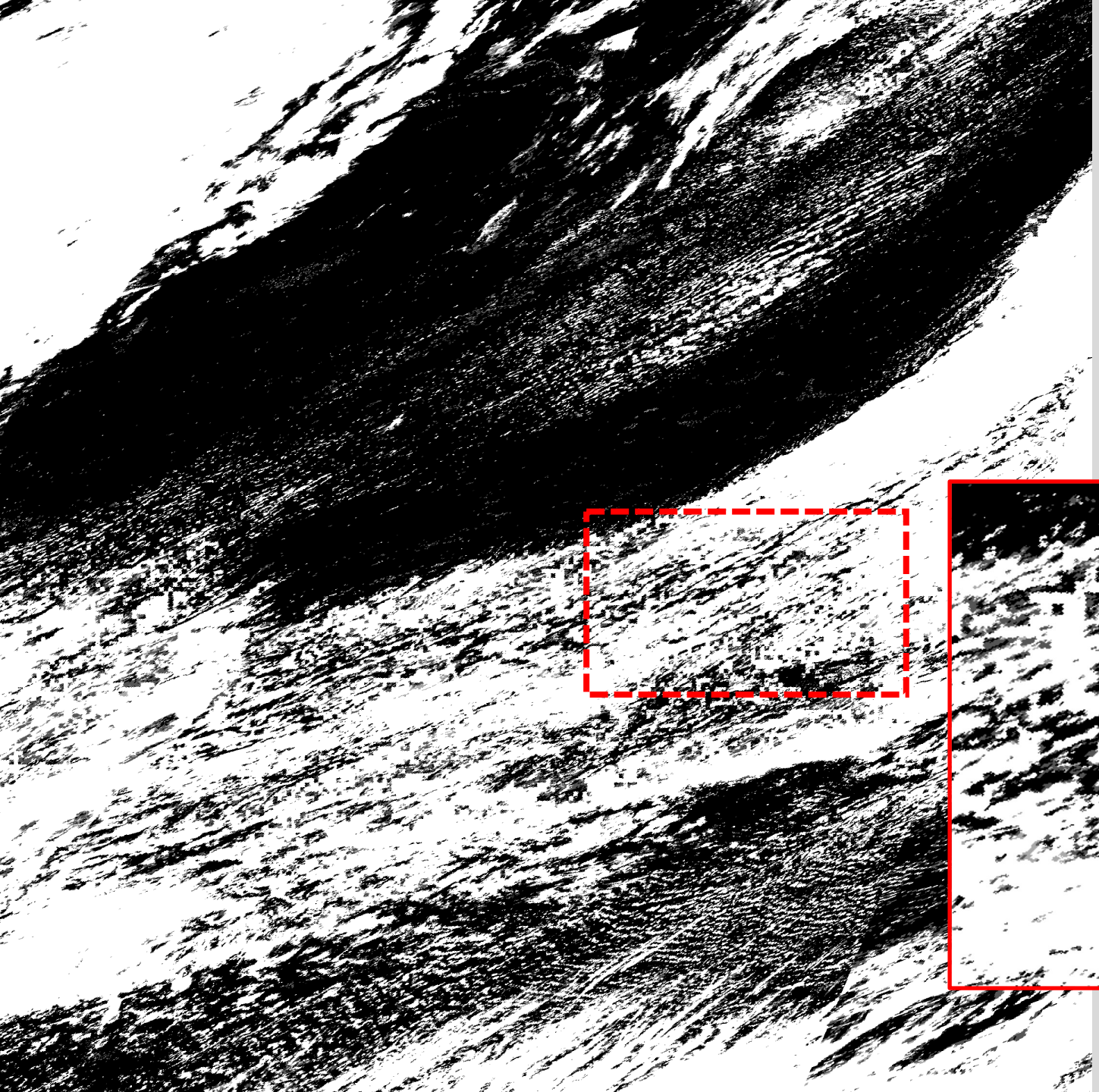
VIIRS Burned Area Products

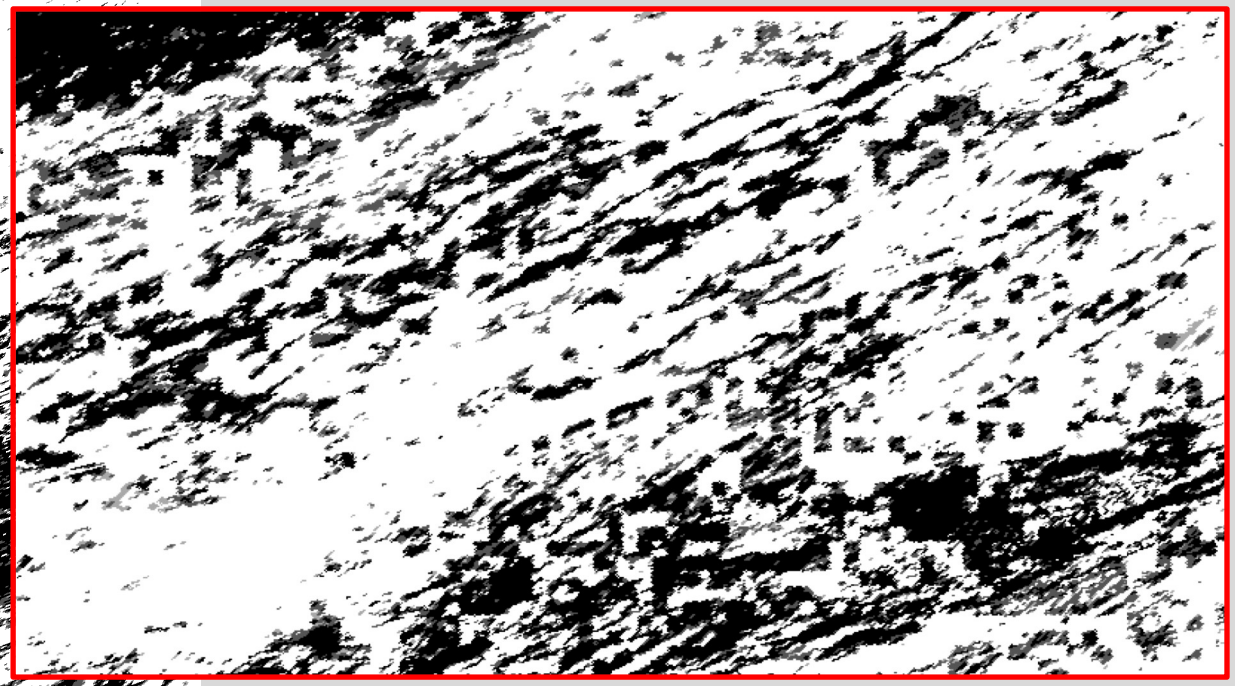
VNP64A1	500-m Monthly
VNP64A1-based GIS Products (SCF)	Shapefiles + 500-m GeoTIFF
VNP64CMQ (SCF)	0.25° Monthly

Cloud Mask Example

VNP09GHKM.A2016232.h12v03.001.2019133144101

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

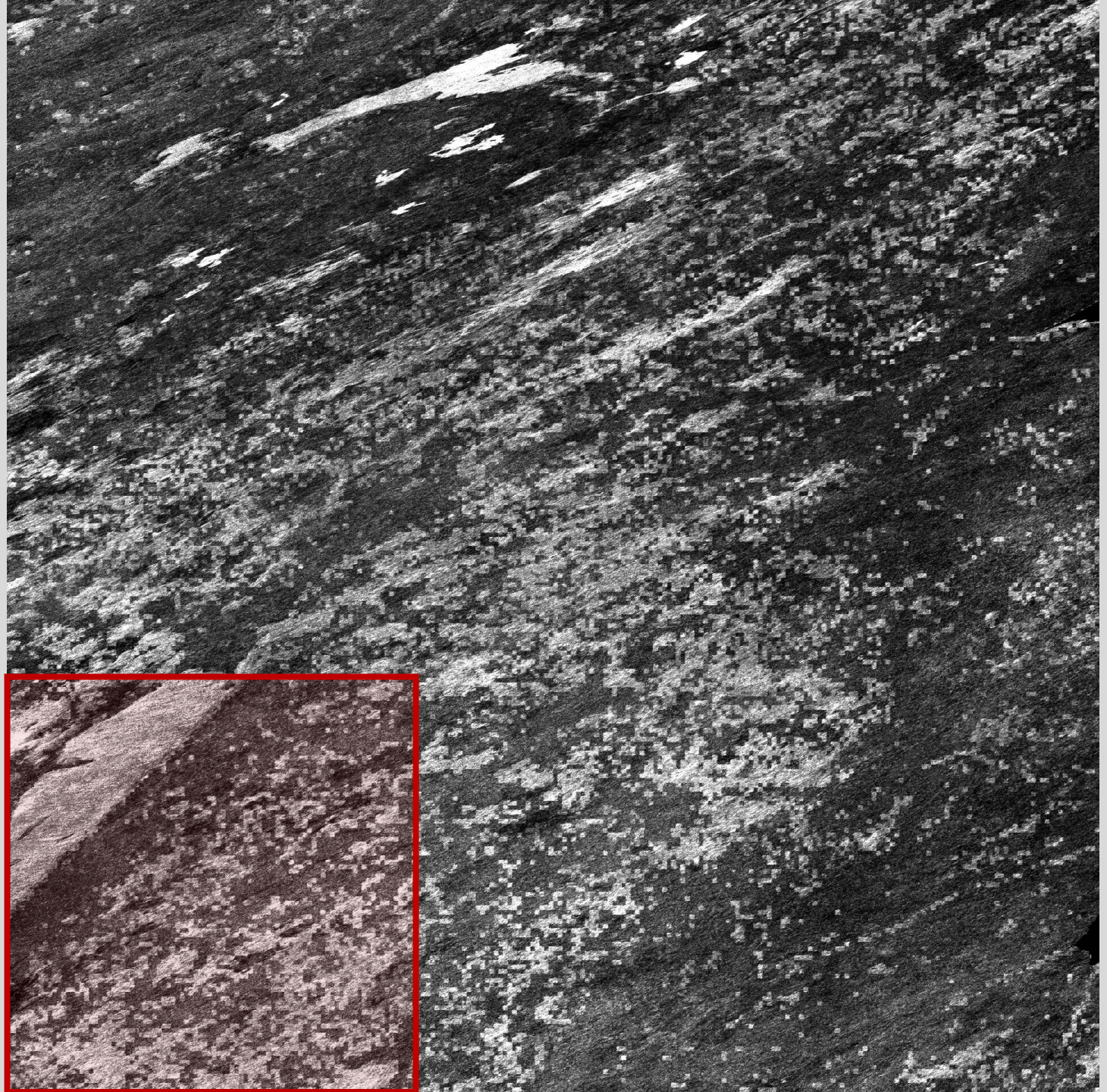




h12v03
2016 183

ΔVI layer from MCD64A0 intermediate product

MODIS



Zoom in

h12v03
2016 183

ΔVI layer from VNP64A0 intermediate product

VIIRS

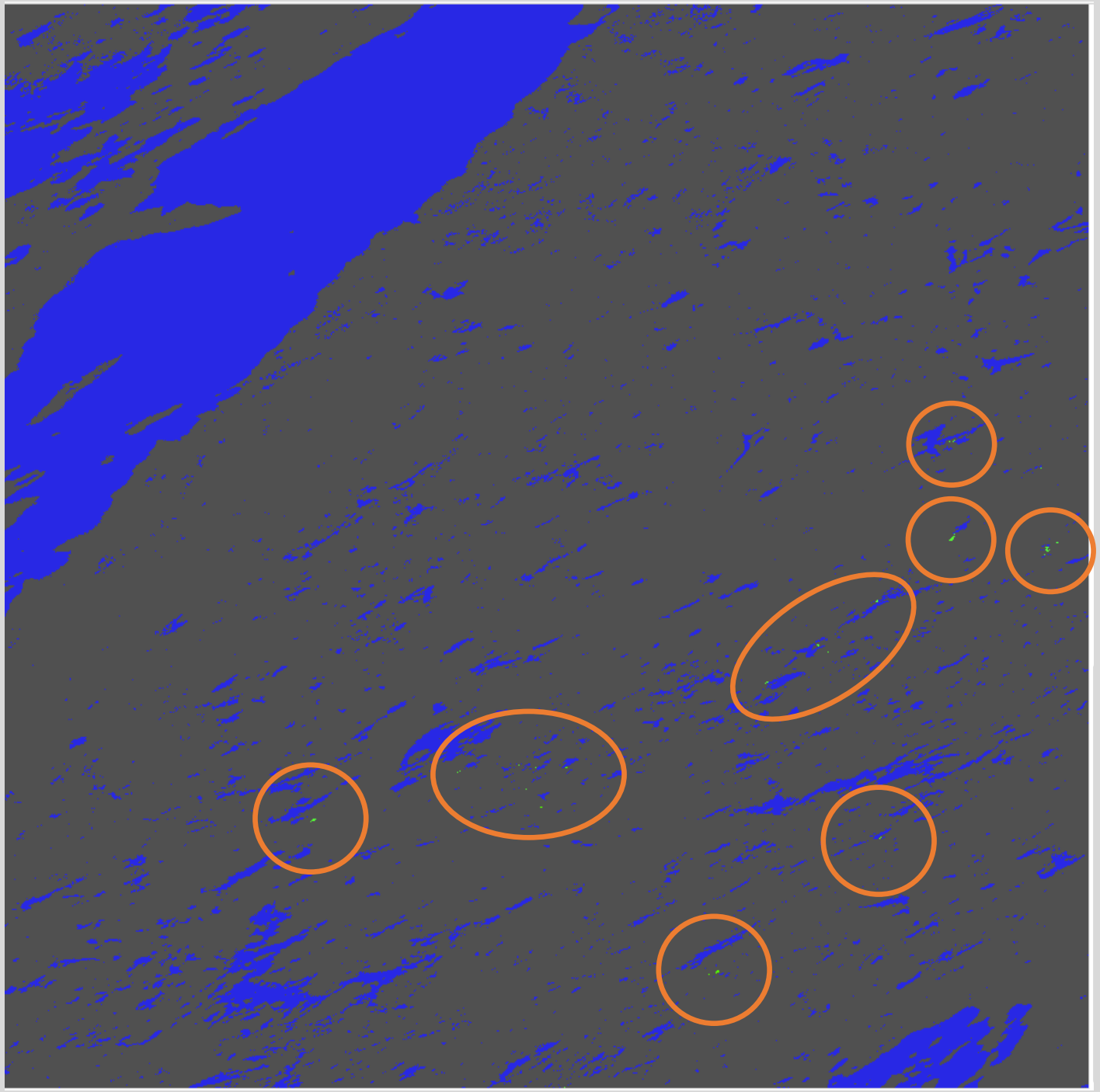
VNP64A0
ΔVI

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

VIIRS

MCD64A0
ΔVI

MODIS

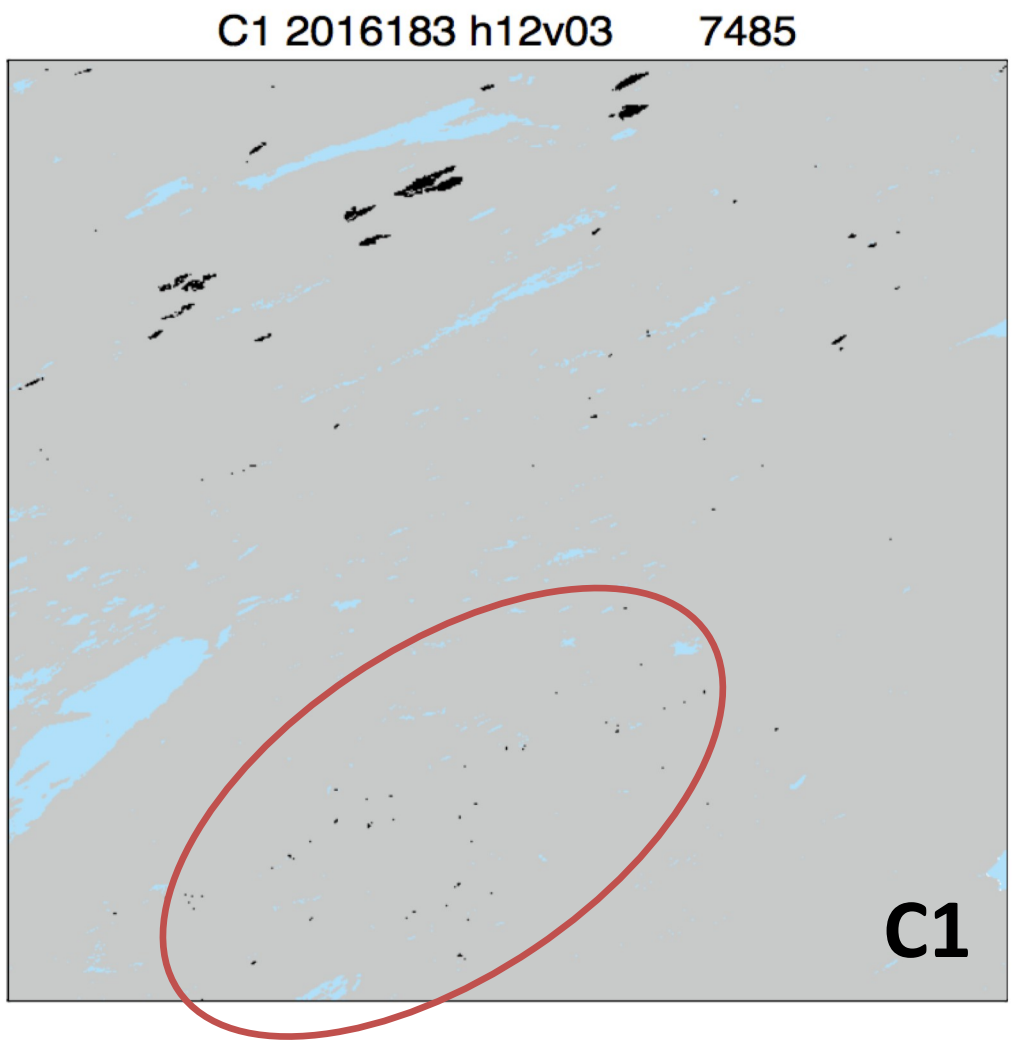


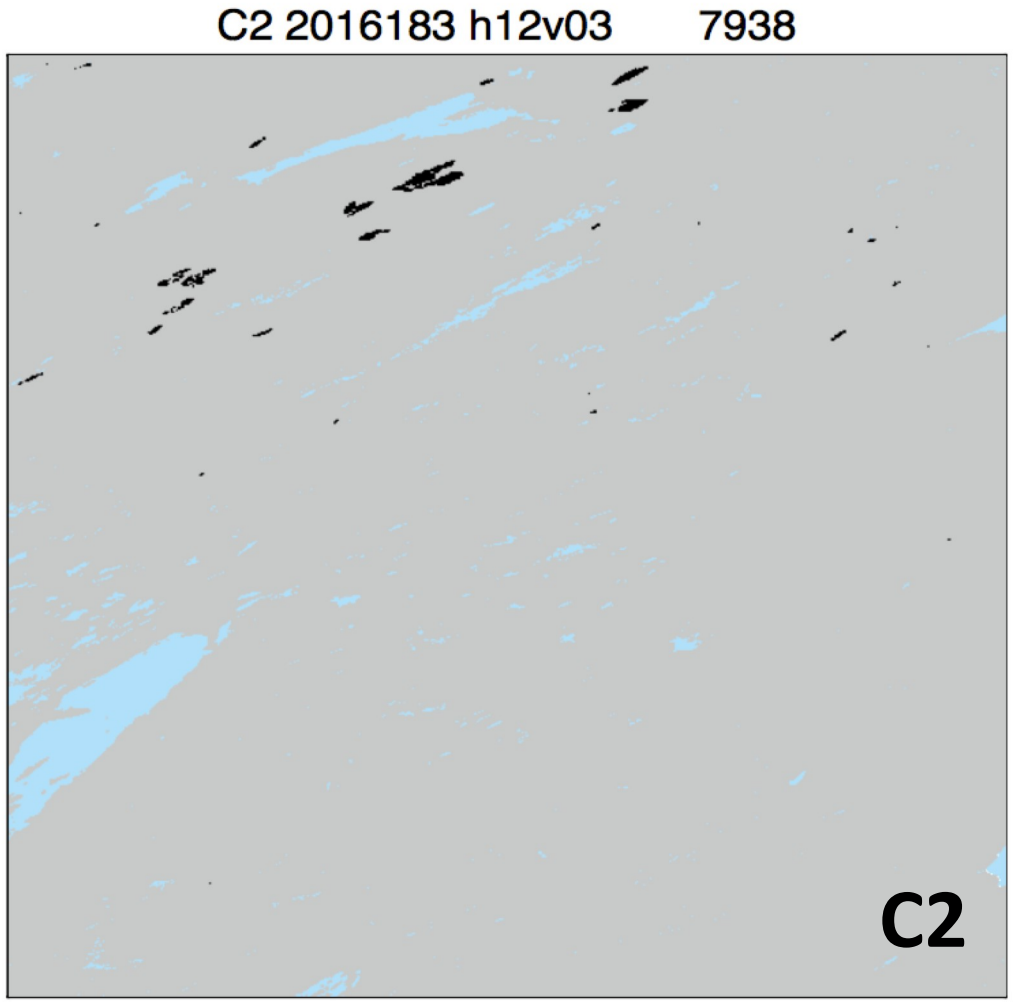
C1 VNP64A1 Day of Burn

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

No burned grid cells in corresponding MCD64A1 product.

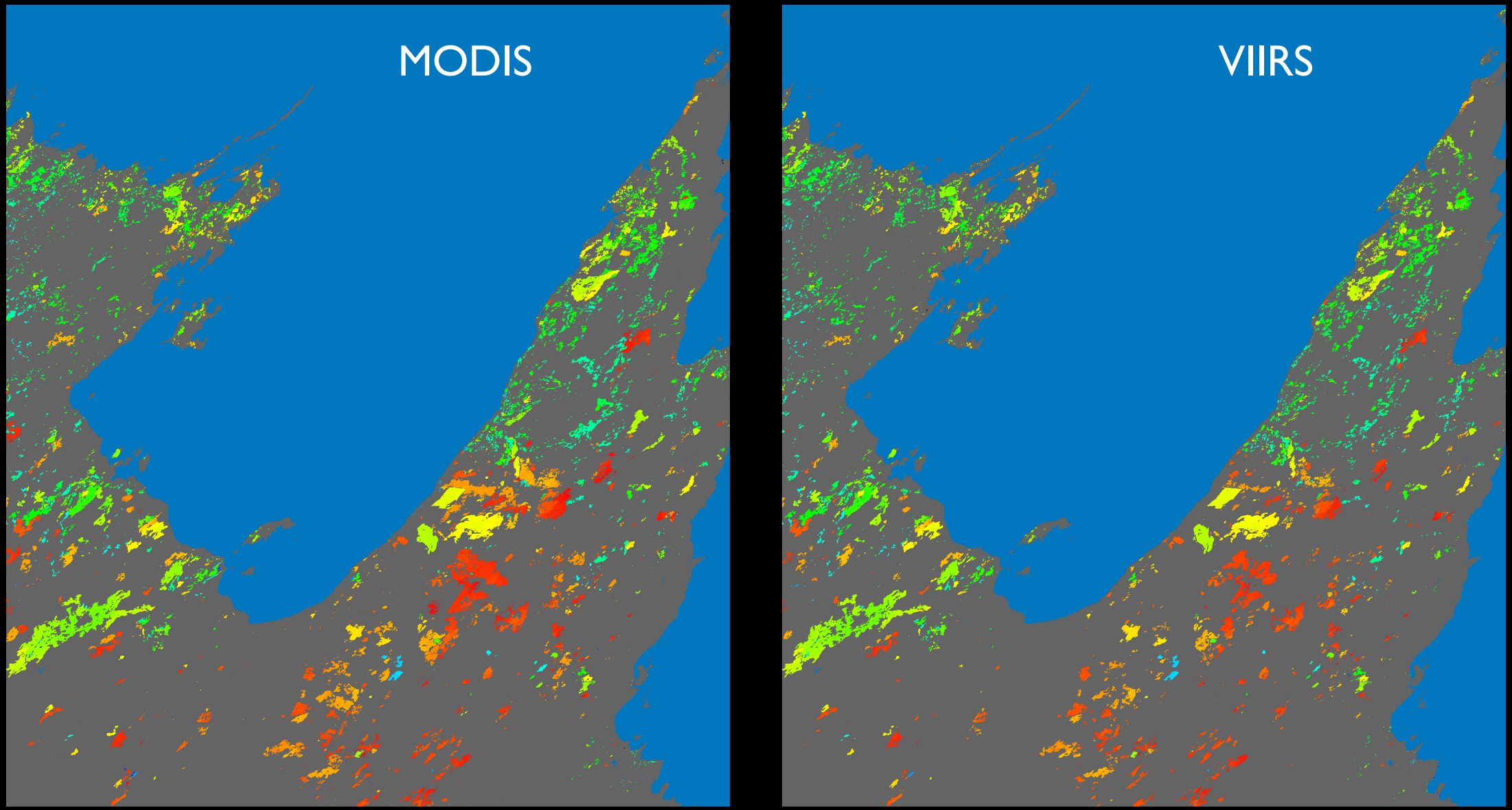
S-NPP VIIRS Burned Area (VNP64A1)





Commission errors caused by C1 cloud mask

2017 Cumulative Burned Area (Northern Australia)



S-NPP VIIRS Burned Area (VNP64A1)

Distribution Plan

- October 2019: Released sample of C1 VNP64A1
- Summer 2022 (?): C2 reprocessing
  - Re-tune VNP64A1
- Fall 2022 (originally **Spring 2020**): Release full suite of C2 VNP64A1 products
  - HDF, GeoTIFF, Shapefiles, CMG

C3 Maintenance/Refinement

- Update with “cross-tile” Collection 7 MODIS algorithm
  - Capture smaller burns
  - Modest improvement in cropland burn mapping
- Improve product fidelity by combining S-NPP and NOAA-20 VIIRS observations

Greatest concern remains the protracted delay in commencing the C2 reprocessing.

Status of S-NPP/NOAA-20 VIIRS Burned Area

- Improve product fidelity by combining S-NPP and NOAA-20 VIIRS observations
- Analogous to combining Terra and Aqua MODIS observations
- Improve MODIS continuity
- NOAA-20 VIIRS “hooks” in code
- Post-C2 (C3?) VNP64A1 product

Multiple VIIRS → Effective resolution of 750-m VNP64A1 burned area product much closer to effective resolution of 500-m MODIS burned area product in tropics. Effective MODIS resolution remains significantly better at high latitudes, however.