

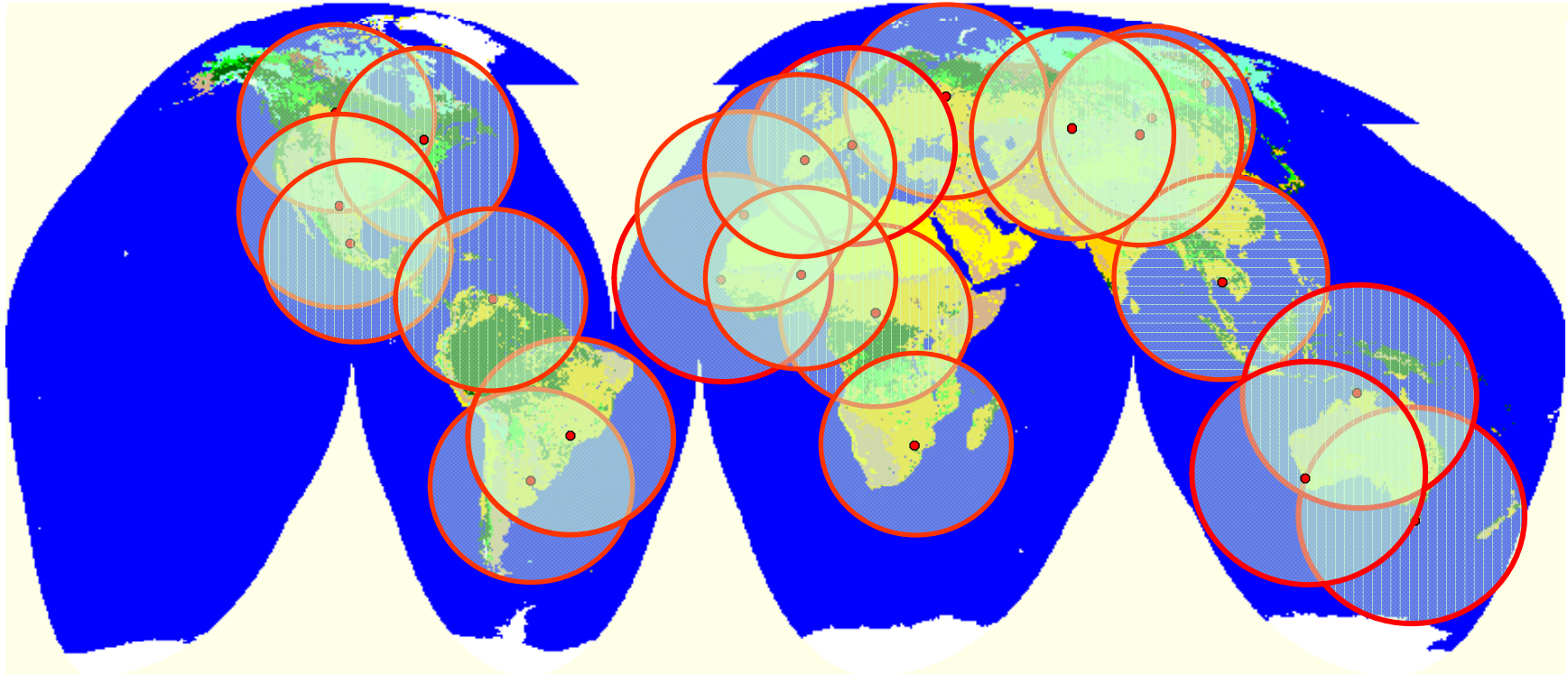
Evolution of Fire Monitoring From Space

- 1980's (Laying the foundations)
 - **NOAA AVHRR** LAC/HRPT (1km data) first used to detect fires (Matson)
 - Basic Detection Algorithm Development (Dozier et al.)
 - AVHRR Amazon fires and deforestation - Setzer /Tucker
 - IGBP IGAC Biomass Burning Experiments (BIBEX) focus on fire emissions (Andreae et al.)
 - Dahlem Conference on Fire - the Global Fire Information System Concept (Crutzen et al.)

Evolution of Fire Monitoring From Space

- 1990's (atmospheric chemistry, fire ecosystem disturbance)
 - INPE established routine AVHRR HRPT fire monitoring of the Amazon (Setzer)
 - Trace A - SAFARI '92 Campaign – African Savanna Fires and Emissions (link to tropospheric ozone anomaly, Atm.Chem)
 - **GOES** ABBA Fire Detections (Menzell, Prins et al)
 - **AVHRR 1km contextual algorithm** (Kendall /Giglio,)
 - DECAFE - EXPRESSO African Fire Experiments – France, LERTS
 - AVHRR GAC 5km - Global Active Fire – Dwyer, JRC
 - IGBP-DIS International Data Coordination 1km Global Data Set (Land Cover) 1992 – Eidenshink et al. USGS
 - **Global 1km Fires** – Malingreau, Eva et al. JRC
 - World Fire Web: network of distributed AVHRR HRPT stations and products – JRC
 - **DMSP** OLS Low Light Detections (Elvidge)

AVHRR Ground Station Network Coverage on June 2001



Required International Cooperation

22 regional nodes in 17 countries
1 network support centre (JRC-Ispra)

GOES Wildfire ABBA Fire Composite Web Distribution

Animations of Wildfire ABBA composite image products are being provided via anonymous ftp and the web every half-hour at:
<http://cimss.ssec.wisc.edu/goes/burn/wfabba.html>

Displays include three overviews and 35 regional views providing coverage of the entire Western Hemisphere.

Examples of Regional View Sectors

Links to Regional Views North America (GOES-8)



GOES-8: Western Canada
- loop of the last 12 Hours
- loop of the previous 12 Hours



GOES-8: Ontario and Western Quebec
- loop of the last 12 Hours
- loop of the previous 12 Hours



GOES-8: Northeastern US and Eastern Canada
- loop of the last 12 Hours
- loop of the previous 12 Hours



GOES-8: Western USA
- loop of the last 12 Hours
- loop of the previous 12 Hours

Links to Overviews



North America GOES-8 Overview:
- loop of the last 12 Hours
- loop of the previous 12 Hours

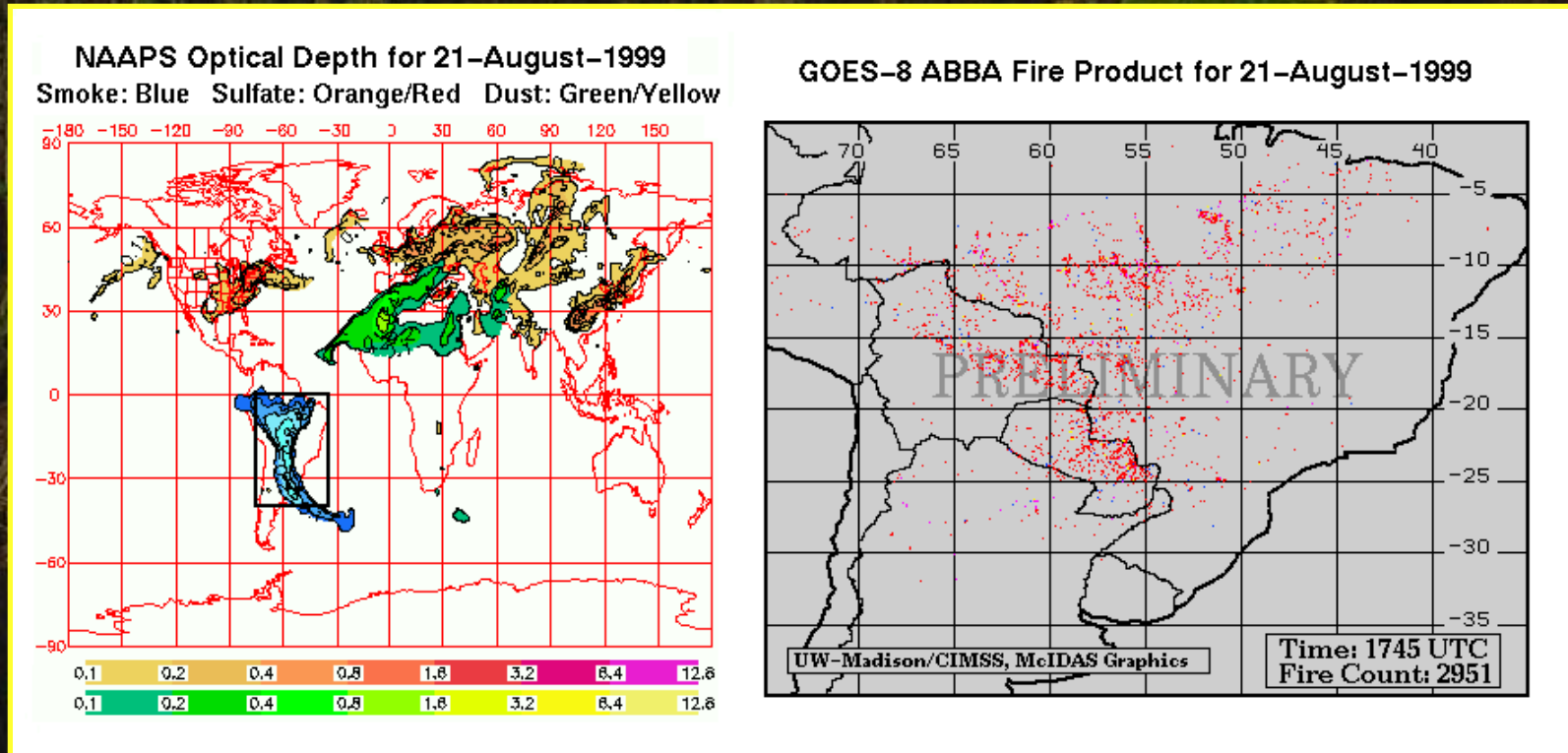


South America GOES-8 Overview:
- loop of the last 12 Hours
- loop of the previous 12 Hours



North America GOES-10 Overview:
- loop of the last 12 Hours
- loop of the previous 12 Hours

Fire Model Data Assimilation Activities



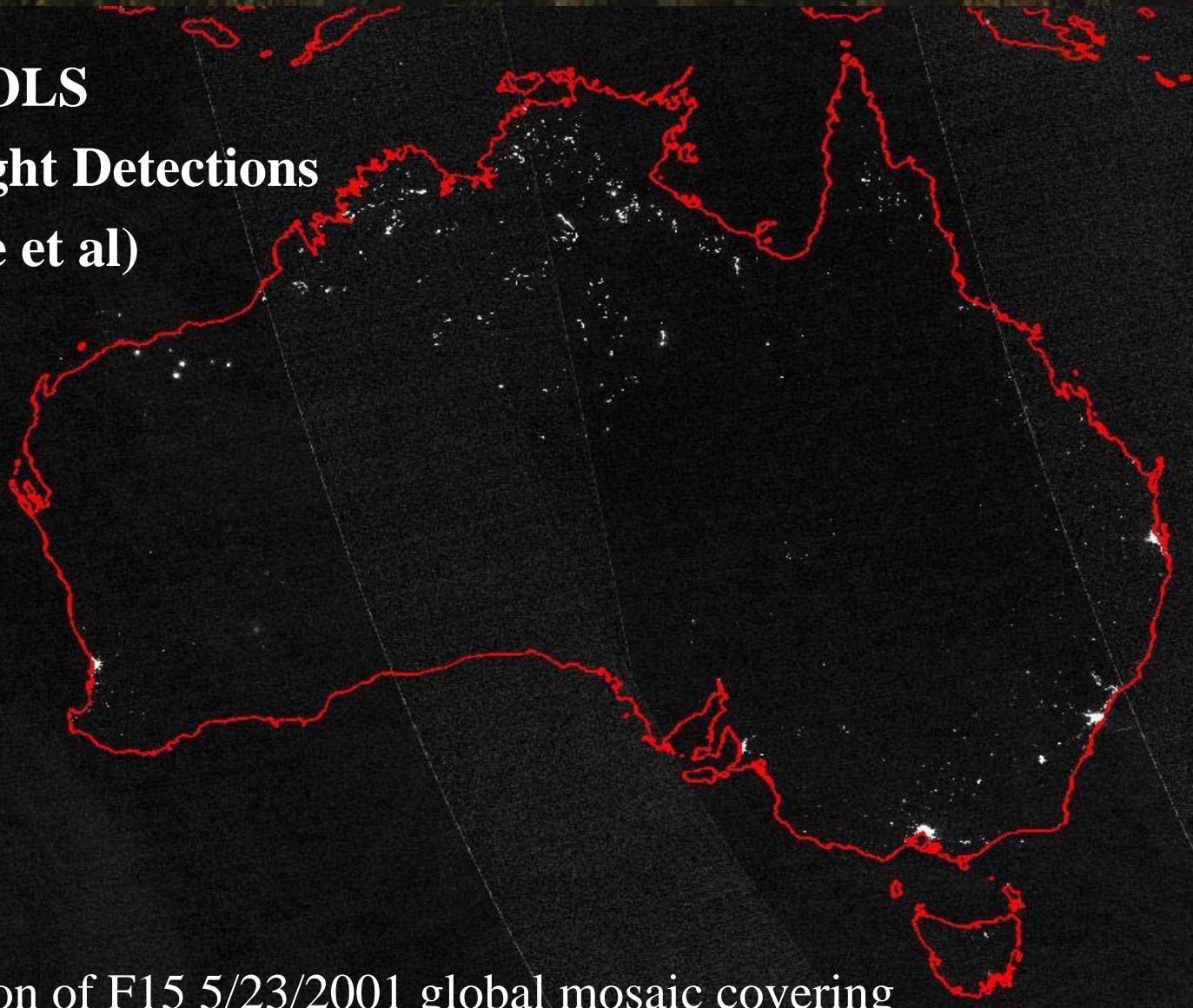
At the Naval Research Laboratory (NRL) GOES ABBA fire product information is being assimilated into the Navy Aerosol Analysis and Prediction System (NAAPS) to analyze and predict aerosol loading and transport in near real time



DMSPP OLS

Low Light Detections

(Elvidge et al)



Section of F15 5/23/2001 global mosaic covering Australia exhibiting fires in the north and city lights.

Global Observation of Forest Cover





ESA ATSR World Fire Atlas

308 or 312K

– 3.7 μ m channel

Global

1995-present

ATSR-2 + AATSR

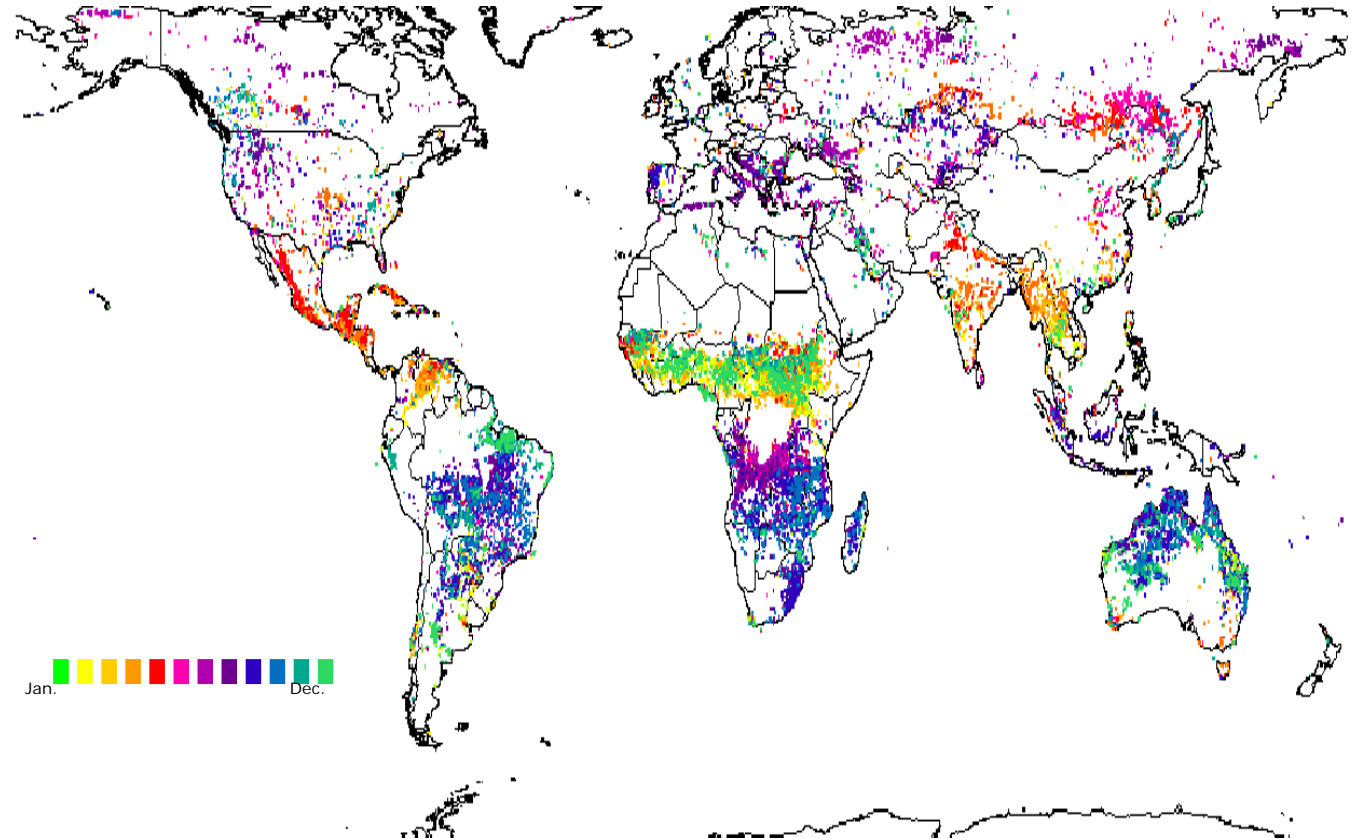
1km*1km

3-day repeat

monthly files in ascii format (Date, Lat and Long)

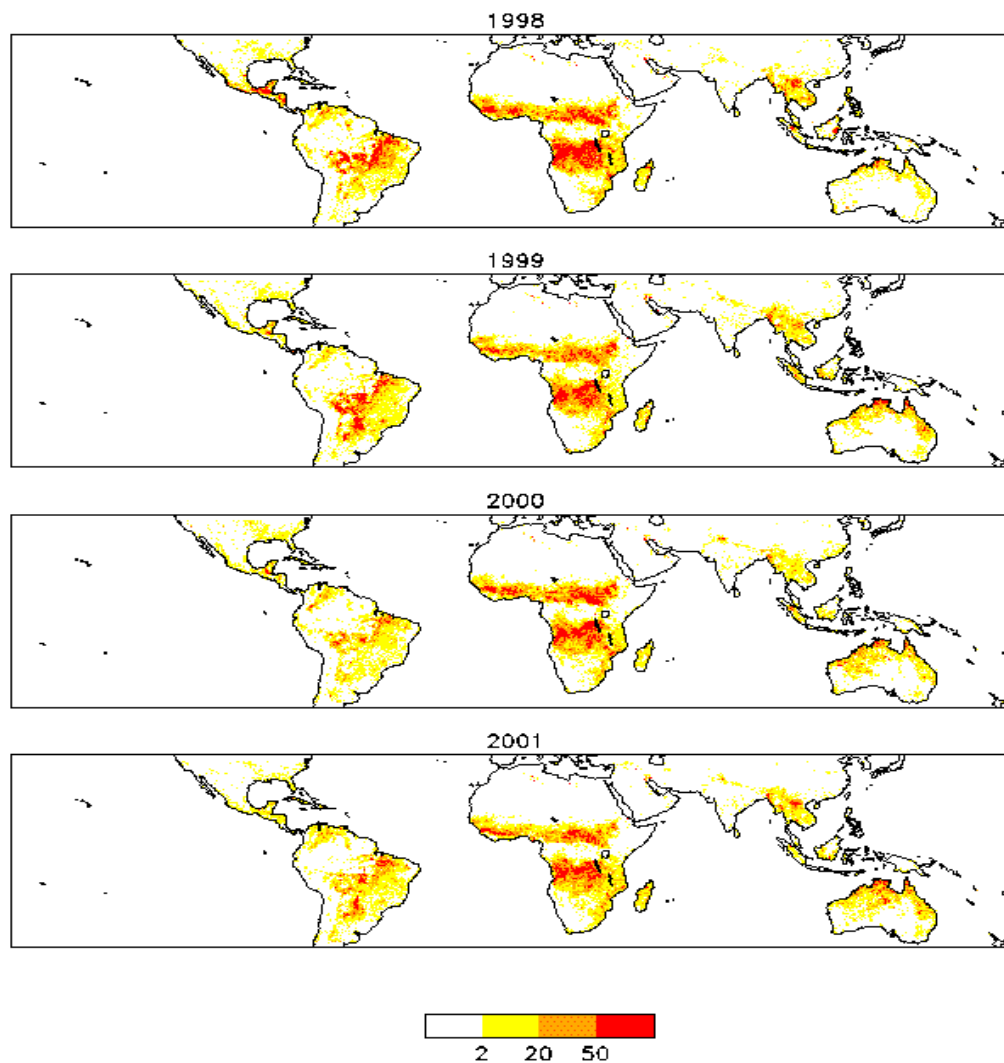
<http://earth.esa.int/ionia>

Underestimation, industrial sites not masked, night-time



TRIMM/VIRS Fire Counts

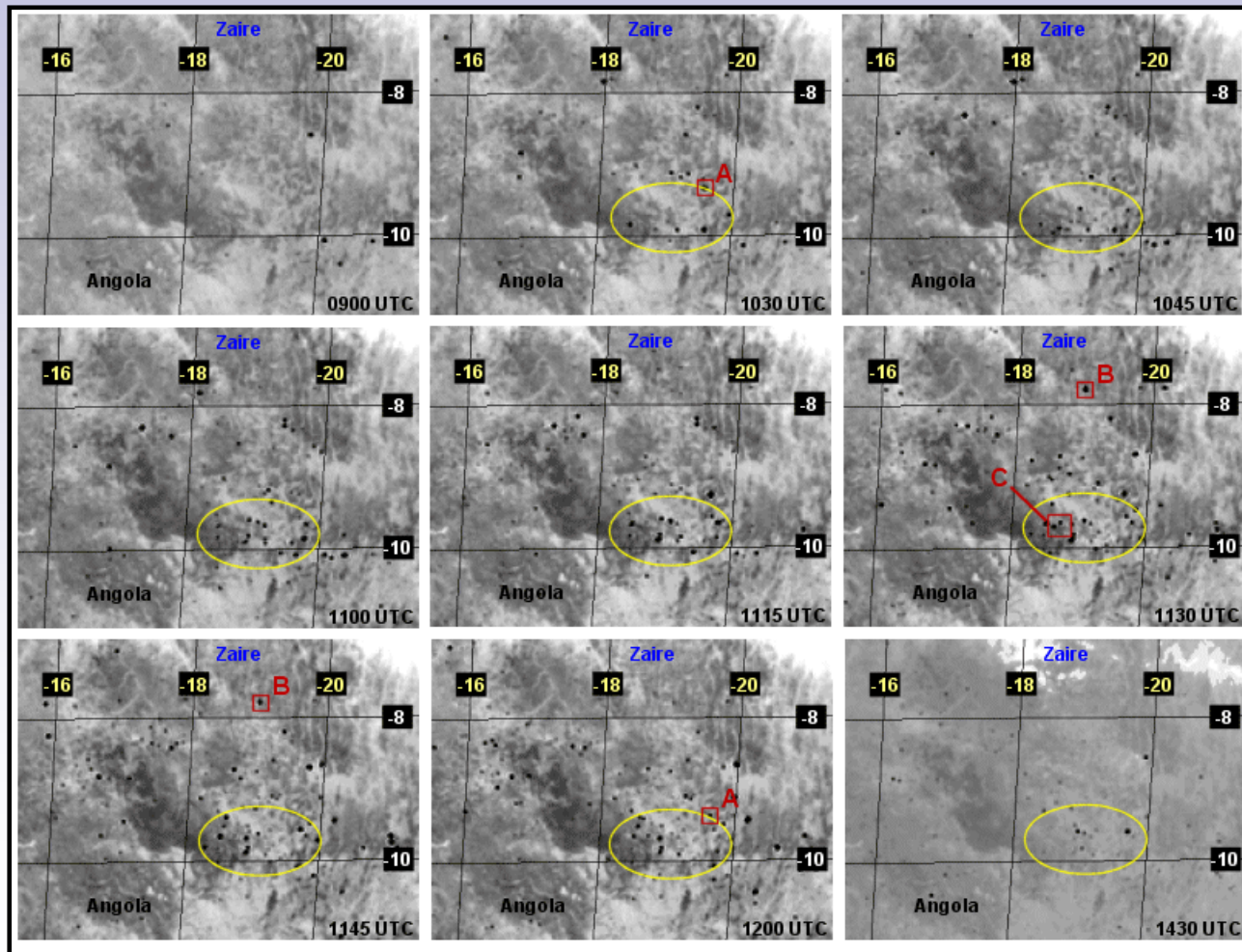
TRMM VIRS Annual Corrected Fire Counts



Evolution of Fire Monitoring From Space

- 2000's (emerging climate / carbon cycle science)
 - SAFARI 2000 Southern Africa (and Miombo network > SAFNET)
 - Airborne Fire Sensor Development (NASA AMES/USFS)
 - **MODIS** Active Fire (Giglio, Kaufman et al. 2000,> Csiszar, Schroeder)
 - **BIRD** (Bispectral and Infrared Remote Detection) satellite (DLR 2001)
 - Globscar **ATSR-2** – ESA global burn scars (Arino et al)
 - IGAC/GOFC Fire Emissions Workshop, UMd (July 2002)
 - Fire Radiative Power **MSG** / MODIS (Kaufman/Wooster et al.)
 - Global Burned Area (GBA 2000) **SPOT Vegetation** (Gregoire /Tansey)
 - Regional Fire/Burned Area Data and Emissions Initiatives
 - Examples: Russia/FSU (Bartalev), Canada (Lynham), Europe EFIS (San Miguel), Latin America (Chuvieco/Cruz et al. - Redlatif)
 - Expansion of MODIS Ground Station Products (DRL, U. Wisconsin)
 - US (RSAC), Brazil (Artaxo, Setzer), Mexico (Cruz, Schmidt), South- Africa AFIS (Frost), Thailand (Verachai) etc
 - GFED Emissions Data Base (Randerson, van der Werf, Giglio et al.)

EUMETSAT Meteosat Second Generation (MSG) 3.9 micron Fire Observations in Africa



Providing 15-30 minute observations – tracking the diurnal variability of fire

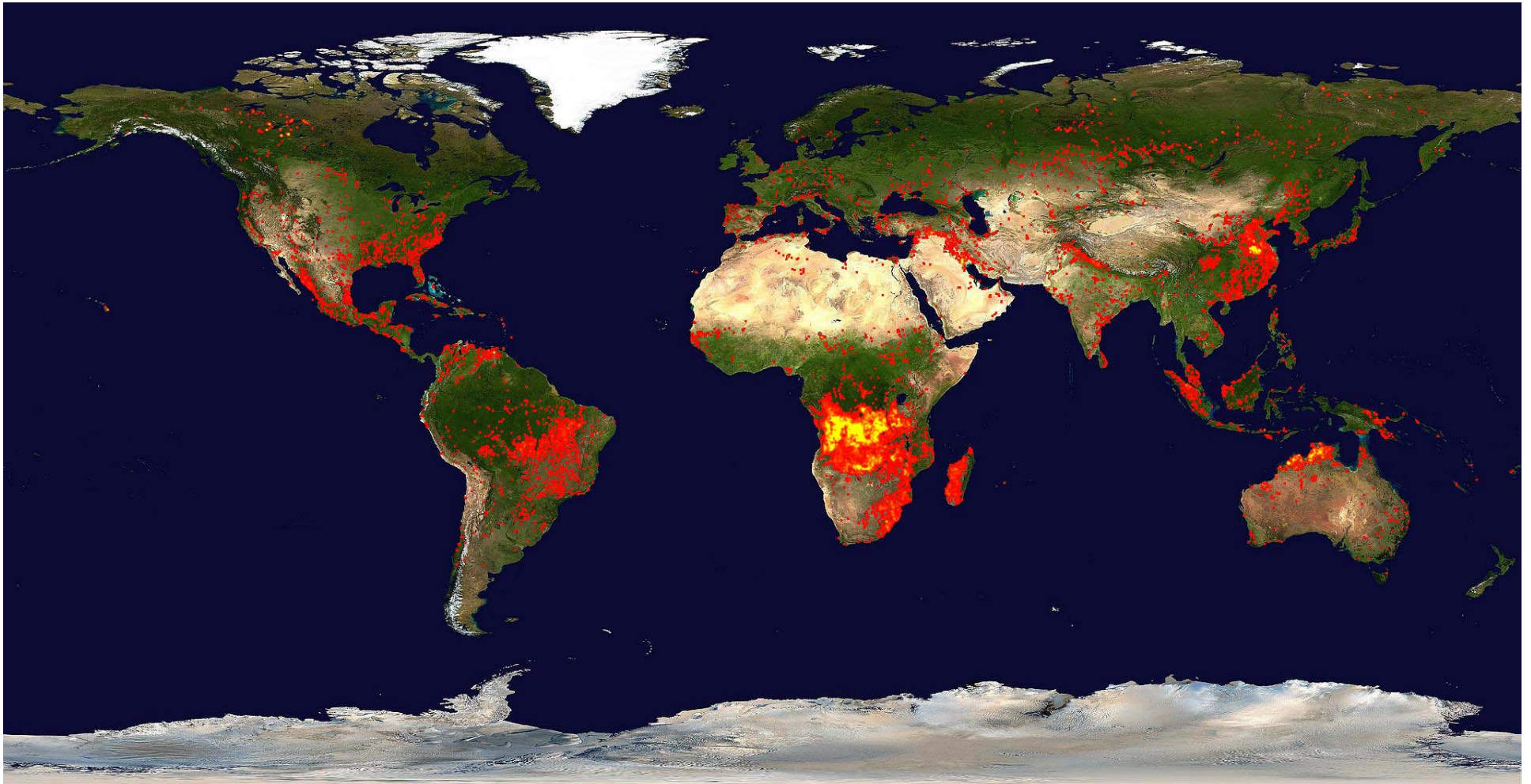
MODIS Active Fire detection product

hot-spot at time of Terra and Aqua overpass
(MOD14/MYD14)

- Daily 1km, 8 day 1km, 0.25 deg. monthly
- Location and time of active fire detection
- Fire Radiative Power [Units: W]
- New Global Data sets generated for Collections 1, 3, 4, 5, 6

Satellite Detection of Fires Burning Last 10 days

MODIS Active Fire Detections 6/10 – 6/19 2014

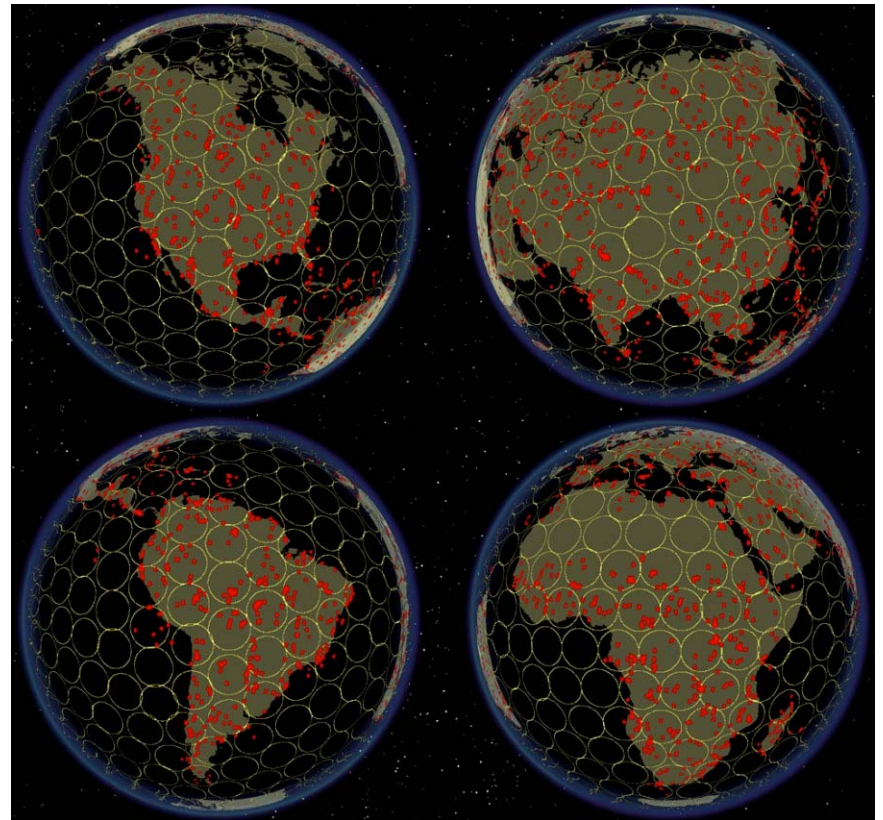


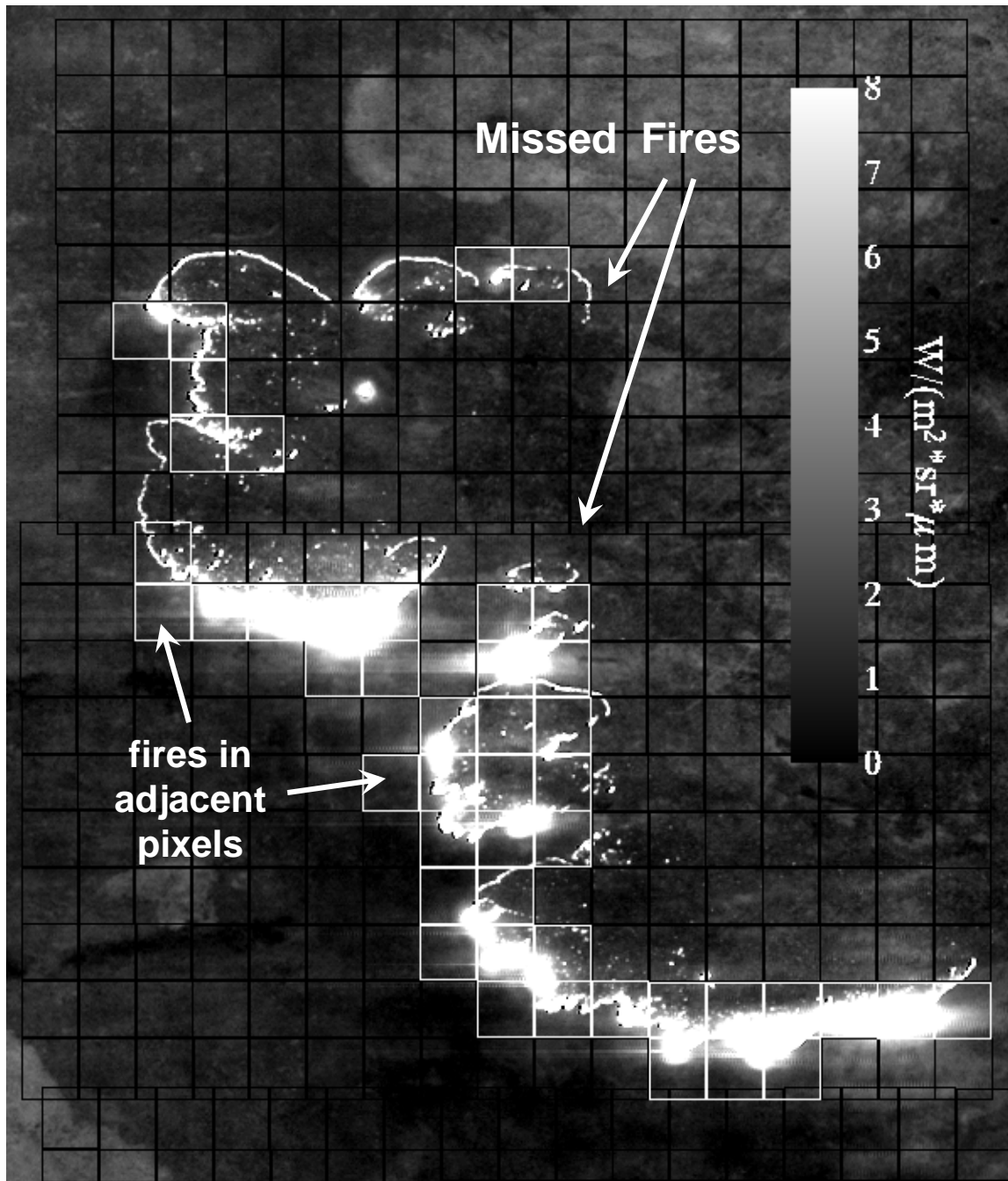
Compiled Daily Observations taken by the NASA MODIS Terra/Aqua Satellites

Global Validation of MODIS Active Fire Product

- 2500 ASTER scenes from 2001-2006
- ASTER algorithm (Giglio)
- Builds on earlier regional studies by Morisette et al. (2005), Csiszar et al. (2006), and Schroeder et al. (2008a,b)

CEOS LPV Stage 3 Validation “product accuracy has been assessed and the uncertainties in the product well established via independent measurements in a systematic and statistically robust way”





MODIS Active Fire Product Validation

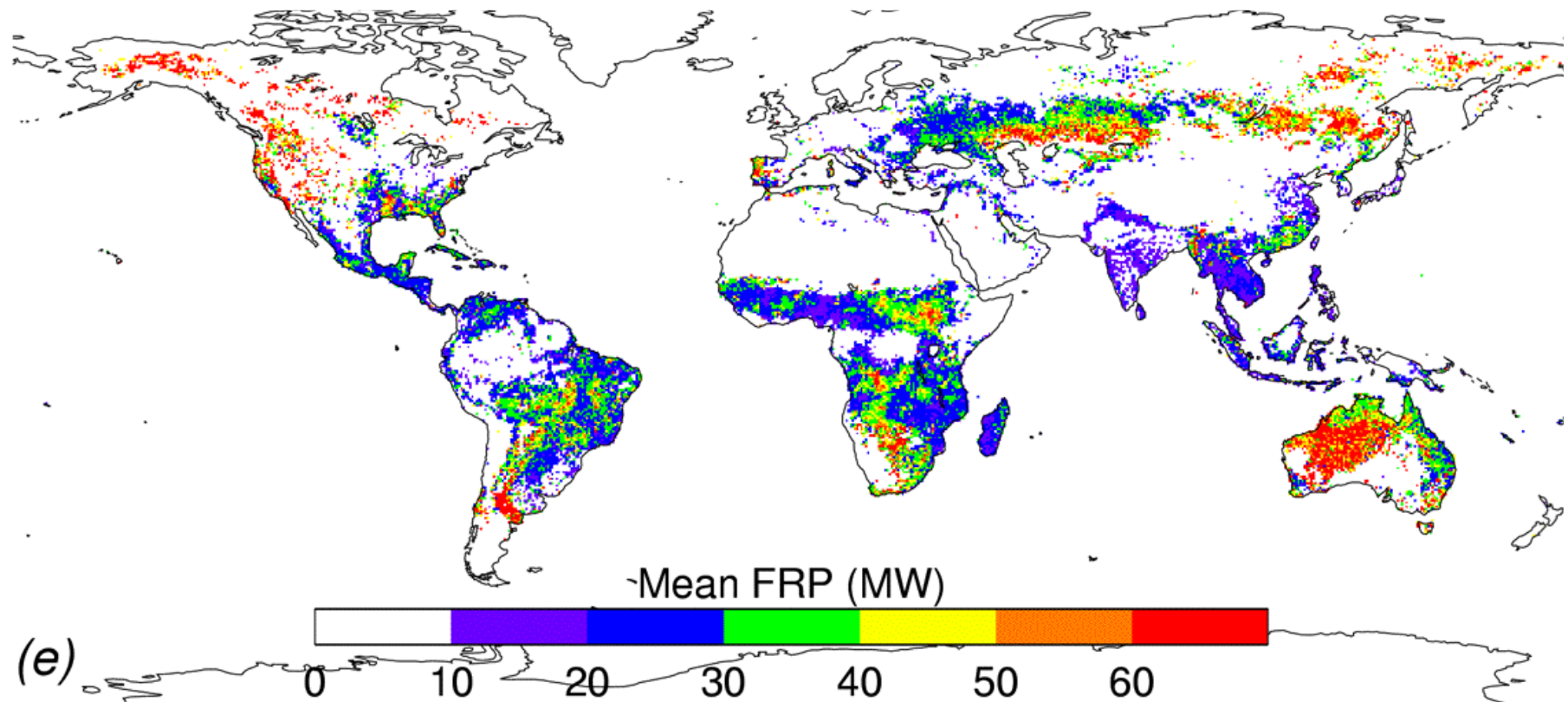
by comparison with contemporaneous ASTER data

ASTER image

MODIS 1km observations (squares)

White squares: MODIS observations flagged as "fire" by MOD14

Global Characterization of active fire properties



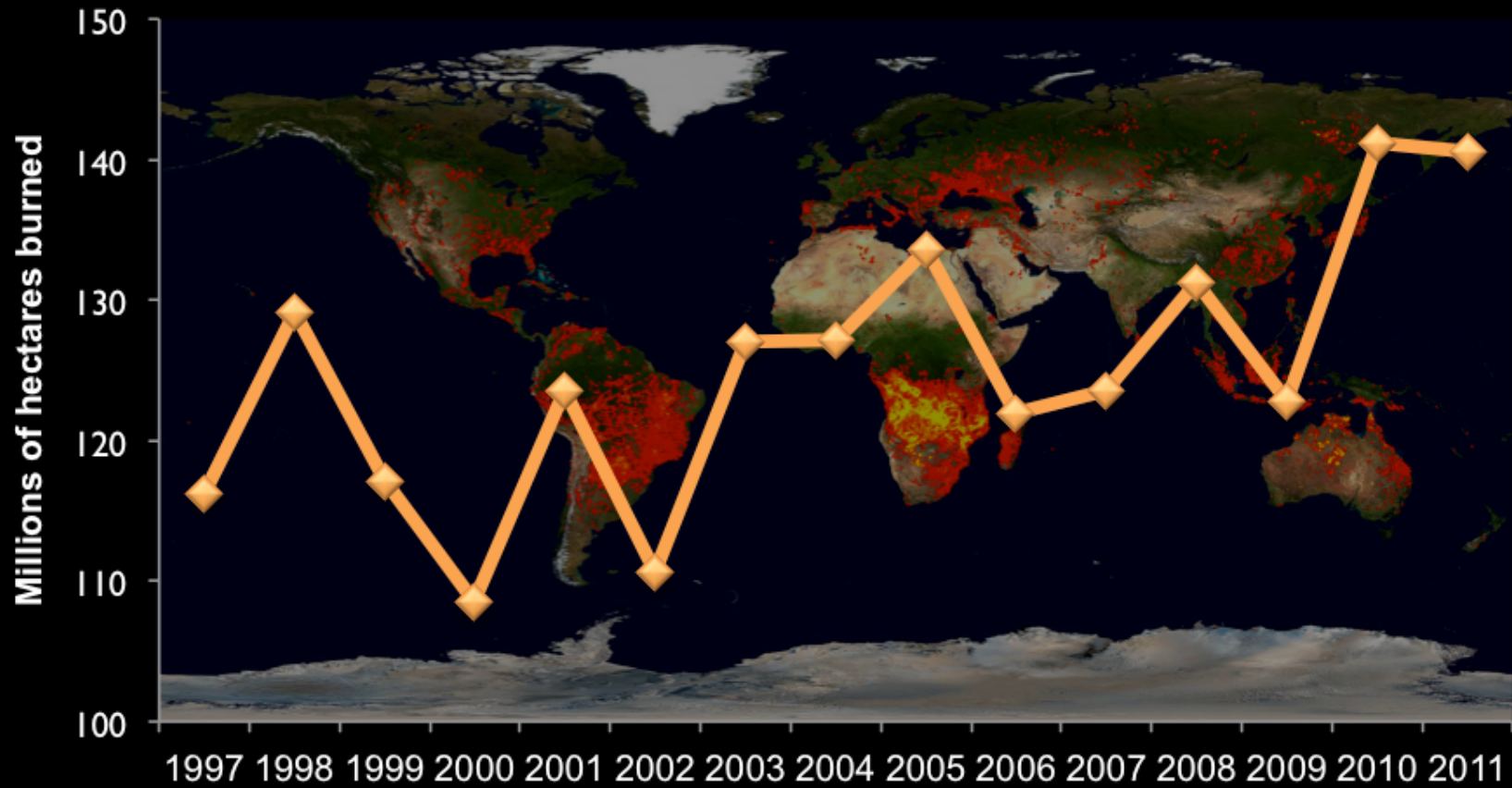
Mean Fire Radiative Power
Radiant heat energy liberated per unit time
(Terra MODIS mean ; Nov. 2001 - Oct. 2005)

Giglio et al.

Global Fire Emissions Database (GFED)

Active Fire Data ED

Southern Hemisphere Africa Fire Trend



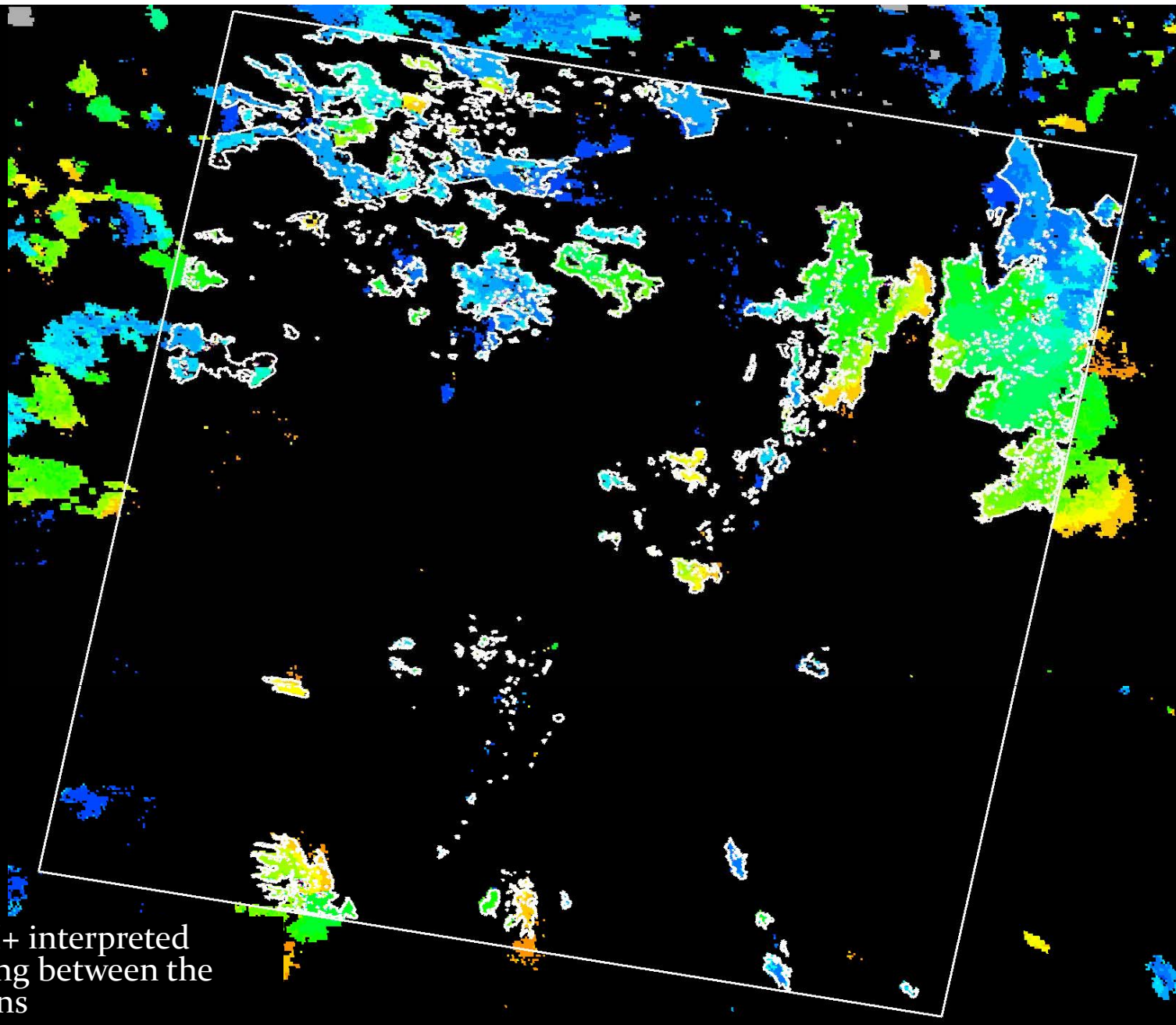
Burned area data from satellite-based Global Fire Emissions Database (GFED)

MODIS Burned Area product (MCD45)

- 500m Location and approximate day of burning
- Day of burning stored as a monthly product
- Generated for Collection 5.1

MODIS
500m
Burned Areas

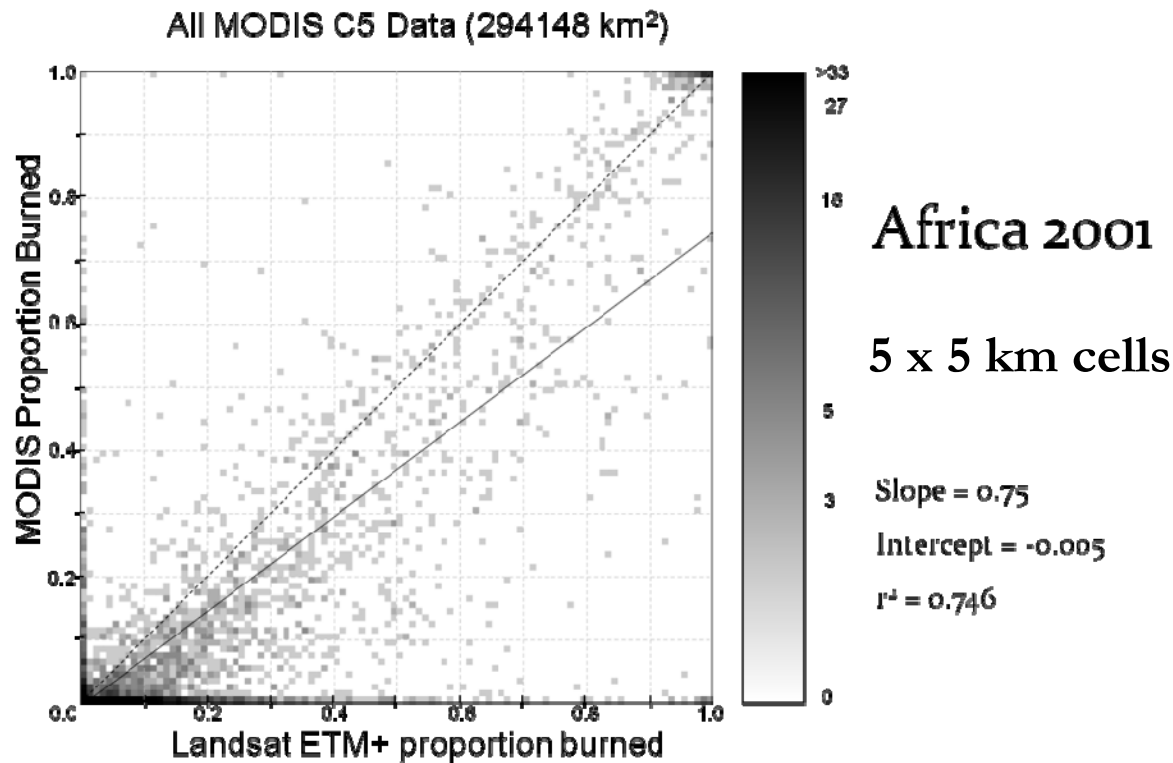
Time 1 Sept. 4
to
Time 2 Oct. 6



White vectors = ETM+ interpreted
burned areas occurring between the
two ETM+ acquisitions

Validation Metrics

- Regression – regional spatial accuracy assessment



- Confusion matrix statistics (overall, user's & producer's accuracy) – pixel level accuracy assessment

Working Group on
Calibration & Validation



Land Product Validation Subgroup

(Validation = independent Accuracy Assessment)

Established in 2000
as a subgroup of the
Committee on Earth Observing Satellites:
Working Group on Calibration/Validation

Linked through
www.wgcvceos.org

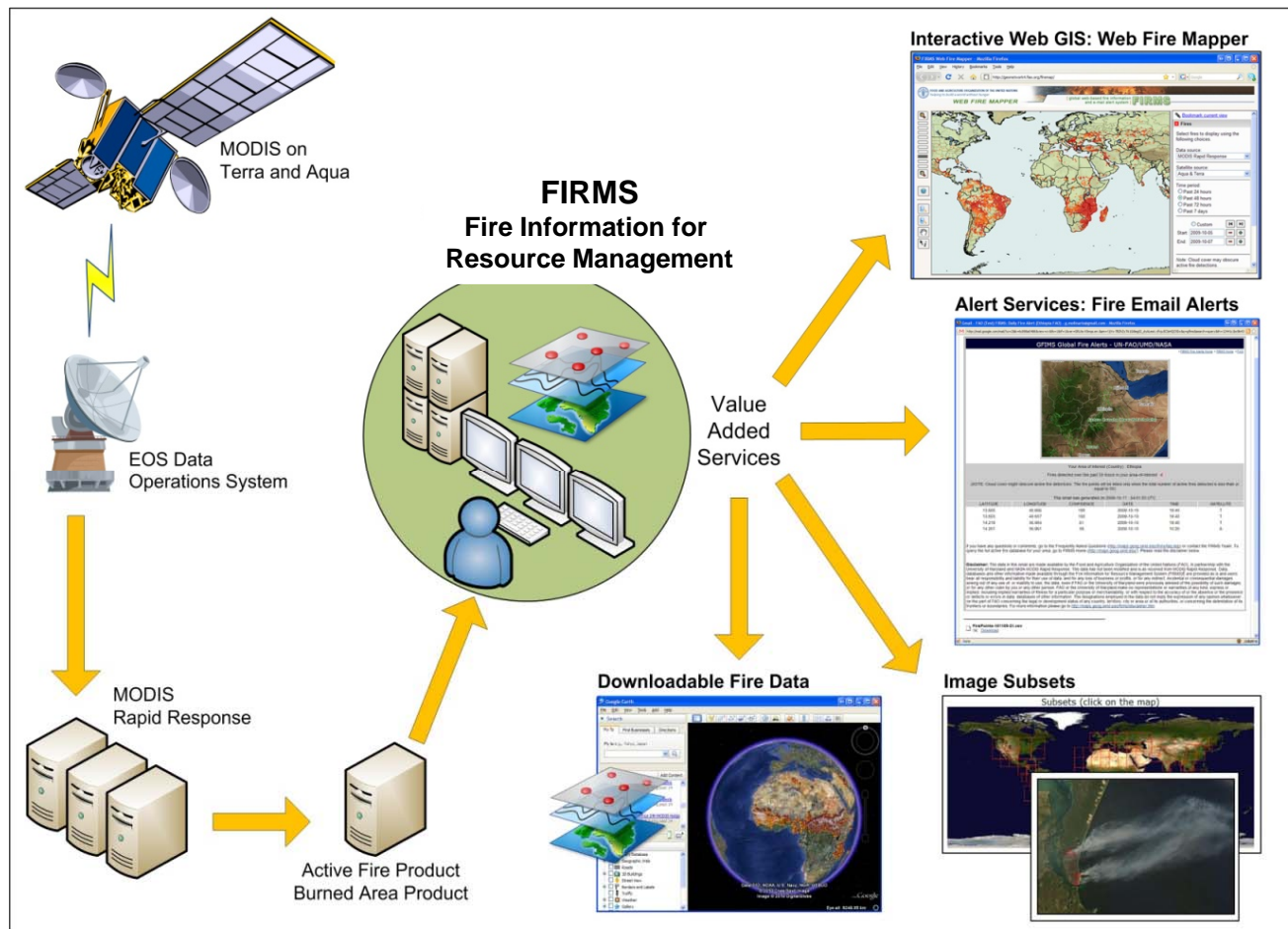
Alan Belward, Jeff Morisette, Fred Baret





Fire Information for Resource Management System

(FIRMS) providing 4 main tools for accessing fire information in easy to use formats:



- Interactive Web GIS
- Email alerts
- Subsets of MODIS images
- Active fire data downloads (KML, Shape, Text files and plug-ins for Google Earth and NASA World-Wind)

NASA – LANCE: Near Real Time Data

NASA Earth Data

Data Discovery ▾

Data Centers ▾

Community ▾

Science Disciplines ▾

Search EOSDIS ▾



National Aeronautics and
Space Administration

EOSDIS

NASA's Earth Observing System
Data and Information System

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Data Tools

Data Centers

Near Real-Time Data

Standards and References

Near Real-Time Data

Land Atmosphere Near Real-time Capability for EOS

Due to the lapse in federal government funding, the earthdata.nasa.gov website will not be fully supported. Affected systems include: Reverb, ECHO, LANCE, GIBS, URS, Worldview, the Earthdata Collaboration Environment (ECE), and Feedback/support emails.

We sincerely regret the inconvenience.

For more information about available government services, visit USA.gov.

Near Real-Time Data

▶ Data

▶ Visualization

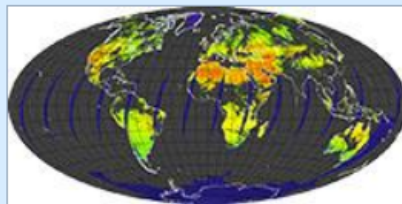
▼ FIRMS

[Web Fire Mapper](#)

[MODIS Global Fire Maps](#)

[Fire Email Alerts](#)

Home > Data > Near Real-Time Data > FIRMS > Active Fire Data



Give us feedback to improve LANCE!

Register for a brief survey to rate the near real-time products and services that NASA currently provides from LANCE. Please provide us with your name and email address to receive an email link from the CFI Group in late October inviting you to participate in the survey.

Global Observation of Forest Cover



2010's

THIS MEETING

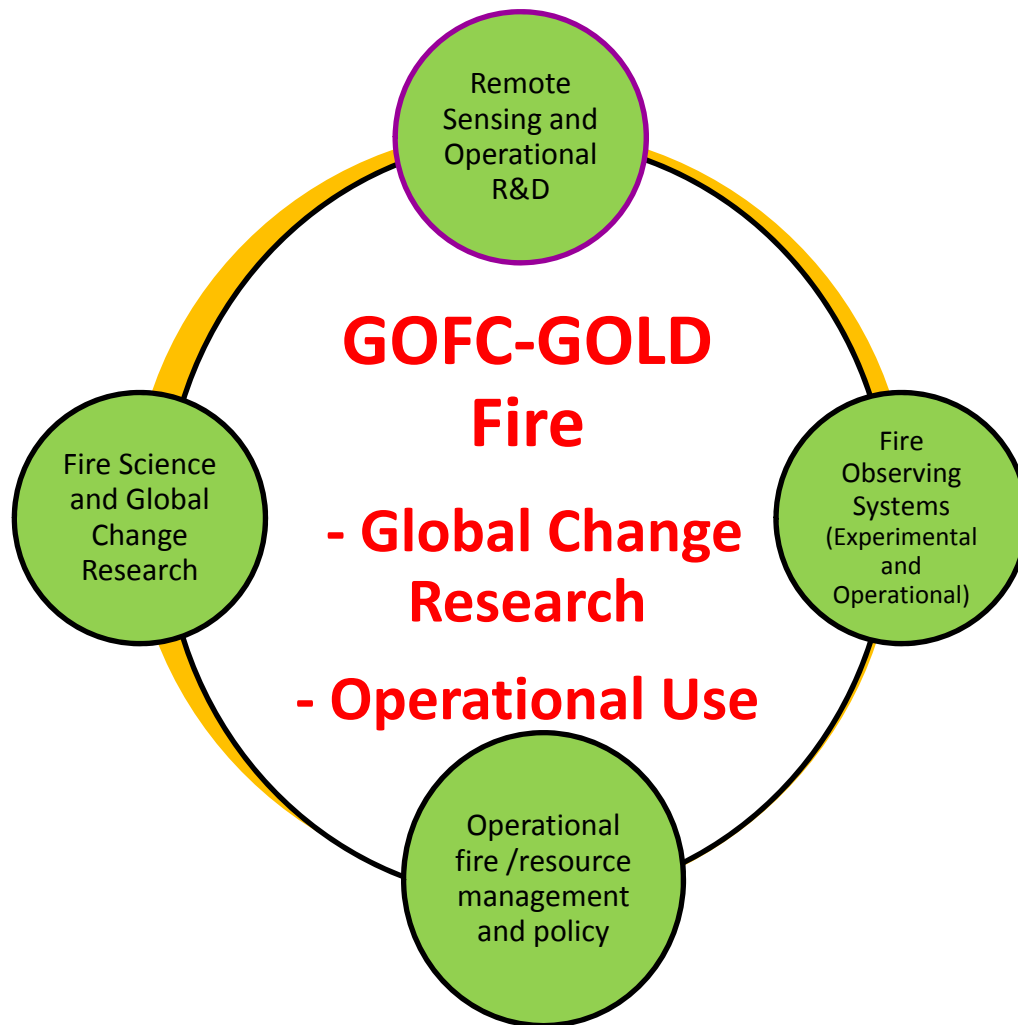
GOFC-GOLD

Global Observation of Forest and Land Cover Dynamics



- Update on the Status of the Fire Implementation Team strategic activities.
- Discussion of recent developments in and future prospects for satellite fire science / applications and new strategic activities.
- Review the current progress of new satellite fire sensing systems e.g. Suomi NPP VIIRS, ESA Sentinels and TET data, processing and products.

The GOFC-GOLD Fire Community



GOFC-GOLD Fire Monitoring & Mapping Implementation Team

Global Observation of Forest and Land Cover Dynamics

HOME PARTICIPANTS PROJECTS RESOURCES REGIONAL NETWORKS MEETINGS CONTACT

Welcome To GOFC/GOLD-Fire

Site Map

- Background
- Implementation Goals
- Objectives
- Documents and Publications
- Related Programs

Current News

04/19/2013 : 04/19/2013
Fire IT Meeting and GOFC symposium at Wageningen University, Netherlands
For more information Click Here

Quick Links

- Upcoming Meetings
- Recent Meetings & Reports
- VIIRS Active Fire Team

GOFC/GOLD (Global Observations of Forest and Land Cover Dynamics) is a project of the Global Terrestrial Observing System (GTOS) program, which is sponsored by the Integrated Global Observing Strategy (IGOS). The main goal of GOFC/GOLD is to provide a forum for international information exchange, observation and data coordination, and a framework for establishing the necessary long-term monitoring systems.

The GOFC/GOLD-Fire Mapping and Monitoring Theme is aimed at refining and articulating the international observation requirements and making the best possible use of fire products from the existing and future satellite observing systems, for fire management, policy decision-making and global change research.

GOFC/GOLD is promoting a self-organized regional networks of data users, data brokers and providers, where closer linkages and collaborations are established with emphasis on an improved understanding of user requirements and product quality. GOFC/GOLD-Fire is pursuing, in a joint effort with the Committee on Earth Observing Satellites (CEOS) Working Group on Calibration and Validation (WCV) Land Product Validation (LPV) subgroup, the coordinated validation of fire products by standardized protocols.

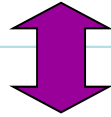
GOFC/GOLD-Fire is partnering with the Global Fire Monitoring Center (GFMC), and the United Nations International Strategy for Disaster Reduction (UNISDR) Wildland Fire Advisory Group / Global Wildland Fire Network.

Site Maintained by Krishna Vadrevu
Website Developed by Jon Nordling

<http://gofc-fire.umd.edu/>

Organization of GOFC-GOLD Fire

GOFC – GOLD Executive Committee

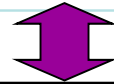


Fire Implementation Team

Co-Chairs: Chris Justice, UMd and Johann Goldammer, GFMC

Fire IT Exec. Officer: Krishna Prasad Vadrevu, UMd

Fire IT Members: Olivier Arino, Luigi Boschetti, Alessandro Brivio, Emilio Chuvieco, Ivan Csiszar, Philip Frost, Louis Giglio, Bill de Groot, Anja Hoffmann, Francesco Gaetani, Eckehard Lorenz, Tim Lynham, David Roy, Jesus San-Miguel-Ayanz, Michael Schmidt, Kevin Tansey, Guido van der Werf, Martin Wooster.



Regional Networks (w. Fire Emphasis)

Coordinator: Anja Hoffman

Regional Networks:

Philip Frost (SAFNET), Alberto Setzer and Isabel Cruz (REDLATIF), Ionnis Gitas (BALKAN Netw.)



International Strategic Partnerships e.g. START, UN ISDR - Wildland Fire Network, CGMS, TOPC, CEOS LPV, GEO Wildfire, EARSEL SIG-Fire, ILDRCC, UN FAO

GOFC/GOLD-Fire IT Goals

Promoting:

- **Increased user awareness of EO fire data**
- **Data and Service Continuity and Long-Term fire data records**
 - **Establishment of a geostationary global fire network**
 - **Operational polar orbiters (coarse and moderate resolution) with adequate fire monitoring capability**
- **Routine Assessment of Fire Product Accuracy and Quality**
- **Global Fire Early Warning Systems - operational products**
- **Use of EO in fire emissions product suites**
- **Improved fire data and information access**
- **Enhanced user products and services**
- **Experimental fire observing systems and related research**

GOFC Fire IT Meeting 2013

U. Wageningen, Holland



Fire IT Program Scope

- **Spaceborne Assets**
- **Derived Data and Information Products**
- **Data Policy, Access and Distribution**
- **Capacity Building for Improved Data Utilization**

Areas of Recent Attention

- **Spaceborne Assets**
 - Fire Monitoring with next generation Operational Polar Orbiters > Data Continuity (e.g. VIIRS, JPSS1, Sentinel 3 SLSTR, ProbaV) > fire related products
 - Moderate Resolution Data Continuity (e.g. Landsat 8, Sentinel 2, ResourceSat, CBERS4)
 - Geostationary Global Fire Network (NOAA and CGMS)
 - Next Generation Fire Sensor Technologies (e.g. TET DLR)
- **Data and Information Products**
 - Regional / Global Burned Area Products Generated (NASA, ESA CCI)
 - Systematic Global BA product validation (e.g. MODIS CEOS LPV Stage 3)
 - Moderate Resolution derived and validated fire products
 - Regional fire emissions modeling and products (e.g. GFED +)
 - Global Fire Early Warning Systems (e.g. CFS / JRC)
 - Multi-source fire data fusion and information integration (e.g. AFIS)
 - Long-Term Fire Data Records (AVHRR 1km > ATSR present)
- **Data and Information Access and Distribution**
 - Near Real-Time Global Daily Active Fire Monitoring (e.g. NASA LANCE)
 - Web-based Fire and Imagery Distribution Systems (e.g. FIRMS, WELD)
 - GeoNetcast Distribution and Mobile Applications
 - Global WildFire Information System (JRC/EC)
 - Coordination between Direct Readout Stations (e.g. ILDRCC?)
- **Capacity Building for Data Utilization**
 - Regional Fire Networks – workshops and initiatives (e.g. SAFNET, CARIN, BALKAN Netw, SEARIN etc.)
 - Increased UN and Regional Fire Monitoring Capability (GFIMS, VNU)

Strategic Priorities for GOFC/GOLD-Fire IT

- Operational fire monitoring capabilities on JPSS VIIRS and METOP, Sentinel 3 SLSTR providing data and product continuity (NOAA/ESA/NASA)
 - including - Near Real Time access to the data
- Space Agency coordination of global moderate resolution data processing and access (Landsat 8, Sentinel 2 (NASA/ESA/USGS), China/Brazil, India (TBD))
- Meteorological Agency support for establishing a Global Geostationary Fire Network (NOAA/CGMS)
- Implementation and regional calibration of operational Global Fire Early Warning Systems (Canada, EC JRC)
- Global Burned Area Products Validation (Stage 3) – NASA/ESA
- Support for the Regional Fire Networks and developing capacity building programs on the use of satellite fire data (START +, NASA)
- Coordination / refinement of requirements of fire observations in support of the International Conventions and articulating implementation methods / best practices
 - ECV's for UN FCCC , CEOS (U. Leicester)
 - Role of Fire in UN REDD (i.e. GOFC-GOLD REDD Sourcebook (U. Idaho w. LC IT U. Wageningen),
 - UN REDD+ Fire Demonstration Projects (TBD)