

Towards a new GCOS Implementation Plan

GOFC-GOLD Meeting
College Park, MD, USA
29-31 July 2014

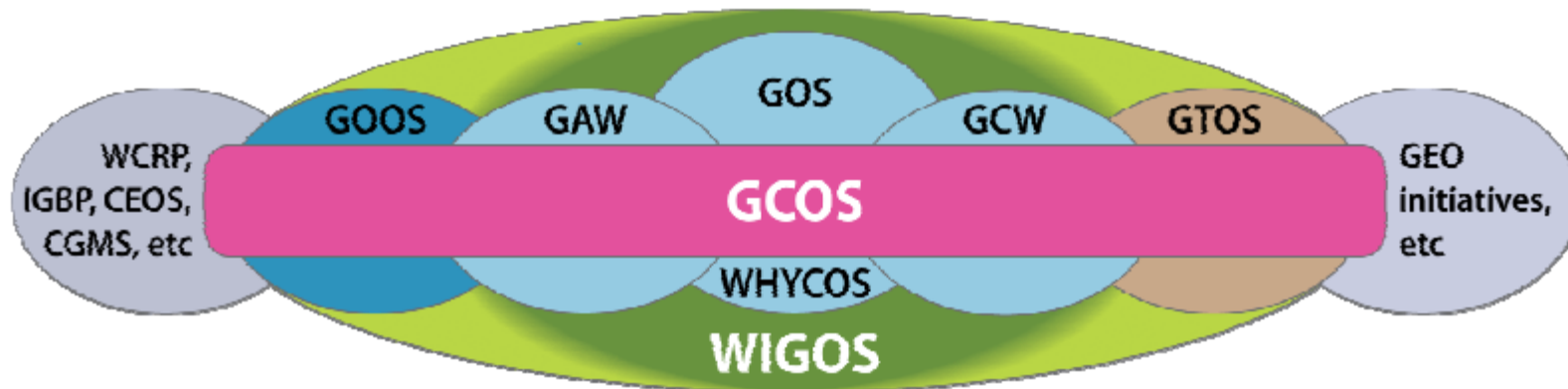


Kevin Tansey

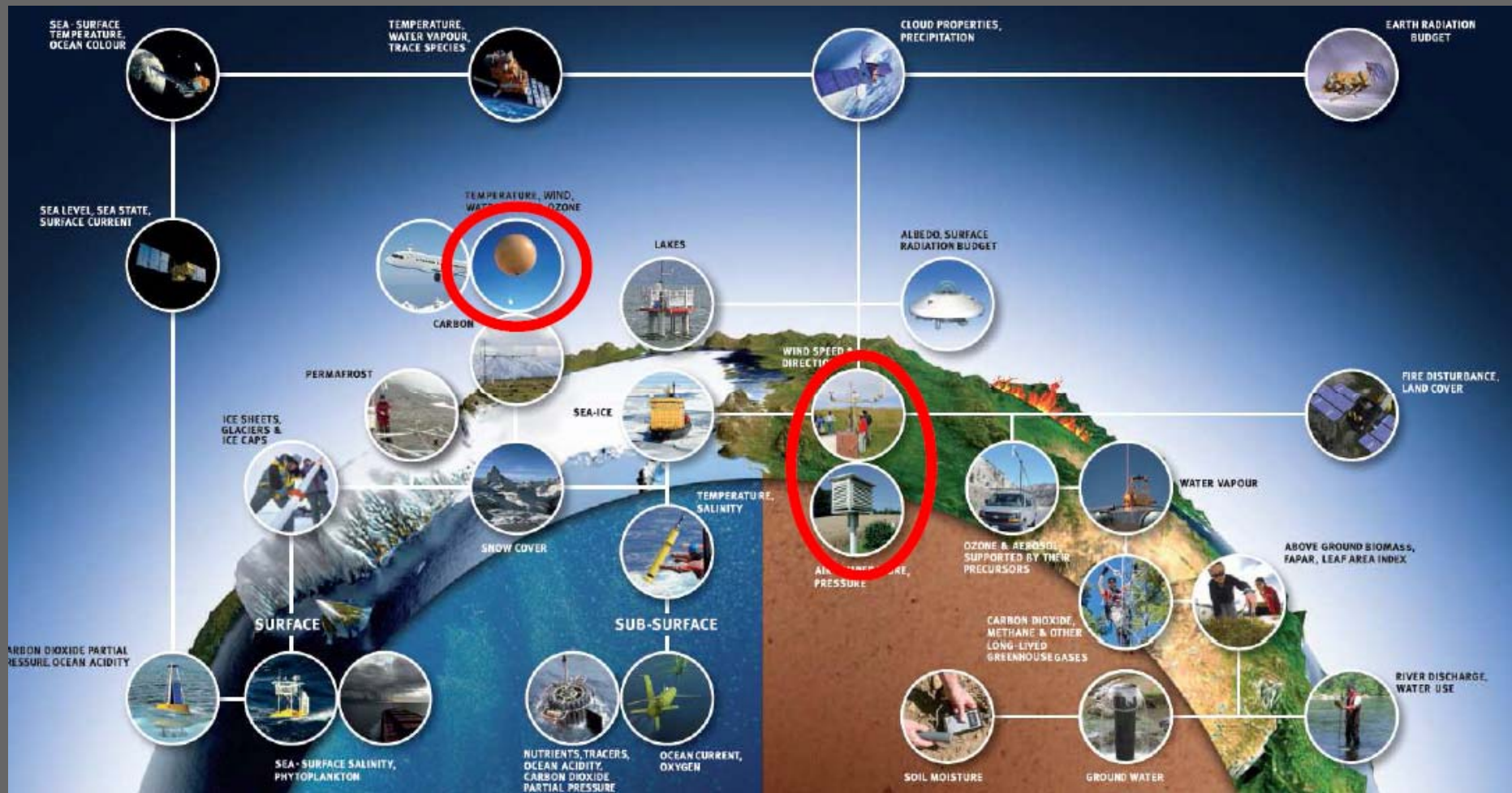


GCOS Concept

Oceans – Atmosphere – Land – Cryosphere – Hydrosphere – Carbon Cycle



- the WMO *observing systems* (e.g. WIGOS – GOS, GCW, GAW)
- the IOC-led co-sponsored *Global Ocean Observing System* (GOOS)
- the FAO-led co-sponsored *Global Terrestrial Observing System* (GTOS)
- observational elements of *research programmes* (WCRP, IGBP, etc.)
- *network systems* contributing climate observations, data management or products (GTNs, GOFC-GOLD, etc.)
- which together form our overall global observing system for climate, and the climate-observing component of the *Group on Earth Observation System of Systems* (GEOSS)



GCOS at 20 years

[Publication](#) Link

[Brochure](#) Link

Restructuring at FAO affecting GTOS

UN Framework Convention on Climate Change (UNFCCC)

(May 1992)

Article 4 Commitments

All Parties shall:

- 1(g) Promote and cooperate in scientific, technological, technical, socio-economic and other research, **systematic observation** and development of data archives related to the climate system.....

Article 5 Research and Systematic Observation

In carrying out their commitments under Article 4, paragraph 1(g), the Parties shall:

- (a) Support and further develop...programs and networks or organizations aimed at defining, conducting, assessing and financing research, data collection and **systematic observation**, taking into account the need to minimize duplication of effort;
- (b) Support international and intergovernmental efforts to strengthen **systematic observation**....particularly in developing countries, and to promote access to, and the exchange of, data and analyses thereof.....

GCOS Continuous Improvement & Assessment Cycle

The GCOS programme has started the process for:

- a 2015 report on the progress and status of climate observation
- a new “Implementation Plan” in 2016, which should identify:
 - continuing and new requirements, including a restatement of the rationale for the list of ECVs and possible amendment of the list
 - the adequacy of present arrangements for meeting the requirements
 - the additional actions needed, with indicative costs, performance indicators and potential agents for implementation
- statements of specific requirements for products
 - from both *in situ* networks and the space-based component
 - and from integration of the data provided by both

either embedded in the main Plan or as separate supplement(s)

Input to the new assessment

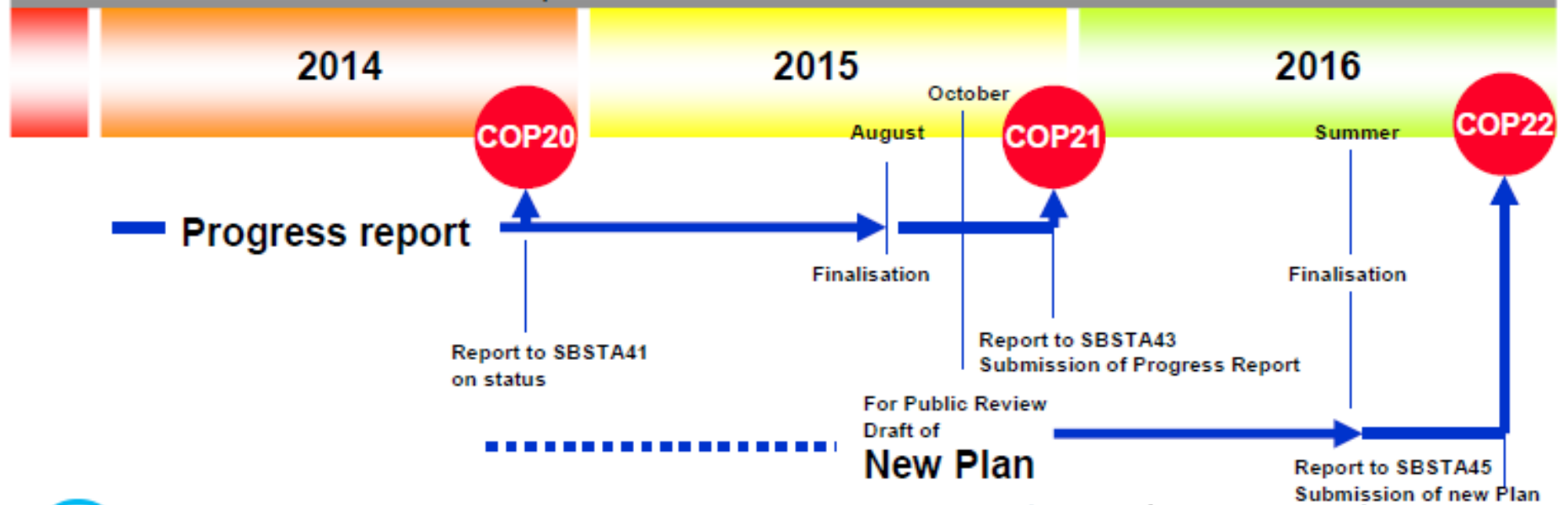
Content will be based on various inputs, including from:

- 2011 WCRP Conference and 2013 SPARC Data Workshop
- 2013/2014 IPCC Fifth Assessment Report
- 2013/2014 national reporting to UNFCCC on systematic observation
- 2014 EUMETSAT/WCRP Climate Symposium
- WMO (GFCS, WIGOS), IOC (GOOS) and post-2015 GEO planning
- CEOS/CGMS/WMO initiatives (Architecture, Inventory of datasets)
- other assessments of requirements (GEO, ESA CCI)
- assessments by GCOS/WCRP panels
- dedicated GCOS workshops
- an open review

Road Map for 2014 to 2016

Input to the Assessment

WCRP Conference 2011 WIGOS Planning IOC GOOS Planning
SPARC Data Workshop 2013 ESA CCI CORE-CLIMAX QA4ECV
UNFCCC National Reports EUMETSAT-WCRP Climate Symposium (Oct 2014)
GCOS Adaptation Workshop 2013 WCRP WDAC (May 2014)
GEO Work Plan Symposium (April 2014) CEOS-CGMS Response
GCOS GOF-C-GOLD Mitigation Workshop (5-7 May 2014) GCOS-IPCC WG II and DRR Workshop (Nov 2014)
IPCC AR5 2013/2014 WCRP-IPCC WG I Workshop (Sep 2014)
GCOS AOPC TOPC OOPC Space Architecture-ECV Inv.



Action T35 [IP-04 T32]

Action: Reanalyse the historical fire disturbance satellite data (1982 to present).
Who: Space agencies, working with research groups coordinated by GOFC-GOLD.
Time-Frame: By 2012.
Performance Indicator: Establishment of a consistent dataset, including the globally available 1 km AVHRR data record.
Annual Cost Implications: 1-10M US\$ (Mainly by Annex-I Parties).



Action T36 [IP-04 T33]

Action: Continue generation of consistent burnt area, active fire, and FRP products from low orbit satellites, including version intercomparisons to allow un-biased, long-term record development.
Who: Space agencies, in collaboration with GOFC-GOLD.
Time-Frame: Continuous.
Performance Indicator: Availability of data.
Annual Cost Implications: 1-10M US\$ (Mainly by Annex-I Parties).



Action T37 [IP-04 T34]

Action: Develop and apply validation protocol to fire disturbance data.
Who: Space agencies and research organizations.
Time-Frame: By 2012.
Performance Indicator: Publication of accuracy statistics.
Annual Cost Implications: 1-10M US\$ (Mainly by Annex-I Parties)



Action T38 [IP-04 T35]

Action: Make gridded burnt area, active fire, and FRP products available through links from a single International Data Portal.
Who: Coordinated through GOFC-GOLD.
Time-Frame: Continuous.
Performance Indicator: Continued operation of the GFMC and the development of the Data Portal.
Annual Cost Implications: <1M US\$ (Mainly by Annex-I Parties).



Action T39

Action: Develop set of active fire and FRP products from the global suite of operational geostationary satellites.
Who: Through operators of geostationary systems, via CGMS, GSICS, and GOFC-GOLD.
Time-Frame: Continuous.
Performance Indicator: Availability of products.
Annual Cost Implications: 1-10M US\$ (Mainly by Annex-I Parties)



Contents lists available at [SciVerse ScienceDirect](#)

 **ELSEVIER**

**International Journal of Applied Earth Observation and
Geoinformation**

journal homepage: www.elsevier.com/locate/jag



Review

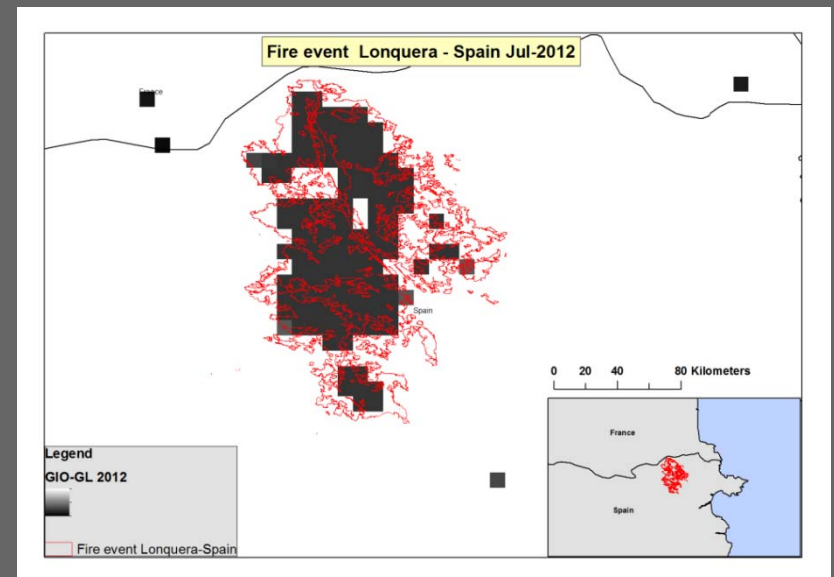
Ten years of global burned area products from spaceborne remote sensing—A review: Analysis of user needs and recommendations for future developments

Florent Mouillot^{a,*}, Martin G. Schultz^b, Chao Yue^c, Patricia Cadule^c, Kevin Tansey^d, Philippe Ciais^c, Emilio Chuvieco^e



- Action???: Review user requirements needed in context of GCOS for burned area, active fire and FRP

- MODIS, ESA CCI, EC GIO-Global Land, Landsat, Sentinel
- MODIS, VIIRS active fires, WFA, Sentinel-3
- FRP in MACC-II
- GFED-4



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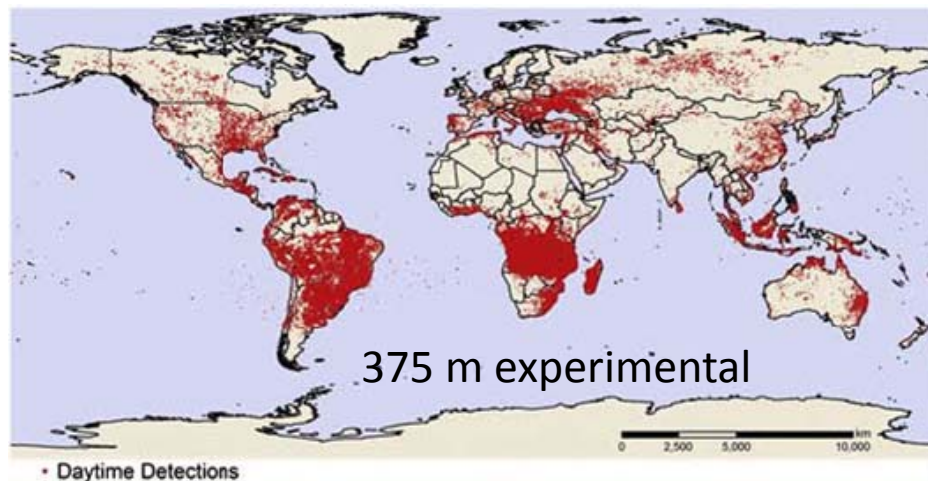
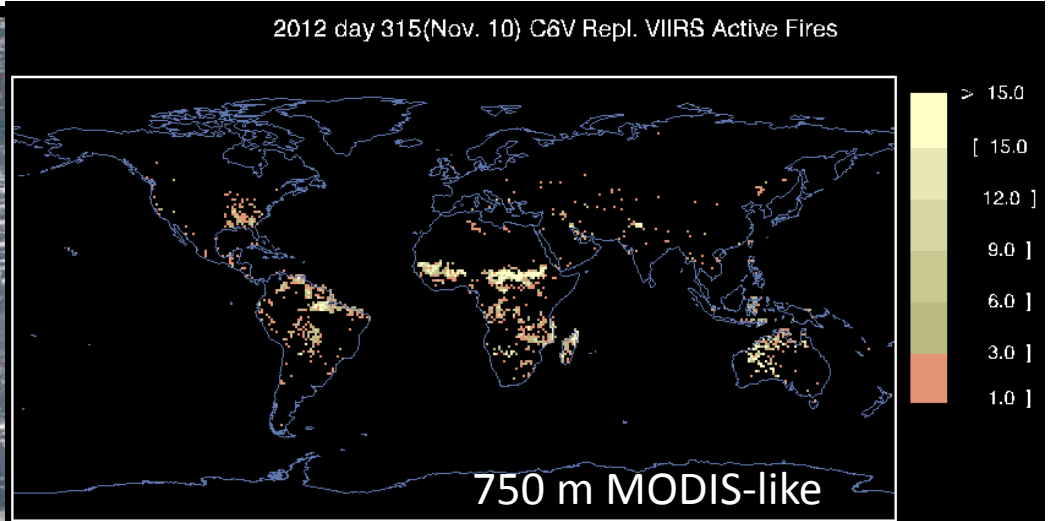
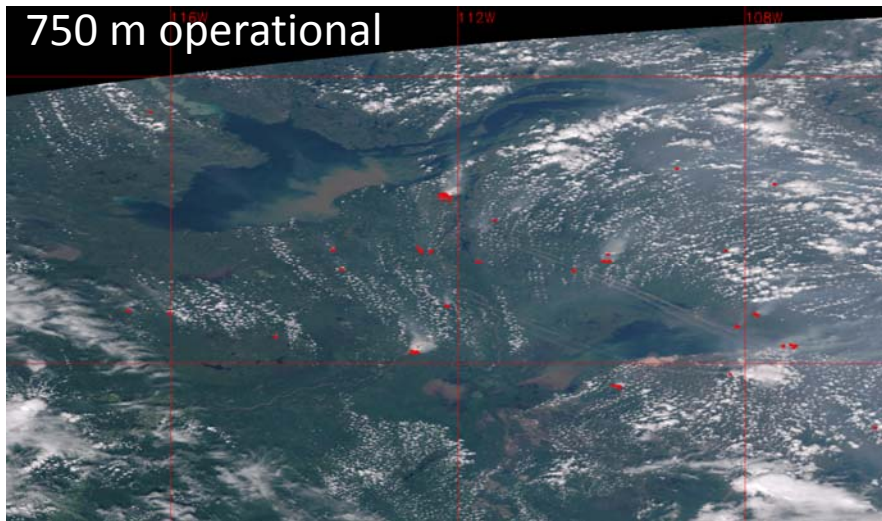
The New VIIRS 375 m active fire detection data product: Algorithm description and initial assessment

Wilfrid Schroeder^{a,*}, Patricia Oliva^a, Louis Giglio^a, Ivan A. Csiszar^b





Global fire disturbance mapping from SUOMI NPP VIIRS



- VIIRS design allows for radiometric measurements to detect and characterize active fires over a wide range of observing and environmental conditions and along the entire scan line
- Data available since Spring 2012
- Good potential for continuity with MODIS
- Suite of operational and experimental products



<http://viirsfire.geog.umd.edu/>

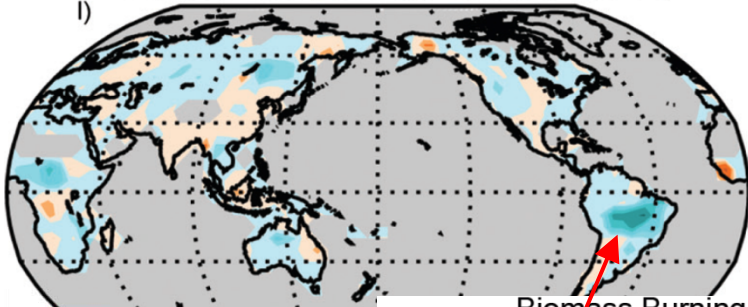


- Advanced data assimilation techniques to allow tracking reflectance for BA estimation & assessment of fire impact on vegetation
- Implement the fire impact (“*fcc*”) part in MODIS Coll6 BA product, resources permitting
- Seamlessly combine data from different sensors + hotspots
- Vegetation modelling framework to track vegetation recovery building on the above two pieces of work to assess the fate of the vegetation, C and nutrients.



Monitoring of ECV Fire Disturbance as C emission in GFAS

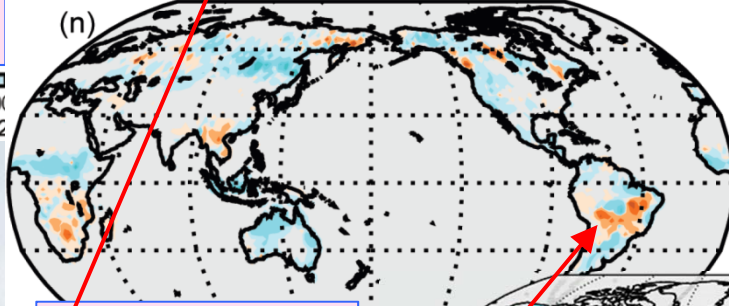
Biomass Burning (average fire radiative power)



anomaly 2009

-0.0050 -0.0030 -0.0020 -0.0010 -0.0005 0.0000
Anomalies from 2003-2009

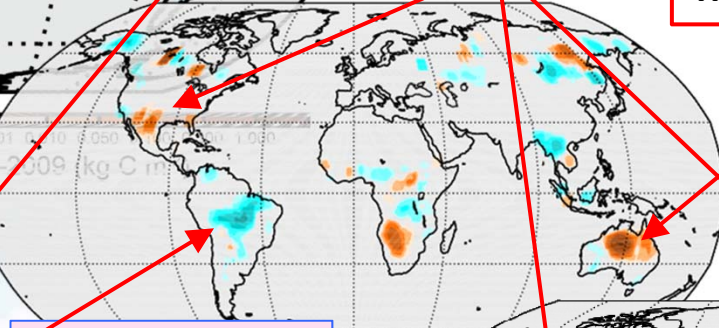
Biomass Burning Carbon Emission



anomaly 2010

-1.000 -0.500 -0.100 -0.050 -0.010 0.000 0.010 0.050 0.100 0.500 1.000
Anomalies from 2003-2009 kg C m⁻² yr⁻¹

SST anomaly in tropical N Atlantic



anomaly 2011

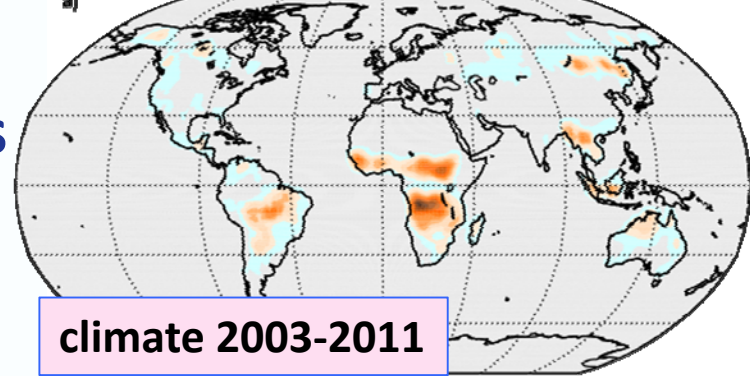
-160 -80 -40 -20 -10 -5 5 10 20 40 80 160
Anomalies from 2003-2011 gC/m²/yr

reduced deforestation

Annual fire anomalies in NOAA's *State of the Climate* reports.

[Kaiser & van der Werf. *BAMS* 2010, 2011, 2012, 2013]

Biomass Burning Climatology over 2003-2011

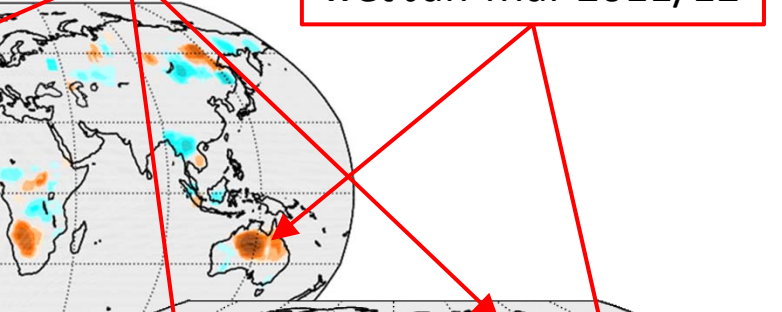


climate 2003-2011

20 40 60 80 100 120 140 160 180 200
gC/m²/yr

hot/dry

El Nino in late 2010, wet Jan-Mar 2011/12



anomaly 2012

-160 -80 -40 -20 -10 -5 5 10 20 40 80 160
Anomalies from 2003-2011 (gC/m²/yr)

J. Kaiser (KCL, ECMWF, MPI-C)



NRT production of daily FRP and emissions in MACC-II

- GFASv1.2
 - MODIS FRP assimilation
 - ~10 km resolution
 - 2000—yesterday
 - used in MACC-II NRT forecasts of aerosols, GHG, reactive gases
- 1 day time resolution
- 40 species (PM, GHG, reactive gases)
- consistent with GFED3
- sensitive to small fires, e.g. agricultural

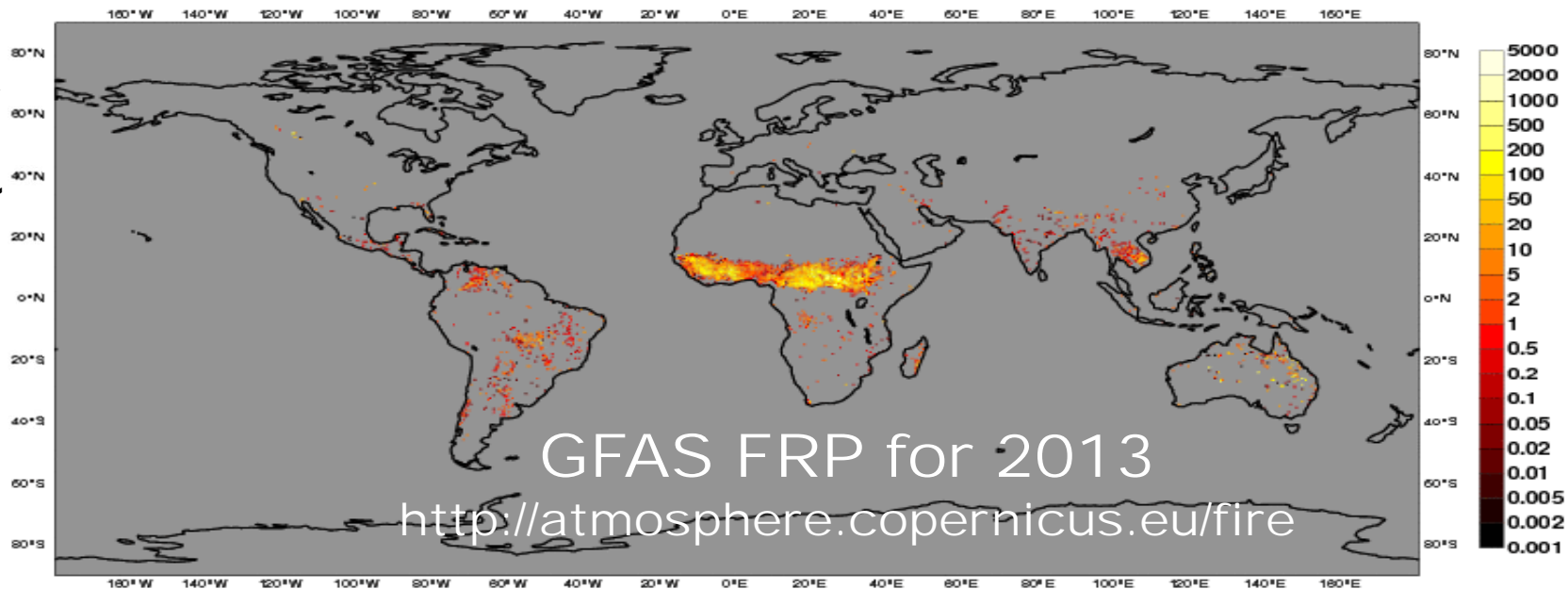


J. Kaiser (KCL, ECMWF, MPI-C) et al.

MACC Daily Fire Products Wednesday 2 January 2013

Average of Observed Fire Radiative Power Areal Density [mW/m²]

max value = 0.67 W/m²





ileaps



- **New IBBI** aims to bring the various communities and new developments together to the improve physical understanding and modelling capabilities of biomass burning.
- Workshop in Schloss Ringberg on 23–26 April 2014
- Atm. Env. plans special issue with IBBI.
- Co-chaired by Melita Keywood & Johannes Kaiser
- <http://www.mpic.de/projekte/ibbi.html>

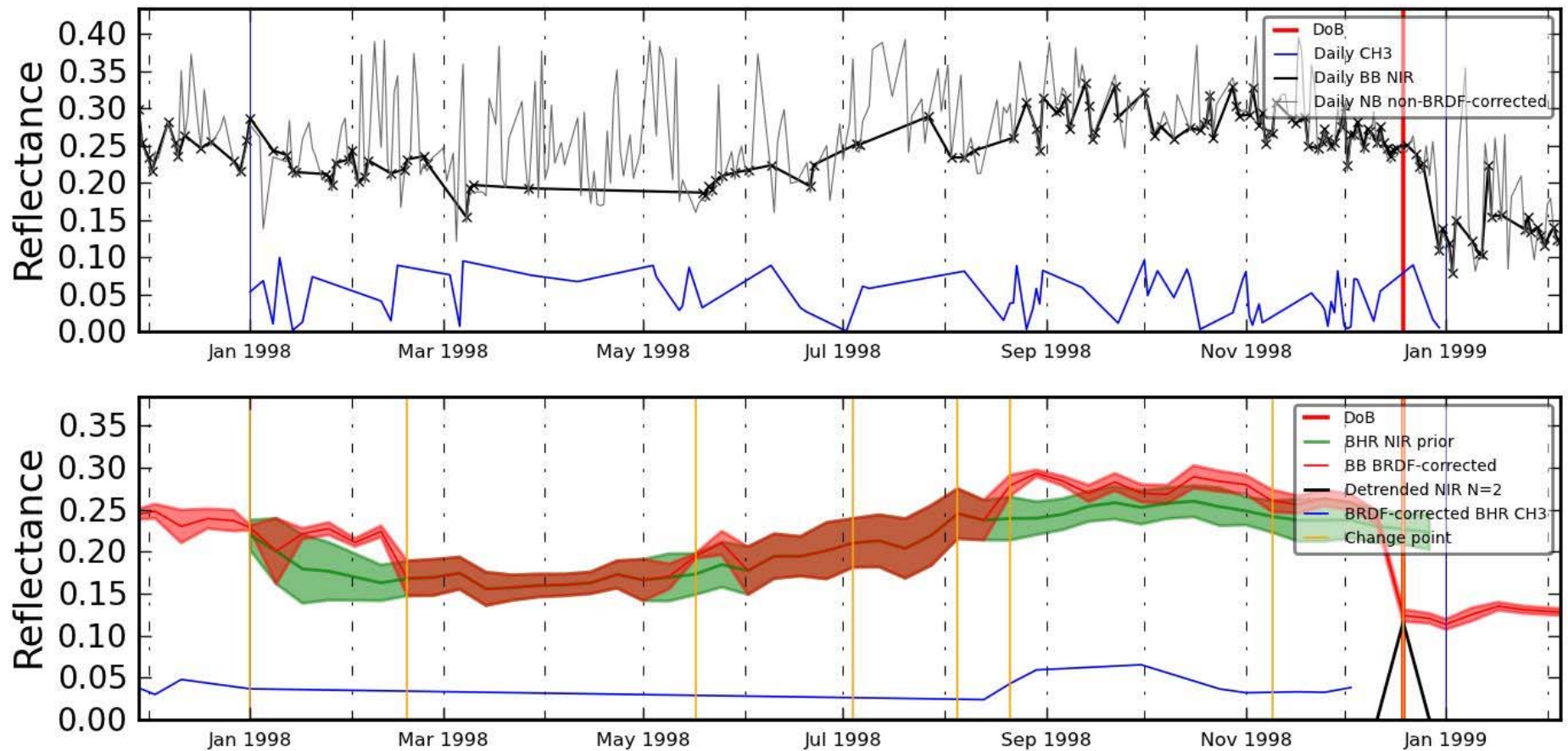


GFED future

- GFED4 burned area finalized (Giglio et al., 2013, *JGR-Biogeosciences*)
- 0.25d (1995 - now) and daily (2001 onwards) resolution
- Layers for small fires and understory fires are being added (Randerson, Morton)
- New emissions estimates (2014) will make better use of comparison with fuel consumption based on literature review

Increasing difference in maturity between emissions (fuel consumption) and burned area estimates

Gerardo López-Saldaña et al. Technical Uni. of Lisbon AVHRR LTDR from 1981 - 1999



Remote Sens. 2014, 6, 2050-2068; doi:10.3390/rs6032050

OPEN ACCESS

remote sensing

ISSN 2072-4292

www.mdpi.com/journal/remotesensing

Article

Assessing the Temporal Stability of the Accuracy of a Time Series of Burned Area Products

Marc Padilla ^{1,*}, Stephen V. Stehman ², Javier Litago ³ and Emilio Chuvieco ¹



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Contents lists available at ScienceDirect

Remote Sensing of Environment

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Validation of the 2008 MODIS-MCD45 global burned area product using stratified random sampling

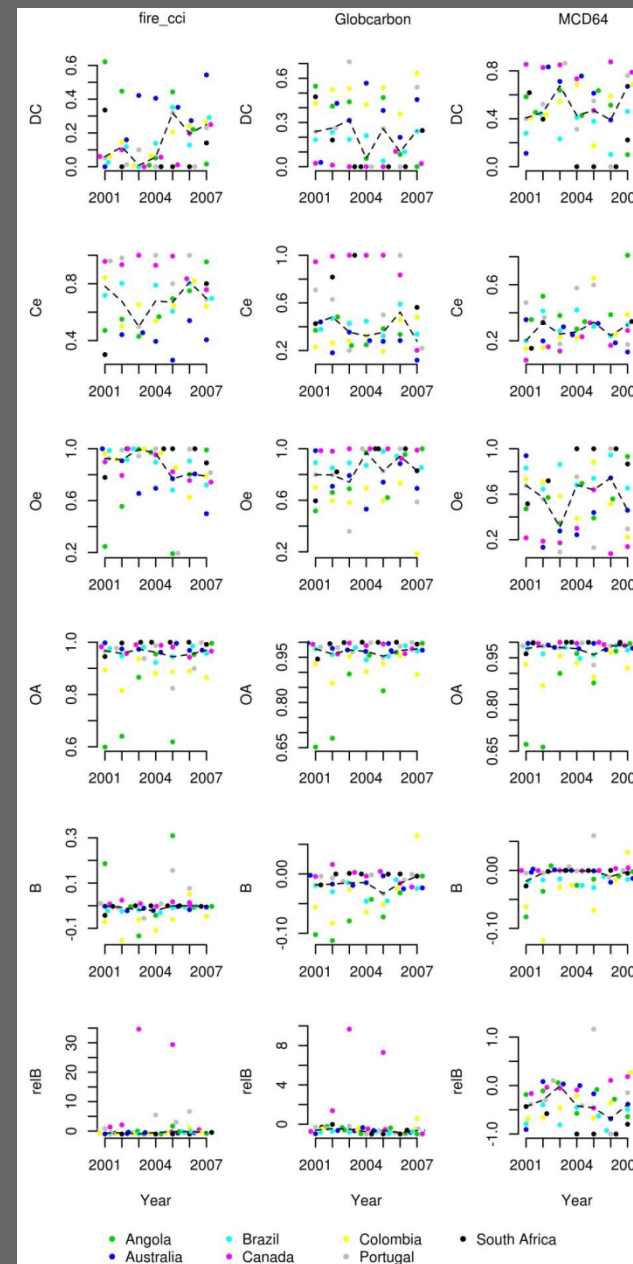


Marc Padilla ^{a,*}, Stephen V. Stehman ^b, Emilio Chuvieco ^a



LPV Mission

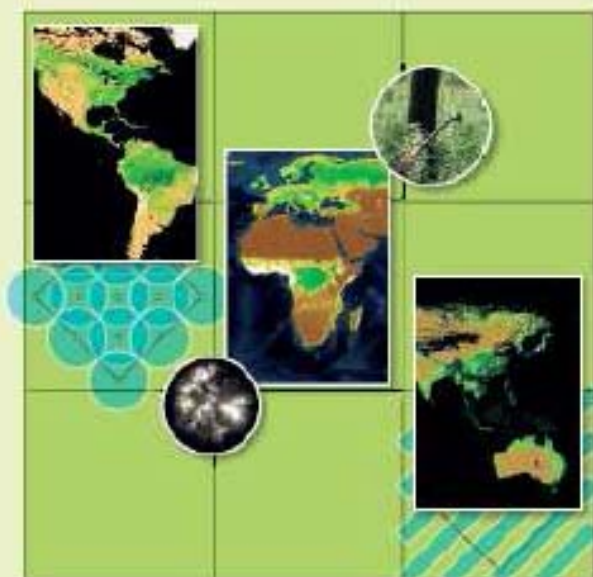
To foster quantitative validation of higher-level global land products derived from remote sensing data and to relay results so they are relevant to users





Committee on Earth Observation Satellites
Working Group on Calibration and Validation
Land Product Validation Sub-Group

Global Leaf Area Index Product Validation Good Practices



Version 2.0
January, 2014

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- Printed version
- On LPV website soon
 1. Digital version of protocol (75 pages)
 2. Reviewer comments and responses
 3. Recommendations to
 - CEOS/WGCV/LPV
 - LAI producers
 - Research community
 - Validation teams
- Living document
- Field component to be further developed by new LAI co-lead (Oliver Sonnentag)

ECV Inventory - Summary Ctd

- The **ECV Inventory** is the essential component/mechanism for the fulfilment of the three main objectives assigned to this Working Group
 - Providing a comprehensive and accessible view as to what Climate Data Records are currently available
 - Making best use of currently available data by delivering additional Climate Data Records (e.g. by identifying and targeting cross-calibration or re-processing gaps/shortfalls)
 - Optimising the planning of future satellite missions and constellations to expand existing and planned Climate Data Records, in terms of both coverage and record length



Quality Assurance for Essential Climate Variables

[NEWS](#)

[MEETINGS](#)

[PROJECT INFO](#)

[PUBLICATIONS](#)

[QA SYSTEM](#)

[ECVS](#)

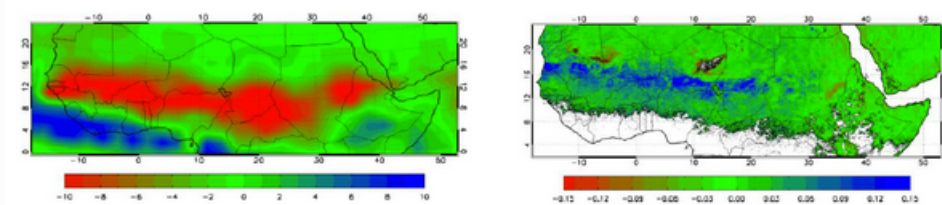
[CONTACT](#)

Headlines

- [Results from User Requirements Survey now available](#)
- [Direct user feedback for QA4ECV at the EGU](#)
- [User Consultation Workshop at the EGU](#)
- [QA4ECV User Requirements Survey for Quality Information in Satellite-derived Climate Data Records](#)
- [Next Project Review Meeting](#)

Introduction

Quality-assured satellite data are of central interest to the [QA4ECV](#) project. Satellites have revolutionised the Earth's observation system of climate change and air quality over the past three decades, providing continuous data covering the entire Earth. However, many users of these data are not conscious of the quality of these satellite data. Because of this, the European Union expressed in its 2013 6th [FP7](#) Space Research Call a need for reliable, traceable, and understandable quality information on satellite data records that could serve as a blueprint contribution to a future Copernicus Climate Change Service. QA4ECV runs from January 2014 until December 2017.





Potential New IP Actions/Issues

- Representation of fire in IPCC-class models
- Validation and Uncertainty characterisation
- Improved spatial resolution -> accuracy
- Operational archive processing
- Vegetation recovery
- Trends analysis
- In-situ observations
- ECV Inventory
- Rolling review of requirements
- Links with Land Cover and Biomass ECV