The Version 4 Global Fire Emissions Database (and Related Topics)

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Contributors

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Topics

- What is GFED?
- GFED burned area component
- MCD64A1 burned area product
- Fire-pixel caveats
- Long-term GFED plans
- The VIIRS active fire product

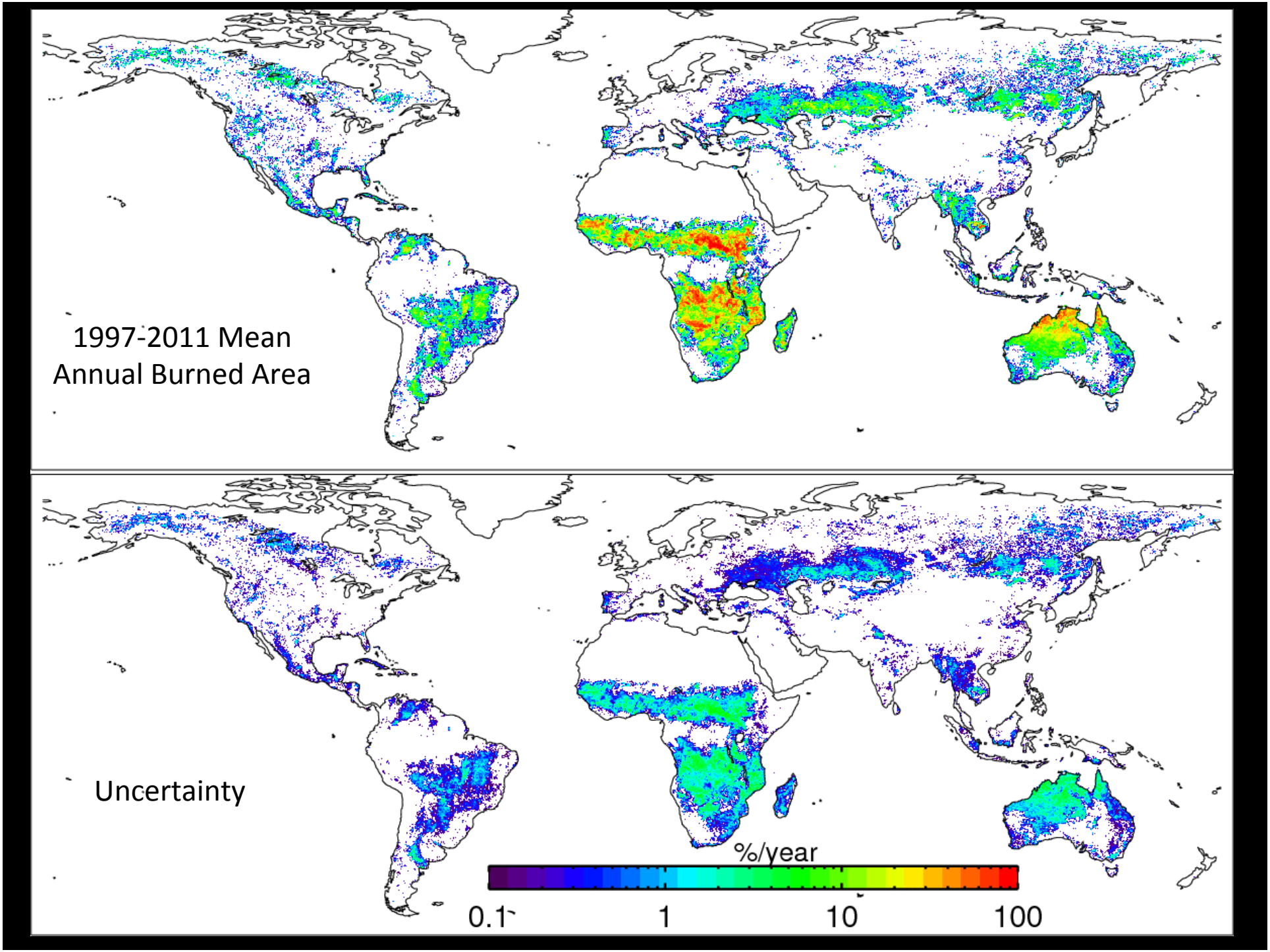
Global Fire Emissions Database (GFED)

- Combine remotely sensed data with the CASA biogeochemical model to produce global, spatially explicit, burned area and pyrogenic carbon emissions estimates
  - C, CO_2, CO, CH_4, H_2, N_2O, NO_x, NMHC, OC, BC, etc.
- Partitioning of fire types
  - Forest, savanna, agriculture, peat, deforestation and degradation

Global Fire Emissions Database (GFED)

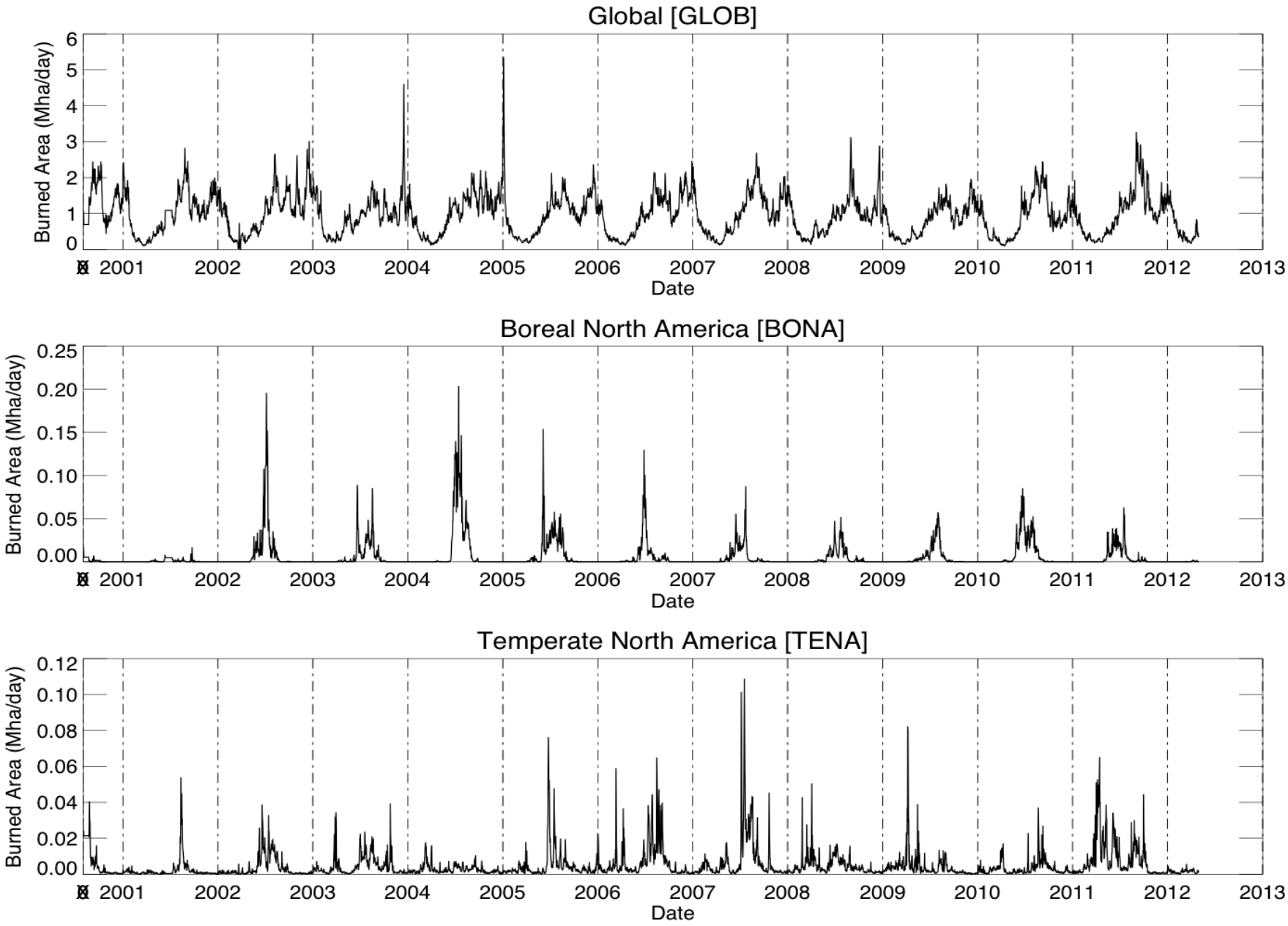
- Now at version 4 (GFED4)
- 0.25° spatial resolution
- Monthly temporal resolution
  - July 1995 - present
- Daily temporal resolution
  - August 2000 - present

Hereafter I will focus on the GFED4 burned area component.

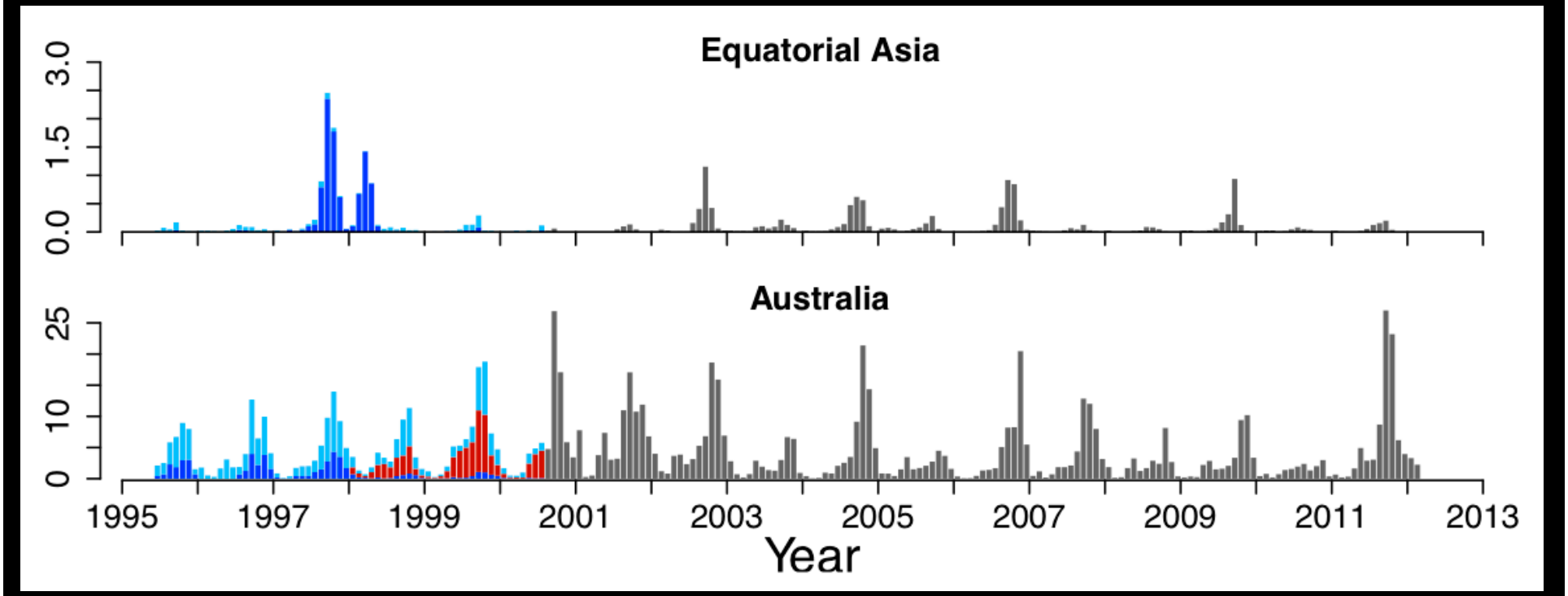

1997-2011 Mean
Annual Burned Area
Uncertainty
%/year
0.1
1
10
100

GFED4 Burned Area

- Pre-MODIS (July 1995-2000)
  - Estimated indirectly using ATSR and VIRS active fire counts + MCD64A1 burned area climatology
  - Reduced temporal resolution (monthly)
- MODIS Era (2000-present)
  - 500-m MODIS MCD64A1 burned area maps
  - Daily temporal resolution


Global [GLOB]
Burned Area (Mha/day)
0
1
2
3
4
5
6
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Date
Boreal North America [BONA]
Burned Area (Mha/day)
0.00
0.05
0.10
0.15
0.20
0.25
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Date
Temperate North America [TENA]
Burned Area (Mha/day)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Date

Monthly Burned Area (Mha)



Calibrated ATSR Fire Counts

Calibrated VIRS Fire Counts

MCD64A1 Climatology

MCD64A1

Data access: http://www.globalfiredata.org

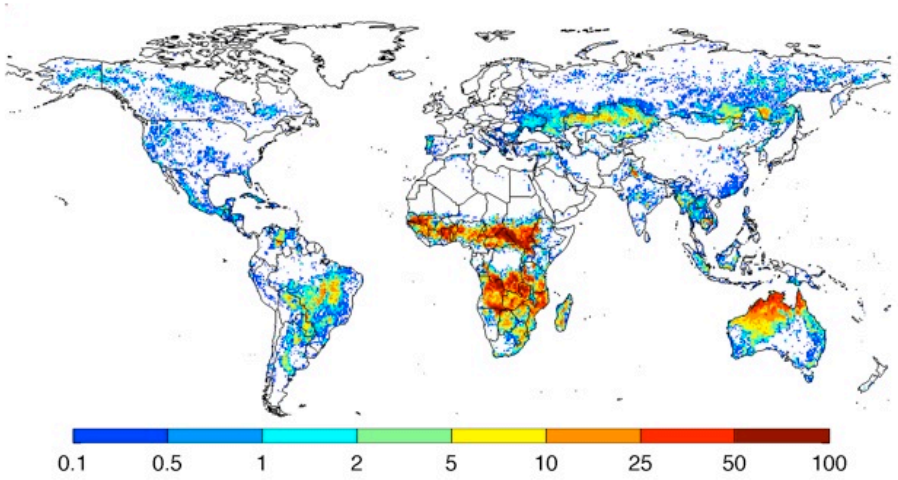
Global Fire Data (GFED)

Introduction | Tables | Graphs | Data | Publications & references | Contact | Scrapbook | Funding

Fires are an important source of atmospheric trace gases and aerosols and are the most important disturbance agent on a global scale. In addition, deforestation and tropical peatland fires and areas that see an increase in the frequency of fires add to the build-up of atmospheric CO_2.

We have combined satellite information on fire activity and vegetation productivity to estimate gridded monthly burned area and fire emissions, as well as scalars that can be used to calculate higher temporal resolution emissions. The resulting datasets are downloadable from this website for use in large-scale atmospheric and biogeochemical studies. The core datasets are monthly burned area, monthly emissions (carbon emissions as well as a suite of trace gas and aerosol emissions), and fields to distribute the monthly emissions to a daily time step, or a 3-hourly time step using a mean diurnal cycle. The current version is 3.

While the data was released initially as the Global Fire Emissions Database (GFED) and will still be released as GFED, it now also includes burned area and other datasets besides the emissions fields



Annual burned area (as percentage of the area of the grid cell), averaged over 1997-2009. For November 2000 onwards it is for 90% based on mapped MODIS burned area using the direct broadcast algorithm, aggregated from the native 500-meter resolution to 0.5 degree. The remaining 10% and burned area for 1997 - October 2000 are based on relations between active fires (ATSR, TRMM-VIRS, and MODIS) and mapped burned area for periods they overlap.

GFED4 Burned Area

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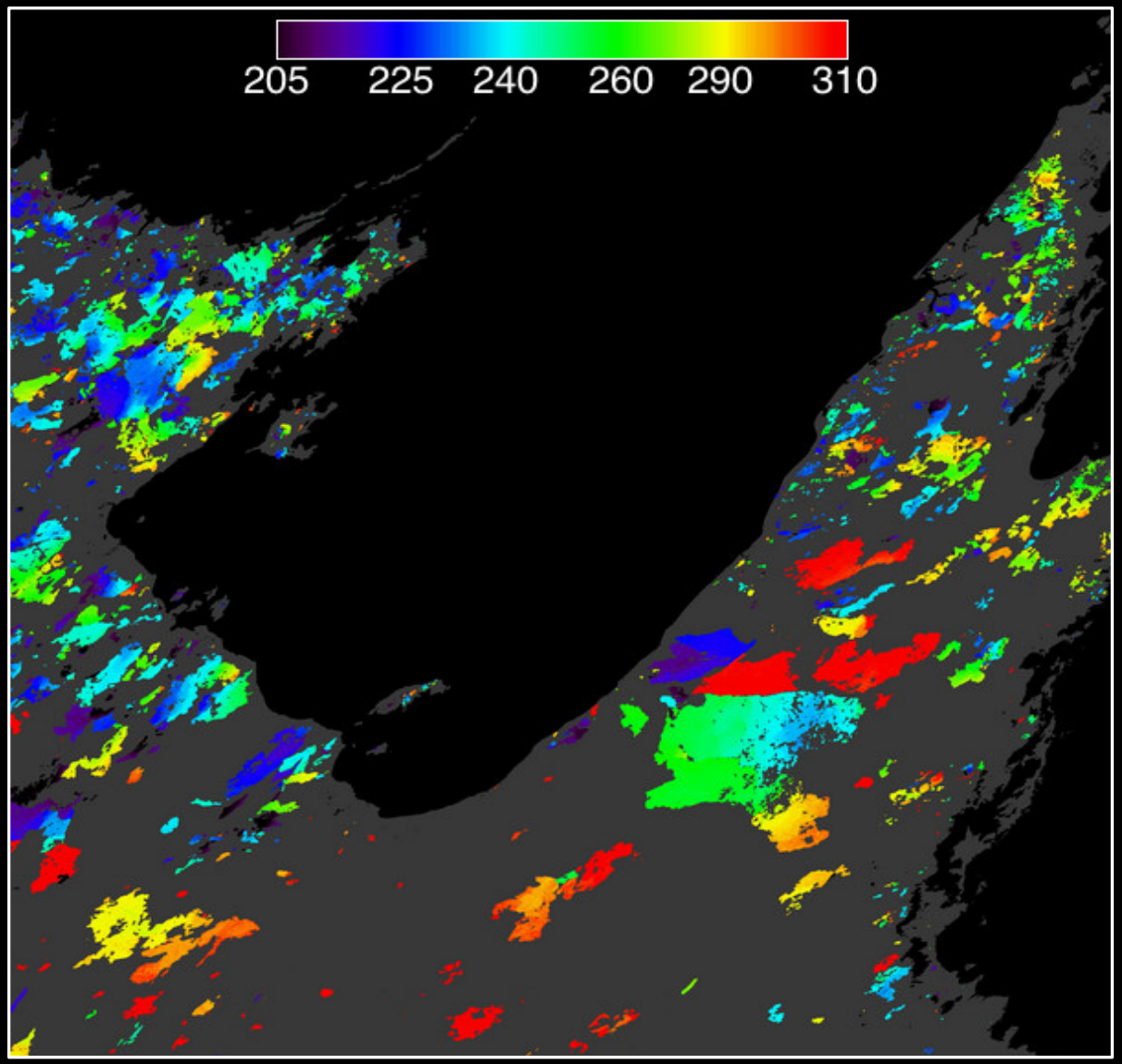
  - Daily temporal resolution

MODIS Direct Broadcast Burned Area Product (MCD64A1)

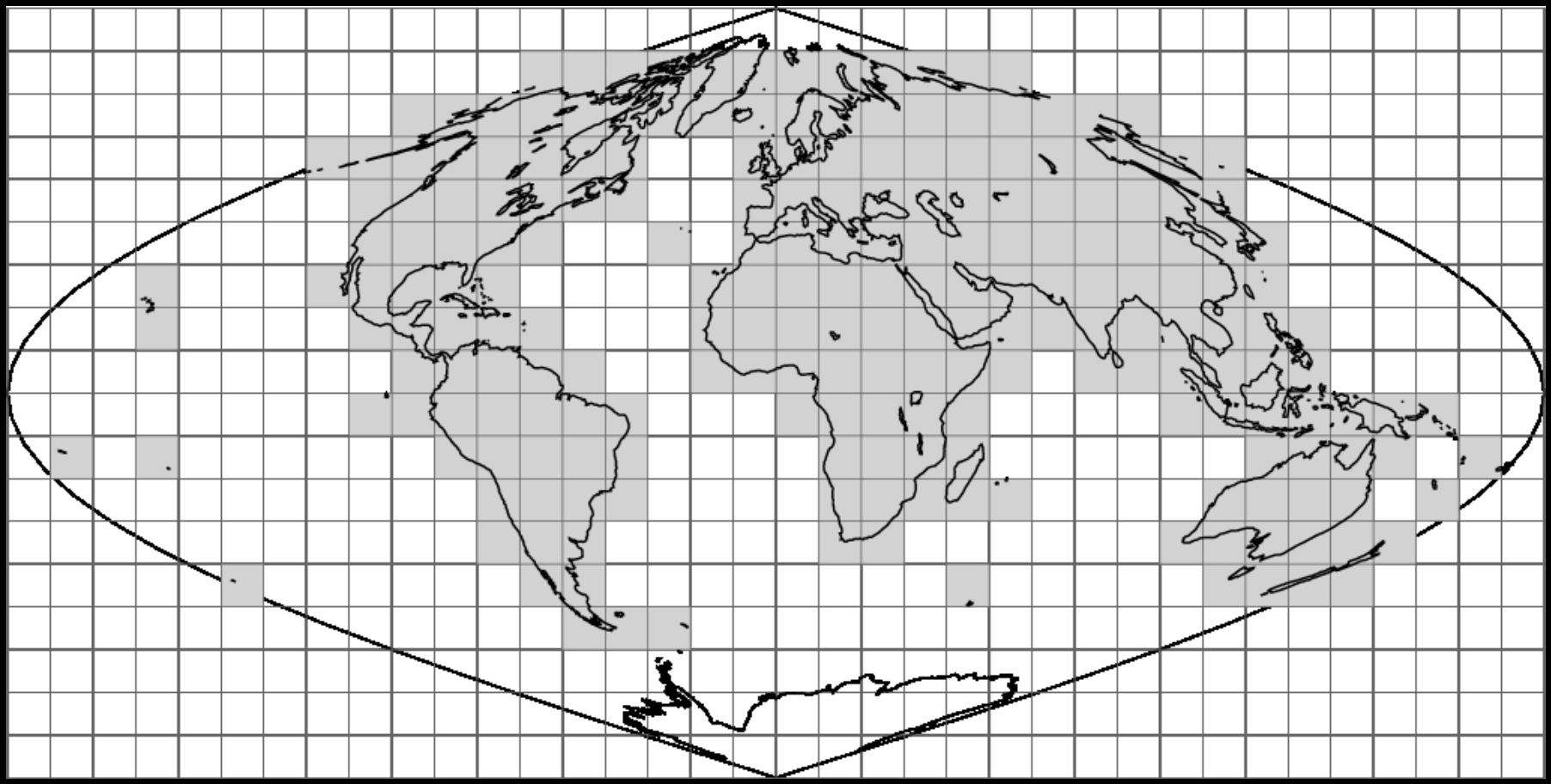
- Giglio et al. (2009) VI time series approach
- 500-m, daily resolution
- Global production to support multiple projects
- Stand-alone code available for use in Direct Readout systems
- Exploits active fire information to help identify burns

Approach

- Use “cleaned” active fire maps to select burned and unburned training samples from temporal composites
- Generate temporally-composited change summary
- Extract conditional PDFs for burned and unburned pixels
- Assign prior burned probability to each pixel
- Bayes’ rule + supplementary relative threshold tests


205
225
240
260
290
310

MCD64A1 Production Tiles



MCD64A1 Data Layers

- Burn Date
- Burn Date Uncertainty
- QA
  - Flags: water/land, valid data, pixel ignored, forced classification, shortened mapping period
- First Day
  - First day of reliable change detection
- Last Day
  - Last day of reliable change detection

MCD64A1 Data Availabiity

fuoco.geog.umd.edu

Login: fire Password: burnt

cd db/mcd64a1

GFED4 Burned Area

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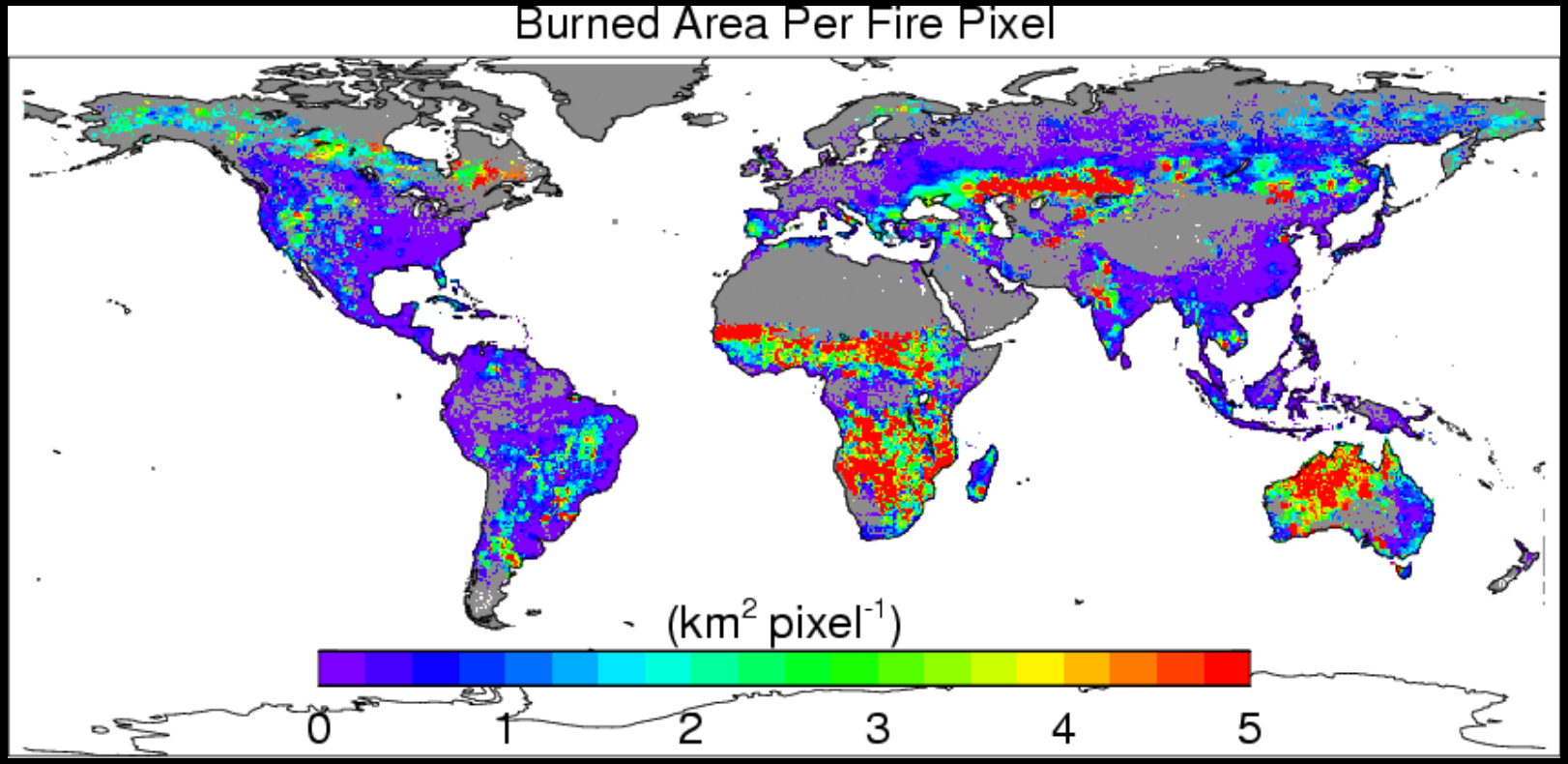
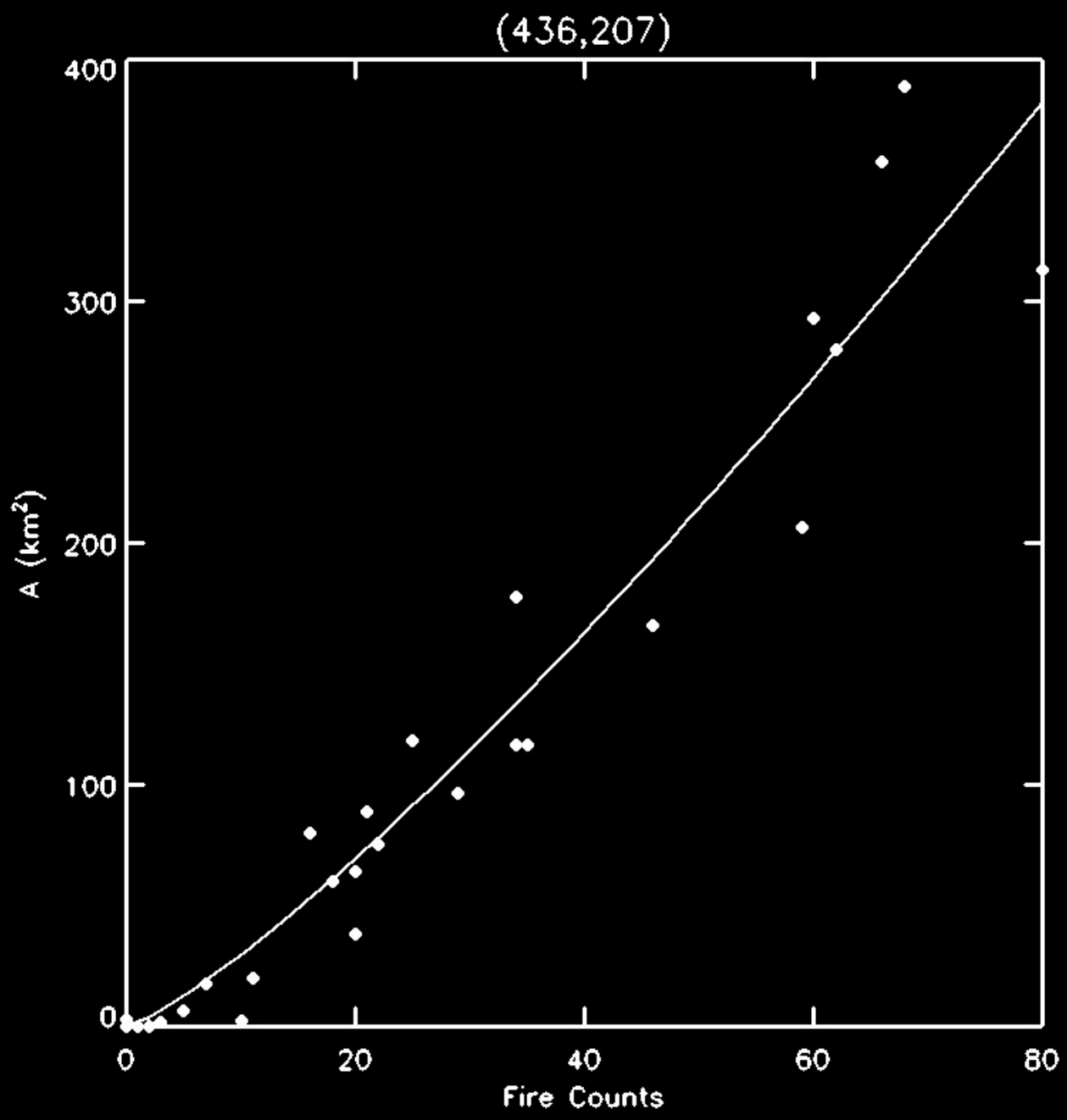
Active Fire vs. Burned Area Observations

- In general they are not the same:
  - 1 km^2 "fire pixel" ≠ 1 km^2 area burn*ing*
  - 1 km^2 "fire pixel" ≠ 1 km^2 area burn*ed*

Average Burned Area per Terra MODIS Fire Pixel



Giglio et al. (2010)



Monthly area burned vs. monthly Terra MODIS fire counts within individual 0.5° grid cell.

SH Africa

Extending GFED

- Pre-MODIS (1996-2000)
  - Likely still indirectly using ATSR and VIRS active fire counts
- MODIS Era (2000-?)
  - 500-m MODIS MCD64A1 burned area maps
- VIIRS Era (?-)
  - 740-m VIIRS burned area maps

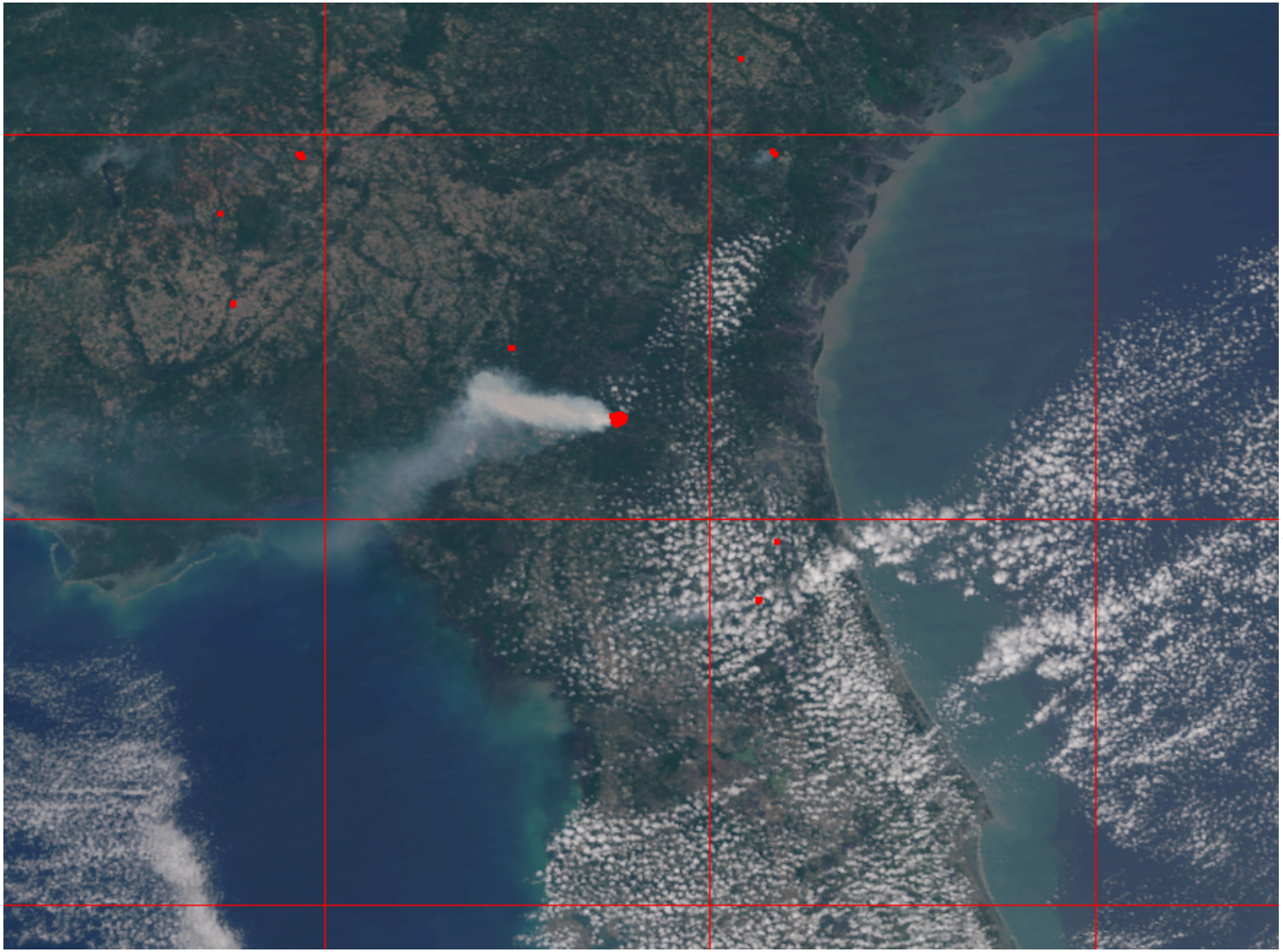
VIIRS

- MODIS "successor"
- On Suomi-NPP and JPSS (formerly NPOESS) satellites
  - NPP launch 25 October 2011
- 22 bands
  - 740 m and 370 m spatial resolution
- Simplistic swath-level fire product
- No burned area product
  - Science team is lobbying to remedy this omission
  - Available in late 2013 **at the earliest**

Overview of VIIRS Active Fire Product

- MODIS Collection 4 detection algorithm
- Geolocation of pixels in which fires are detected
  - No spatially explicit pixel classes
- No FRP
- No higher level fire products

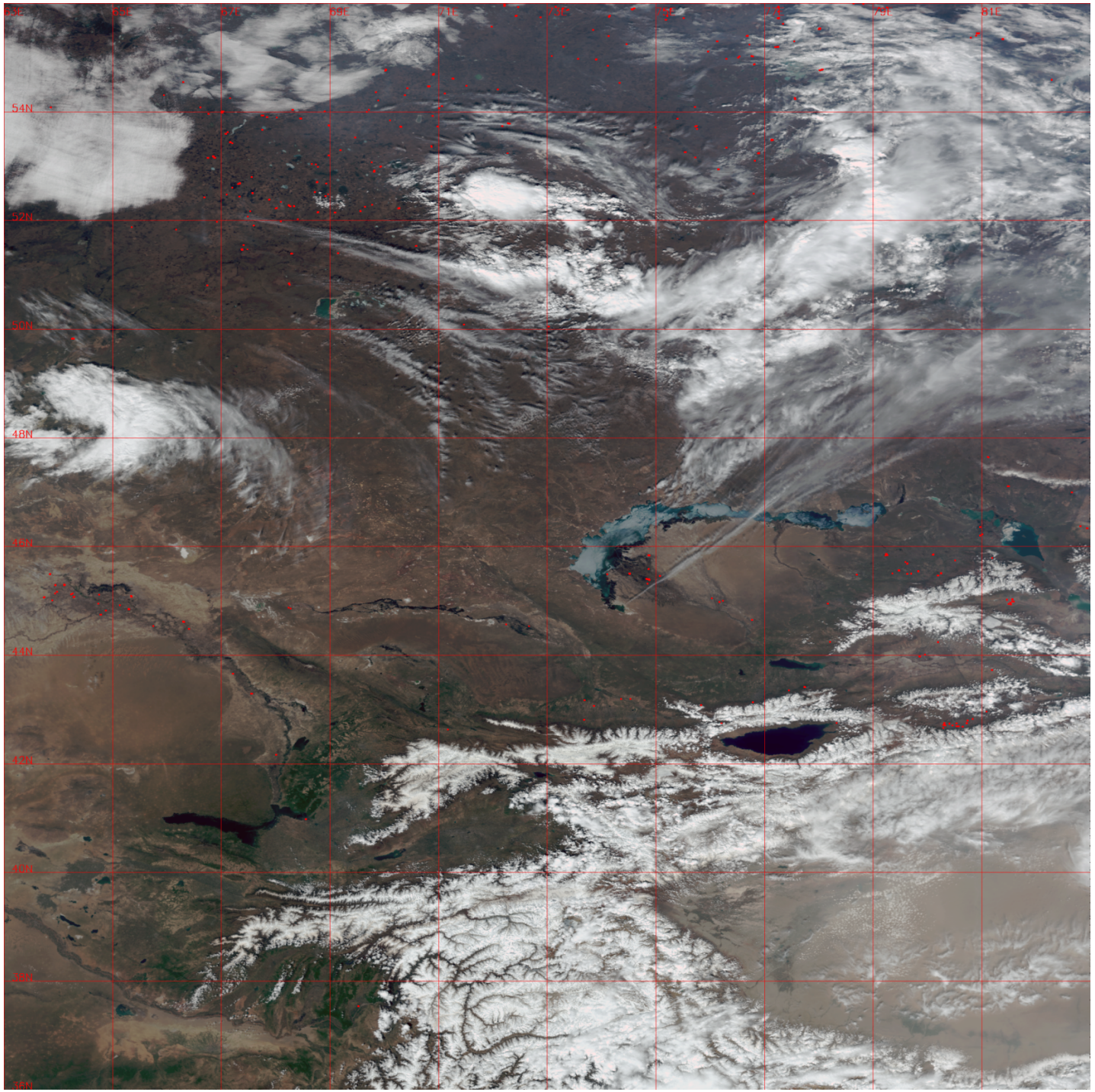
Suomi NPP Active Fire Detections



SE US

M5-M4-M3 RGB
+
IDPS Active Fire ARP

VIIRS 04 April
2012
18:43UTC



NPP VIIRS

Central Asia

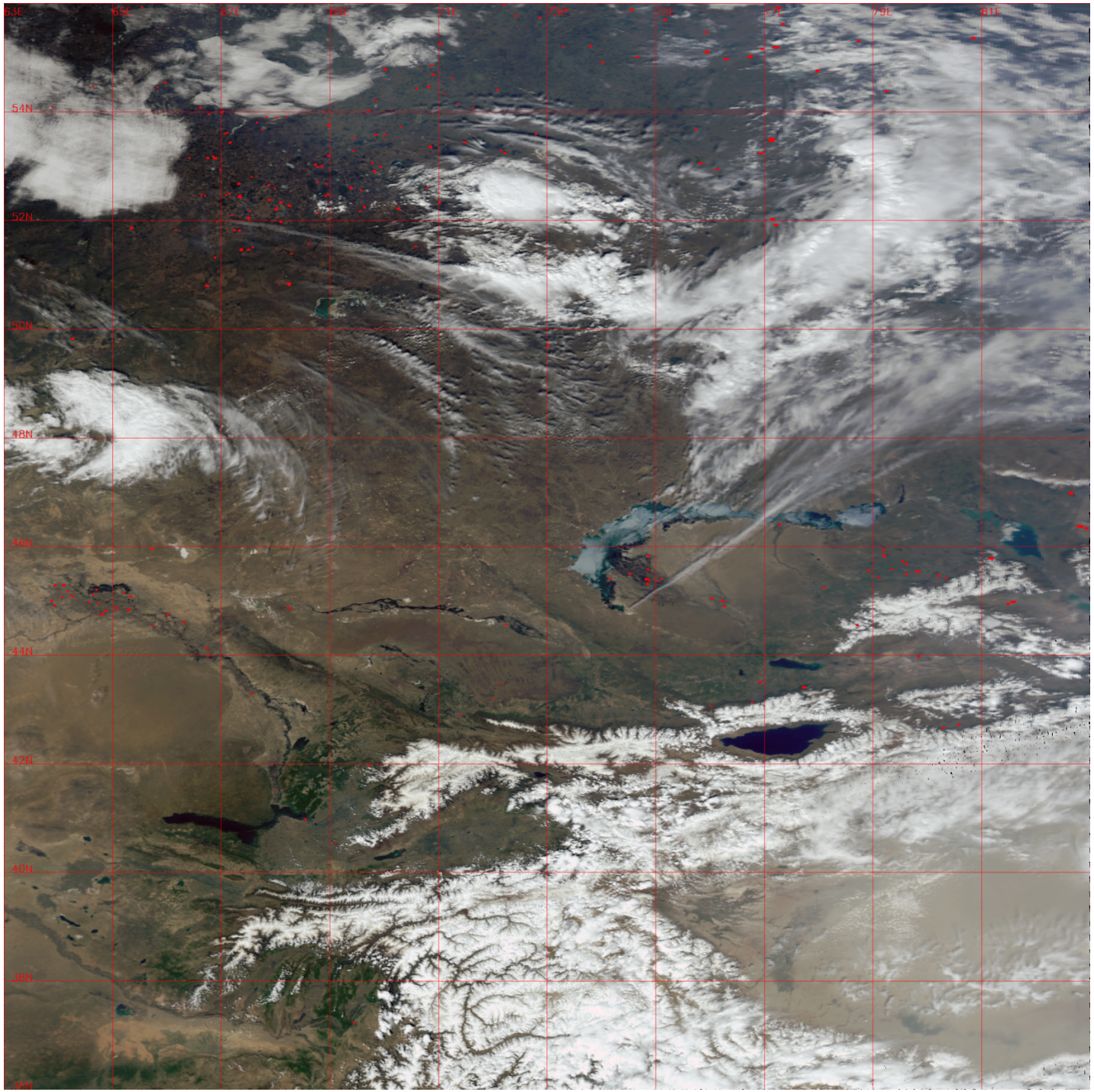
April 13 2012

7:53 UTC

M5-M4-M3 RGB

+

IDPS Active Fire ARP



Aqua MODIS

Central Asia

April 13 2012

8:18 UTC

Band 1-4-3 RGB
+
MYD14

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Release Info
- » Version 6.0.1.2 August 2, 2012

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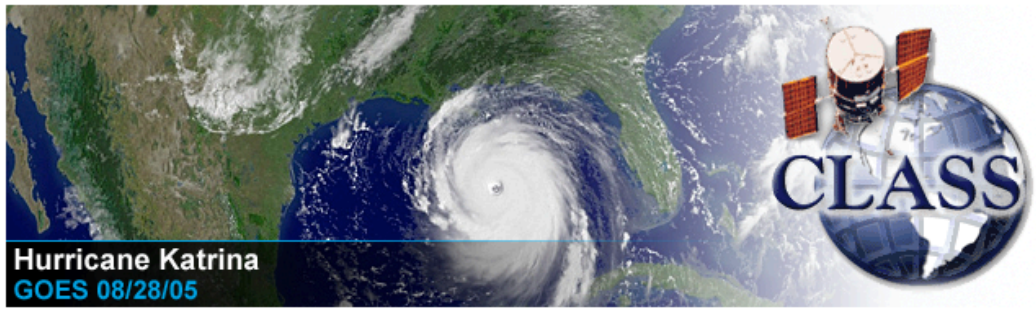


NEWS

Suomi NPP data access status:
VIIRS RDR and SDR products along with CrIS SDR and RDR products are the latest products to be released to the public and can be ordered through CLASS. Please go to the **Suomi NPP FAQ** page to view the list of all products and dates ranges that are available. The remaining NPP products will be released to the user community over a time frame of several months.

Please note that all newly released products are at 'Beta' maturity level as defined in the **Product Maturity Level page**. Details of high priority issues related to the data quality are contained in the Readme files provided by the NPP Project Scientist. All users are encouraged to read these before ordering and using the data. The following Readme files are provided

Readme for released S-NPP OMPS SDR data
Readme for released S-NPP CrIS SDR data
Readme for released S-NPP VIIRS SDR data
Readme for released S-NPP VIIRS Non-NCC Imagery EDR data

Tutorial for ordering Suomi NPP data in CLASS:
A tutorial for ordering data through CLASS can be found at **Data Access**. The tutorial references Suomi NPP data but is applicable to all data types. If you have any questions please email **CLASS Help Desk**.

SEARCH FOR DATA

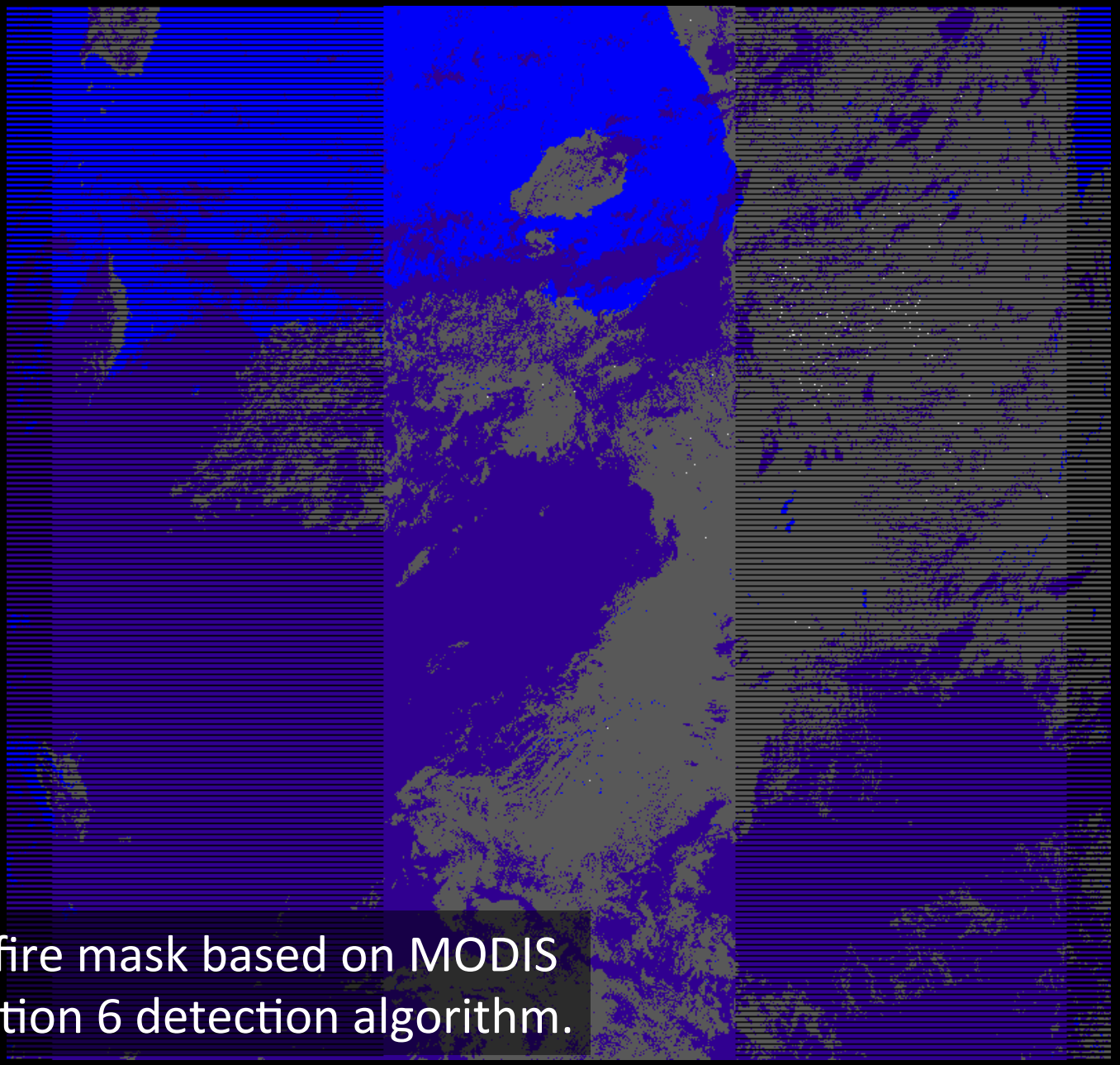
- ⊞ Environmental Data from Polar-orbiting Satellites
- ⊞ Environmental Data from Geostationary Satellites
- ⊞ Defense Meteorological Satellite Program (DMSP)
- ⊞ Suomi National Polar-orbiting Partnership (NPP)
- ⊞ Sea Surface Temperature data (SST)
- ⊞ RADARSAT
- ⊞ Altimetry / Sea Surface Height Data (JASON-2)
- ⊞ Global Navigation Satellite Systems (GNSS)
- ⊞ Other - Miscellaneous products in CLASS

SEARCH COLLECTION METADATA

» GO

Overview of VIIRS Active Fire Product

- Current standard product offers limited compatibility with long-term MODIS data record
- Improved science-quality product based on MODIS Collection 6 algorithm is being developed



VIIRS fire mask based on MODIS Collection 6 detection algorithm.