



Satellite-derived global level biomass burning products



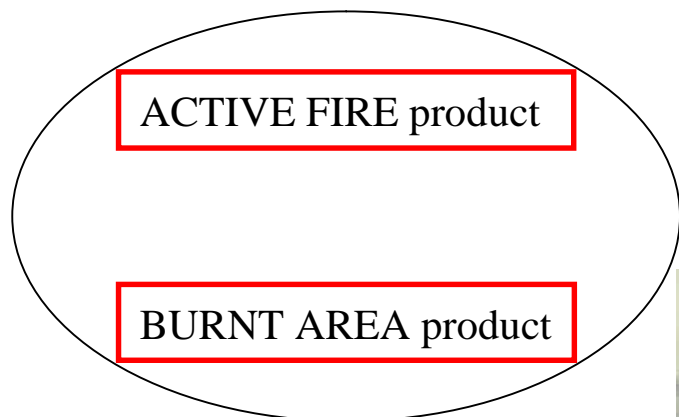
BBSO workshop – Toulouse – 14-15 December 2005

Jean-Marie Grégoire



- ✓ An overview of existing products *J.-M. Grégoire*
- ✓ The RETRO burnt area product *J. Silva*
- ✓ An improved version of the World Fire Atlas
An overview of existing products *J. Silva*
- ✓ The burnt area product from MODIS *L. Boschetti et al.*
- ✓ Estimation of burnt biomass from MODIS *I. Palumbo*
- ✓ A global fire assessment for the year 2004 *J. Goldammer & P. Kraus*

Two types of fire products accessible from Earth obs. systems



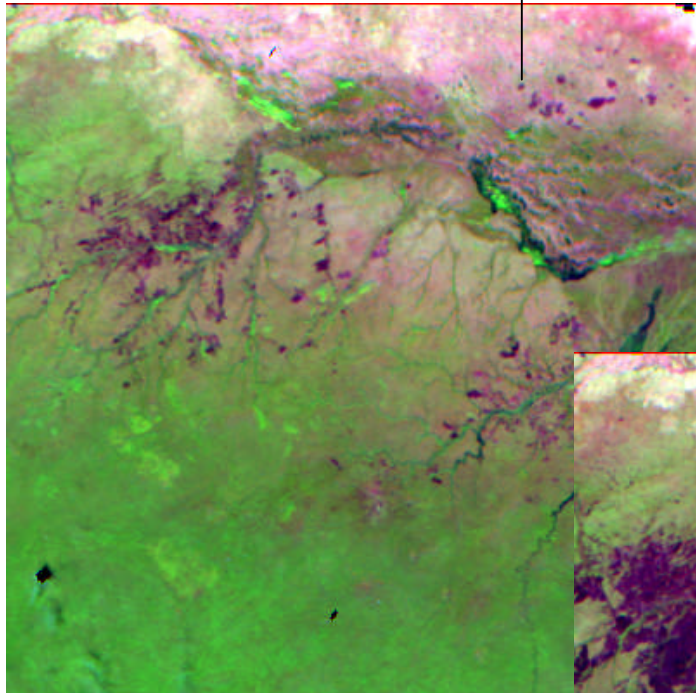
- Active fire
- Hot spot
- Fire pixel
- Fire count

Fire front

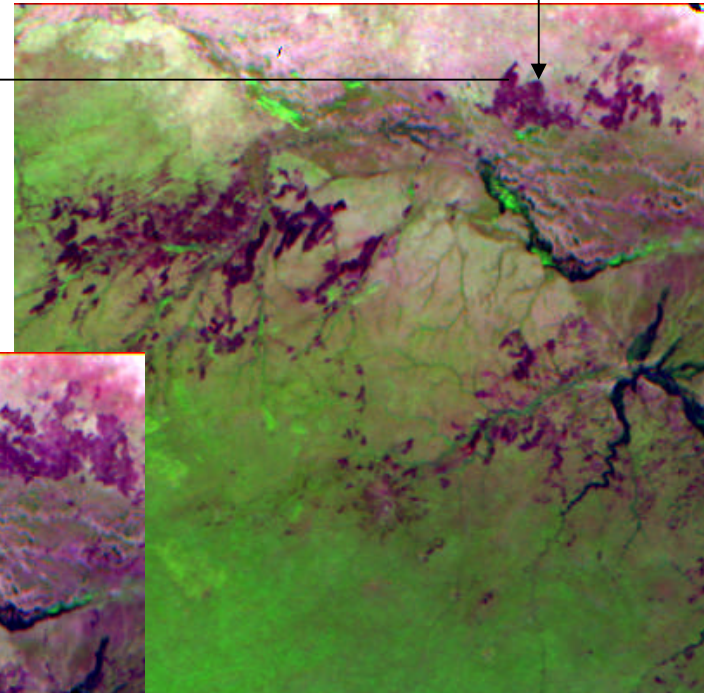
- Burnt area
- Burnt pixel
- Burnt scar

Area burnt

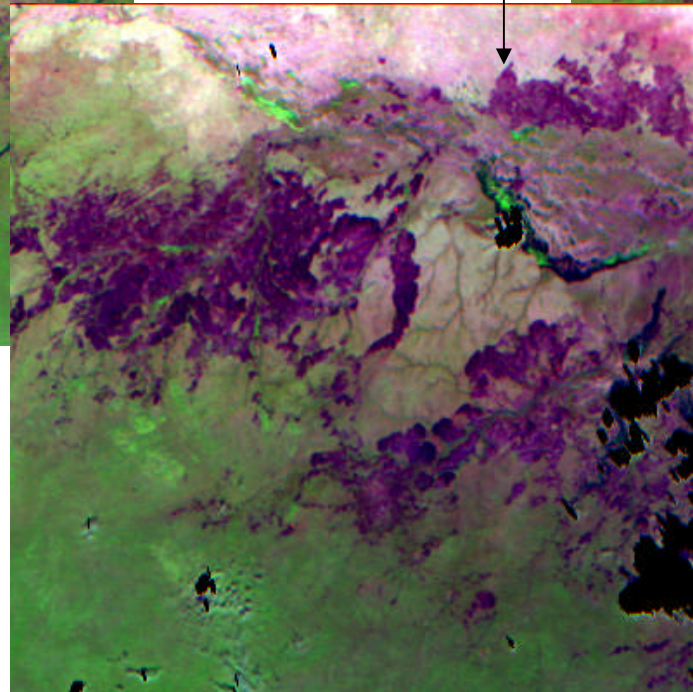




2 Nov. 1999



7 Nov. 1999



12 Nov. 1999



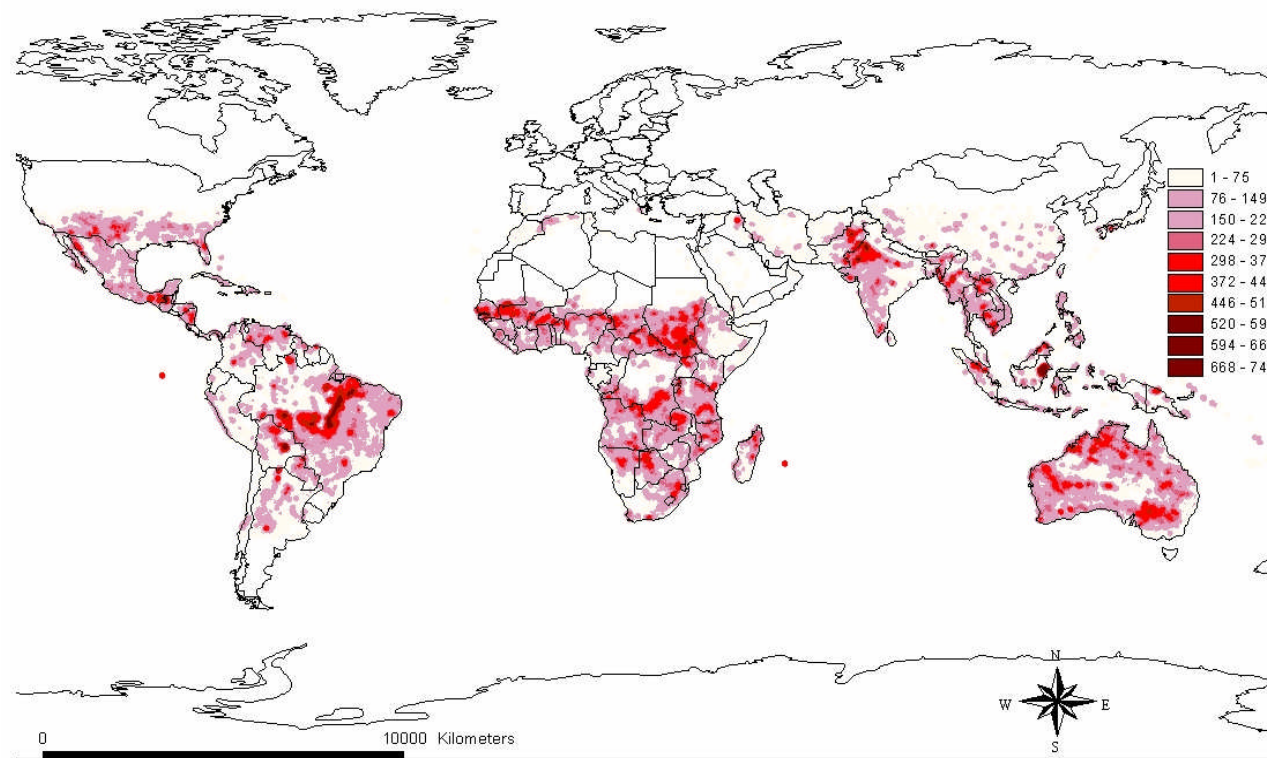
Satellite derived global **active fire products**

Product name <i>Satellite-sensor</i> Product type	Resolution sensor product	Time step sensor product	Coverage	Period	Source	Documentation
1. IGBP-GFP <i>NOAA-AVHRR</i> Active fire/day	1 km 1 km	day day & 10- day	Globe	April 1992 to December 1993	JRC	Dwyer <i>et al.</i> , 1999, J. Biogeography (27) http://www-gvm.jrc.it/tem/
2. WFA-algo1 <i>ERS-ATSR, AATSR</i> <i>ENVISAT-AATSR</i> Active fire/night	1 km 1 km	day day	Globe	July 1996 to now	ESA	http://shark1.esrin.esa.it/ionia/FIRE/AF/ATSR/
3. Screened WFA-algo2 <i>ERS-ATSR2</i> Active fire/night	1 km 1 km	day day	Globe	1997 to 2002	ISA (Portugal)	Mota <i>et al.</i> , 2005, ACPD, (5) http://www.isa.utl.pt/def/
4. TRMM <i>TRMM-VIRS</i> Active fire/day & night	2.2 km 0.5 degree	day month	+/- 40° (from equator)	Jan. 98 to mid-04	NASA	Giglio <i>et. al.</i> 2000, IJRS(21) http://earthobservatory.nasa.gov/Observatory/Datasets/fires.trmm.html
5. MODIS Active Fire <i>AQUA, TERRA-MODIS</i> Active fire/day & night	250 m lat long	day day	Globe	~ 2001	MODIS team	http://rapidfire.sci.gsfc.nasa.gov/



Densité des feux dans la zone inter-tropicale durant l'année 1998

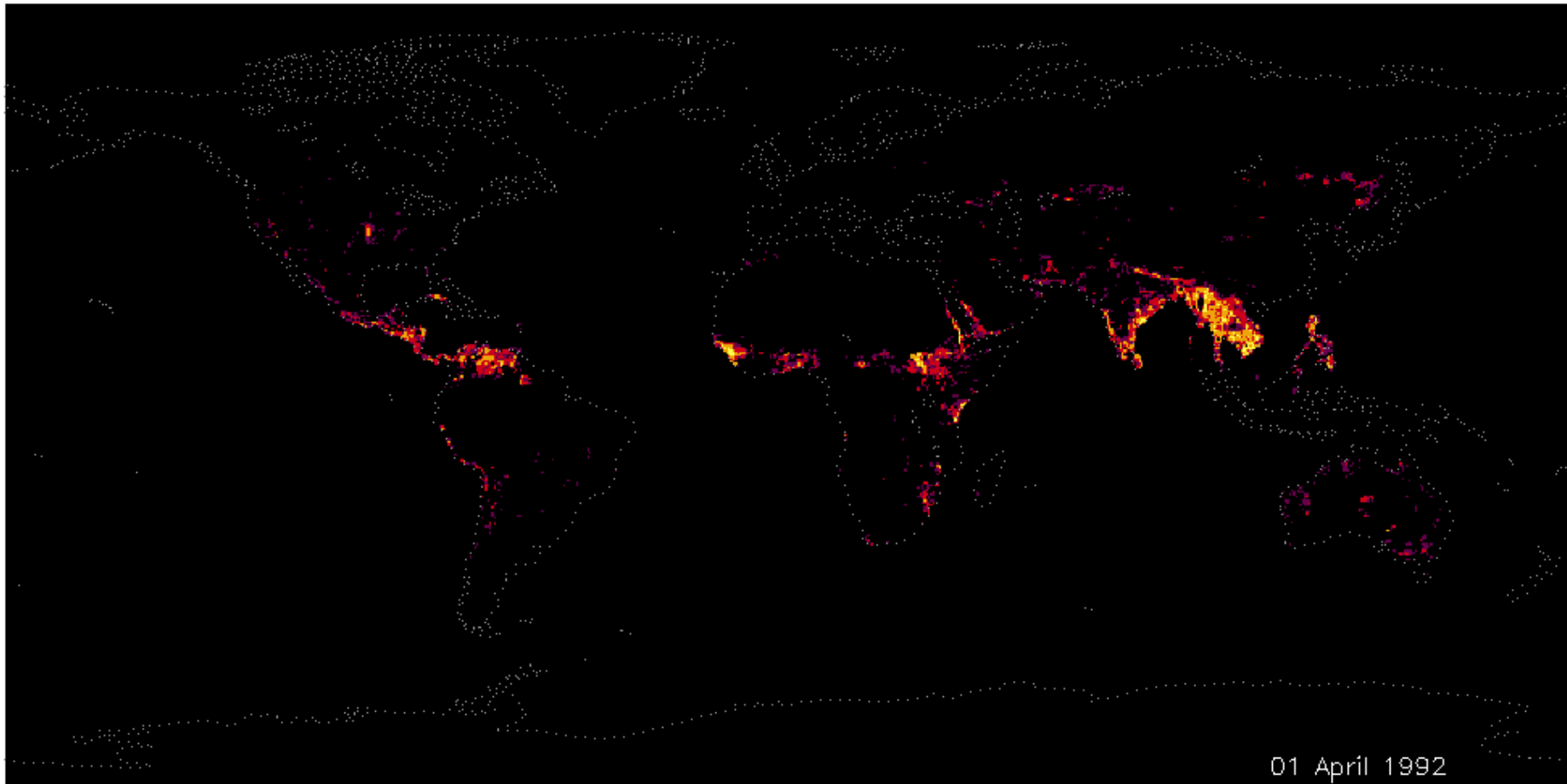
source: TRMM ((Tropical Rainfall Mapping Mission)





The Global Distribution of Active Vegetation Fires as Derived from NOAA-AVHRR Satellite Data

Monitoring of Tropical Vegetation Unit, Space Applications Institute, Joint Research Centre of the European Commission, Ispra, Italy

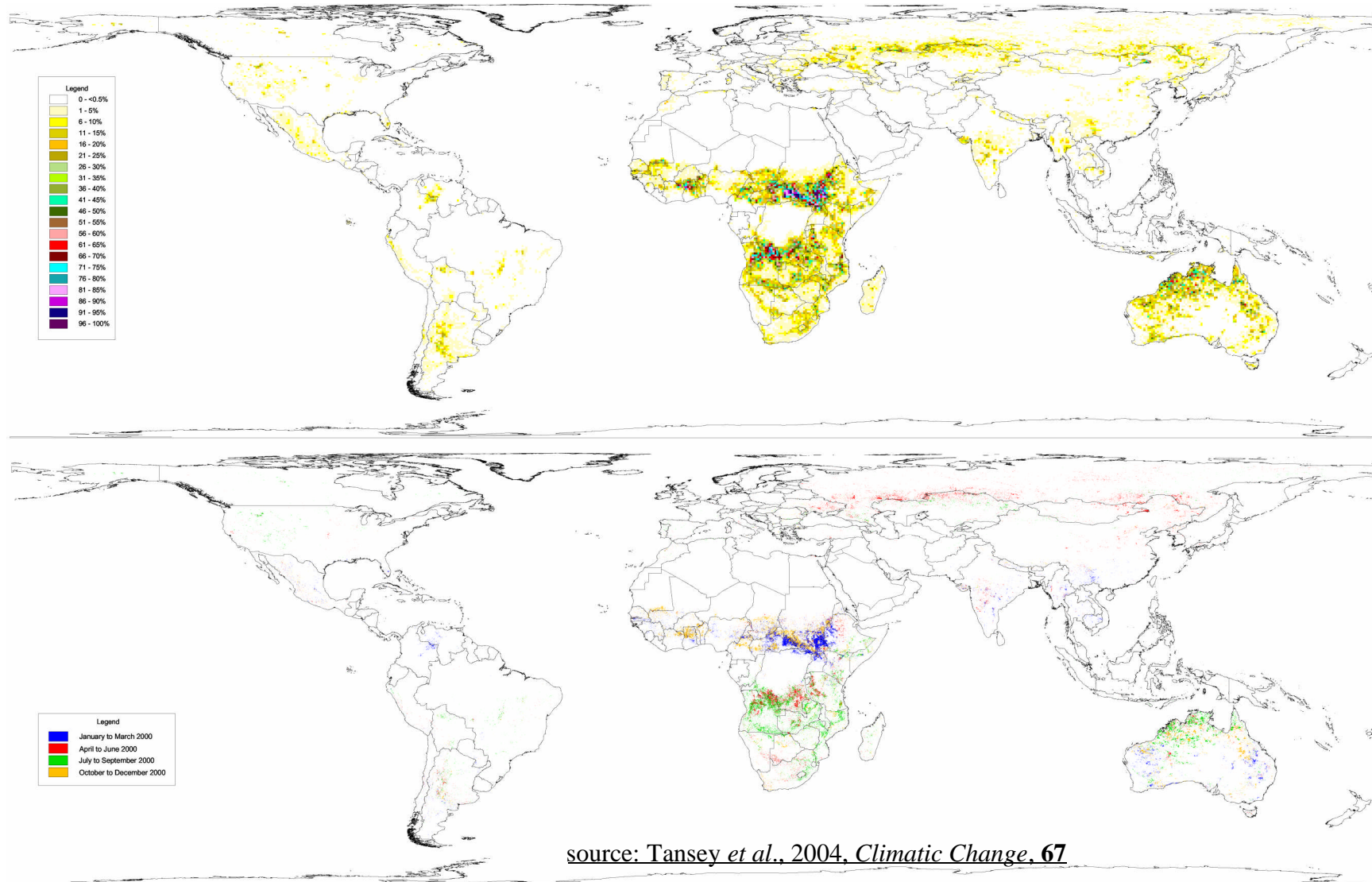


Jan Feb Mar **Apr** May Jun Jul Aug Sep Oct Nov Dec **1992**

Global Vegetation Monitoring Unit (GVM)
Terrestrial Ecosystem Monitoring in EU development-assistance regions (TEM)

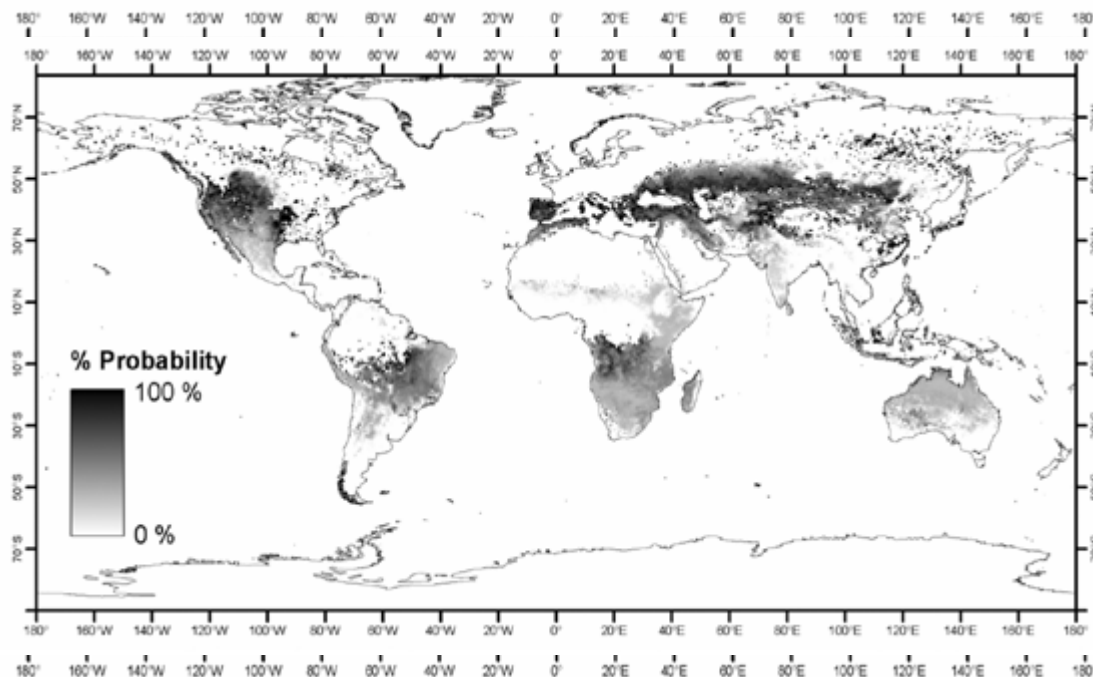
Satellite derived global burnt area products

Product name <i>Satellite-sensor</i> Product type	Resolution sensor Product	Time step sensor Product	Coverage	Period	Source	Documentation
GBA2000 <i>SPOT-VGT</i> Burnt area	1 km 1 km ²	day Month	Globe	Nov. 99 to Dec. 00	JRC	Tansey <i>et al.</i> , 2004 JGR(109) & Climatic Change (67) //www-gvm.jrc.it/fire/gba2000/index.htm
GLOBSCAR <i>ERS-AATSR</i> Burnt area	1 km 1 km ²	day Month	Globe	2000	ESA	Simon <i>et al.</i> , 2004 JGR(109) //shark1.esrin.esa.it/ionia/FIRE/BS/ATSR/
GBA1982-1999 <i>NOAA-AVHRR</i> Burnt area	5 km 8 km ²	day week	globe	1982 to 1999	JRC	Carmona-Moreno <i>et al.</i> , 2005 Global Change Biology (11/9) //www-gvm.jrc.it/tem/Disturbance_by_fire/index.htm



source: Tansey *et al.*, 2004, *Climatic Change*, 67

Fire probability maps: derived from the GBS82-99 product



Sep-Oct-Nov.

Dec-Jan-Feb.

Mar-Apr-May

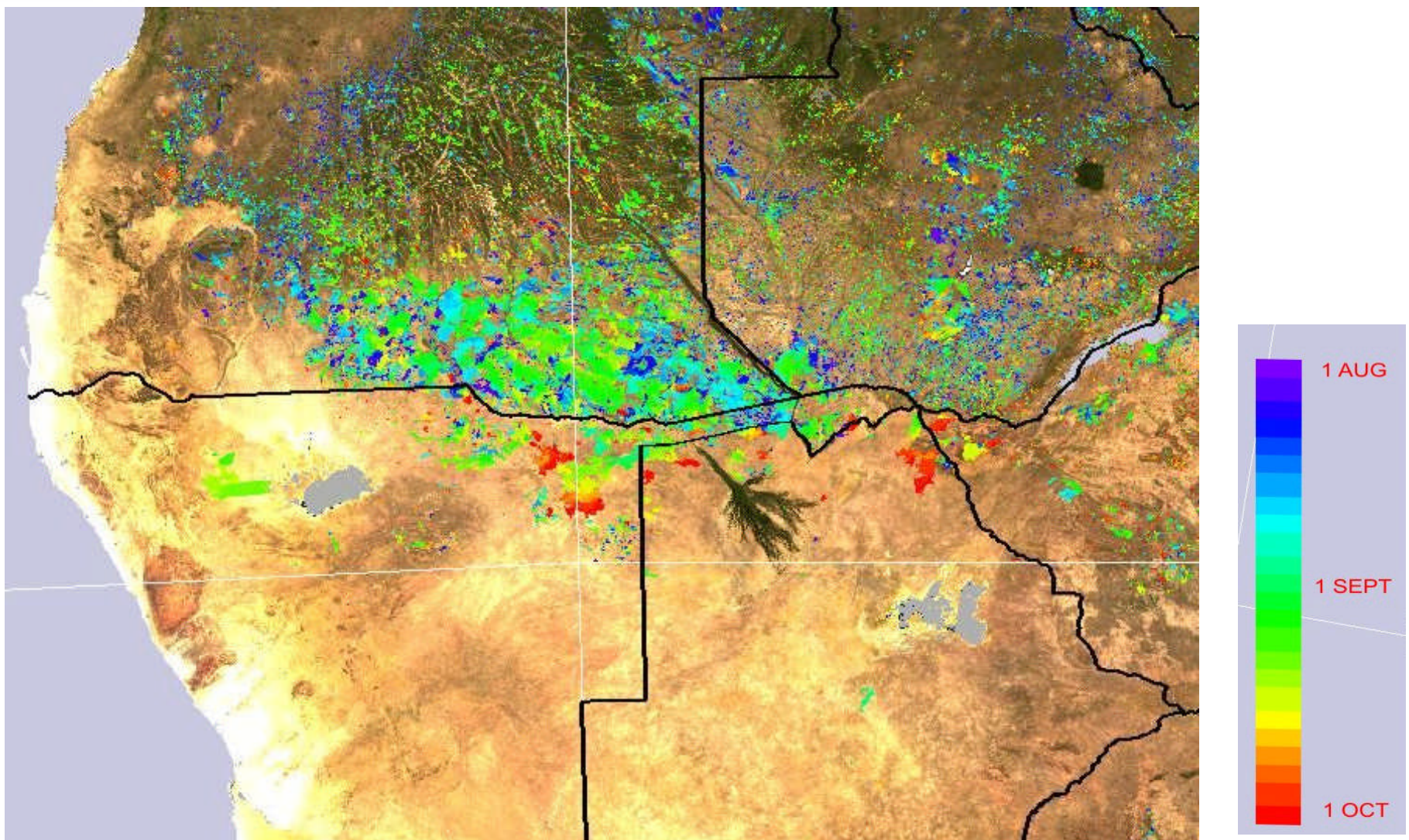
Jun-Jul-Aug.

source: Carmona-Moreno et al., 2005, Global Change Biology (11/9)
[//www-gvm.jrc.it/tem/Disturbance_by_fire/index.htm](http://www-gvm.jrc.it/tem/Disturbance_by_fire/index.htm)

Satellite derived fire & burnt area products: under development

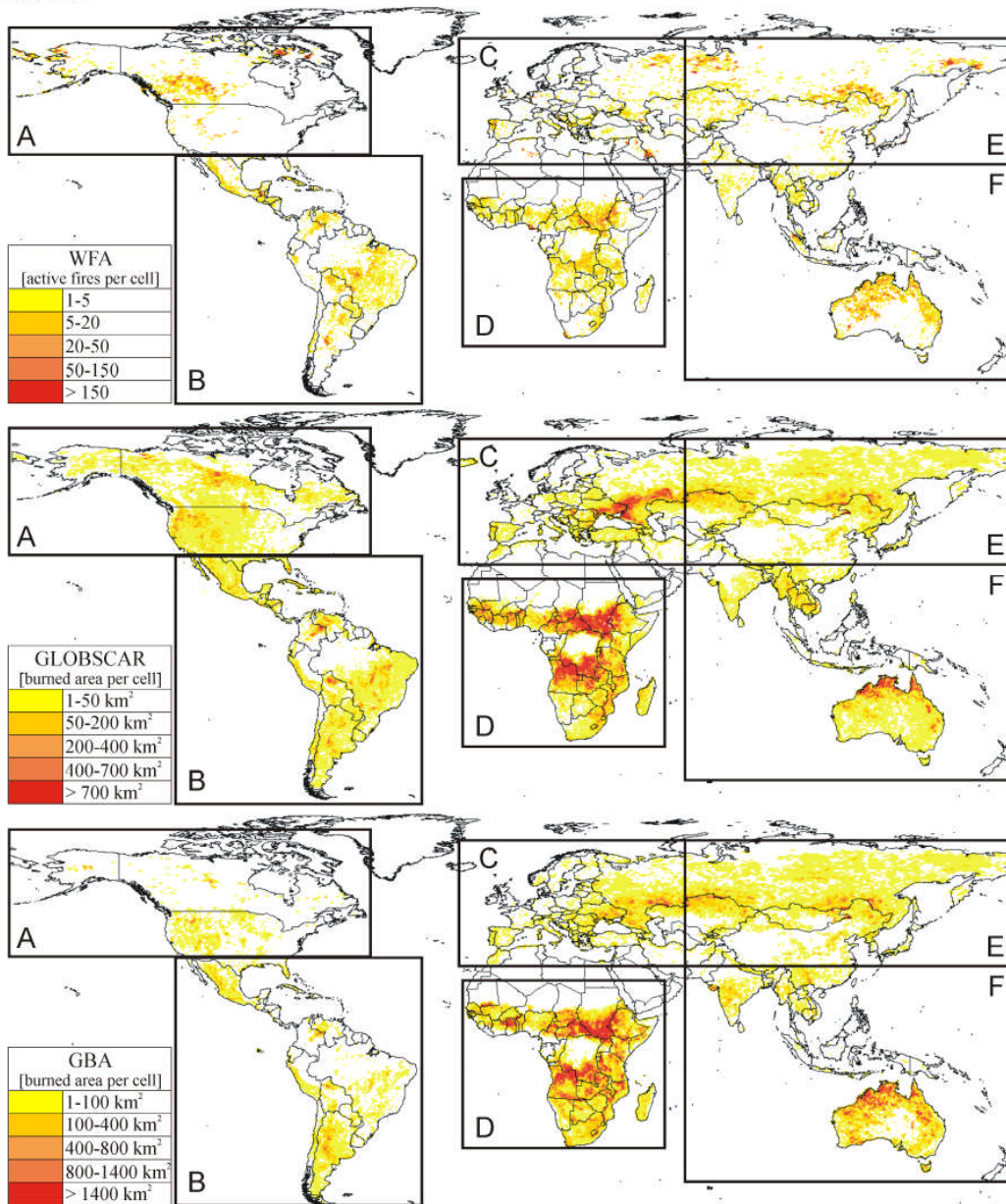
Product name EO system product type	Resolution sensor product	Time step sensor product	Coverage	Period	Source	Documentation
GLOBCARBON ERS, ENVISAT, SPOT ATSR, AATSR, MERIS, VGT Active fire (day & night) Burnt area	1 km 8 km	day month	globe	1998-2003	ESA	http://dup.esrin.esa.it/projects/summary43.asp
VGT4Africa SPOT-VGT Burnt area	1 km 1 km ²	day 10 days ~ real-time	Africa	from 2005	JRC	http://www-gvm.jrc.it/tem/ - To African Meteo. Services - Plans: daily, global, from 2000
GEOLAND = GLOBCARBON/VGT	1 km 1 km	day 10 days	Africa & Eurasia	1998-2003	JRC	http://www-gvm.jrc.it/tem/ Restricted access (GEOLAND)
MODIS Burned Area TERRA, AQUA Burnt area	500 m 500 m	day month	globe	from 2000	NASA	http://modis-fire.umd.edu/products.asp#8

MODIS burnt area product: under development



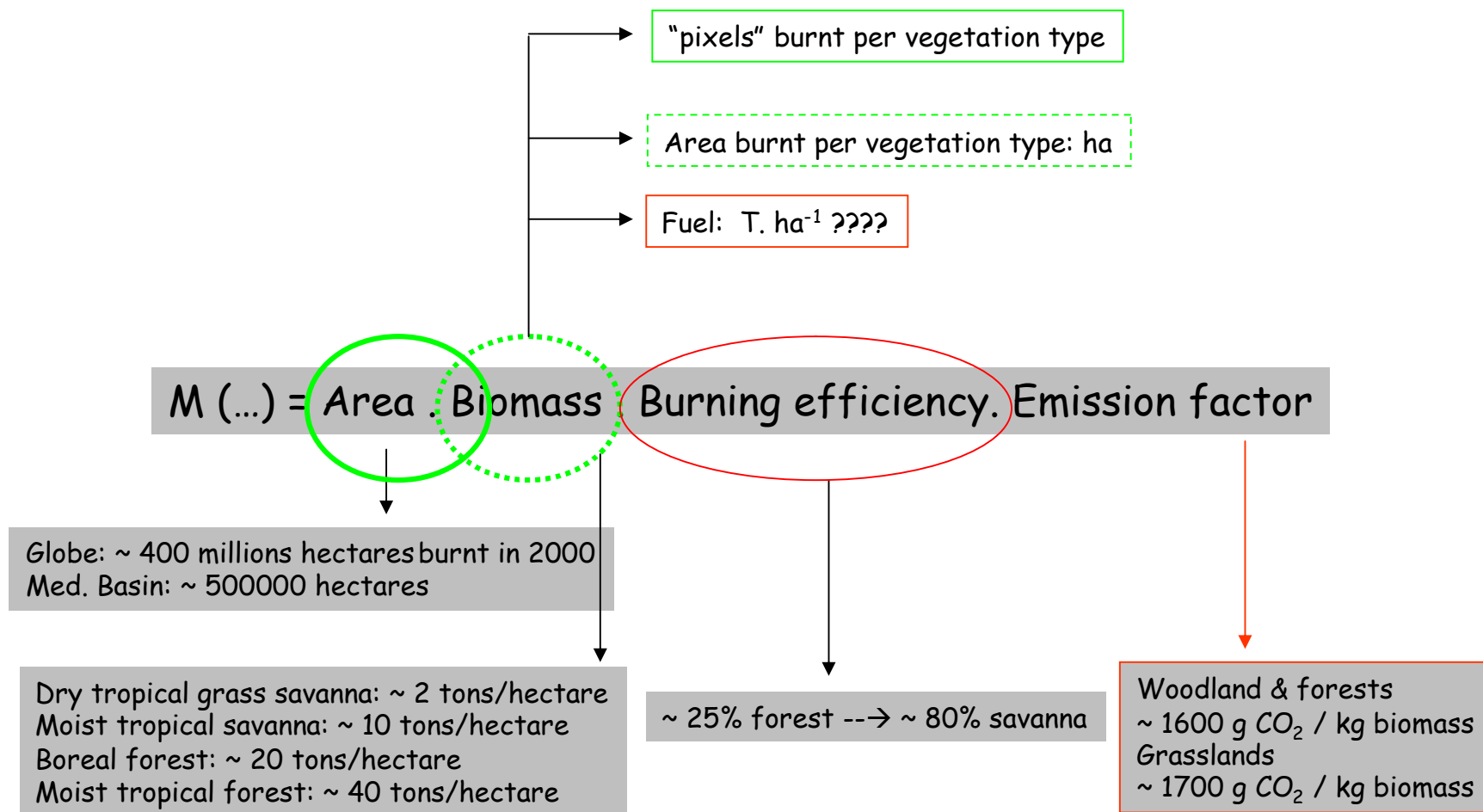
Source: NASA / MODIS Fire & Thermal Anomalies - <http://modis-fire.umd.edu/products.asp#8>

Global Vegetation Monitoring Unit (GVM)
Terrestrial Ecosystem Monitoring in EU development-assistance regions (TEM)



Inter-comparison of global fire products:
 - World Fire Atlas (WFA)
 - GLOBSCAR
 - GBA2000

Boschetti et al., 2004
Geophys. Res. Letters
 Vol. 31



Can satellite observations make the end-users happy ???

Weaknesses ?

Feasible ?

YES

YES, but

NOT YET

Global level products

Both fires & burnt area

Quantitative data (25x25 km)

- Only 1 active fire product (WFA)
- No quantitative burnt area product (GBA82-99)

Not always feasible, due to gaps in time series

Only since 2002 (TERRA-AQUA MODIS)

Seasonal distribution

- Only 1 active fire product (WFA)
- No quantitative burnt area product (GBA82-99)

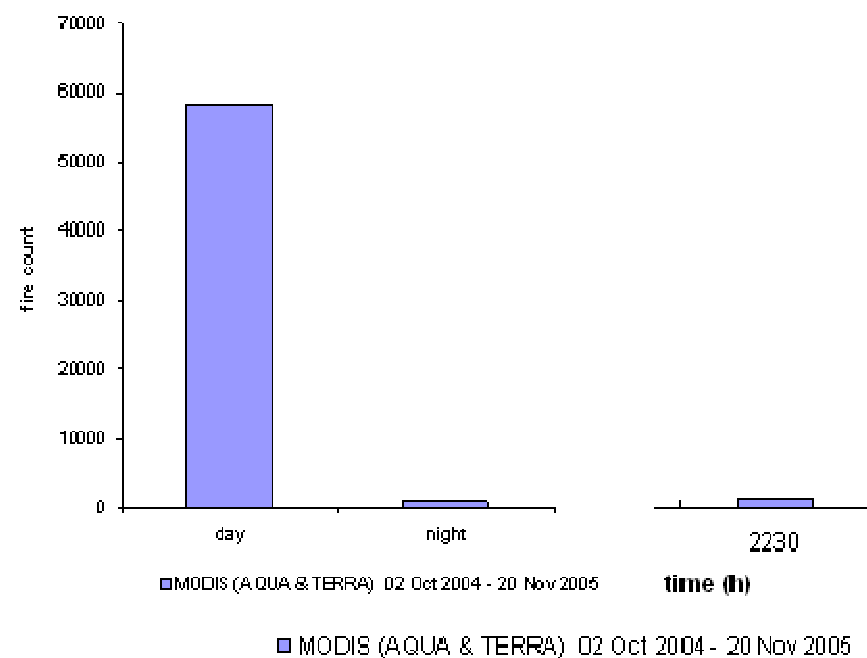
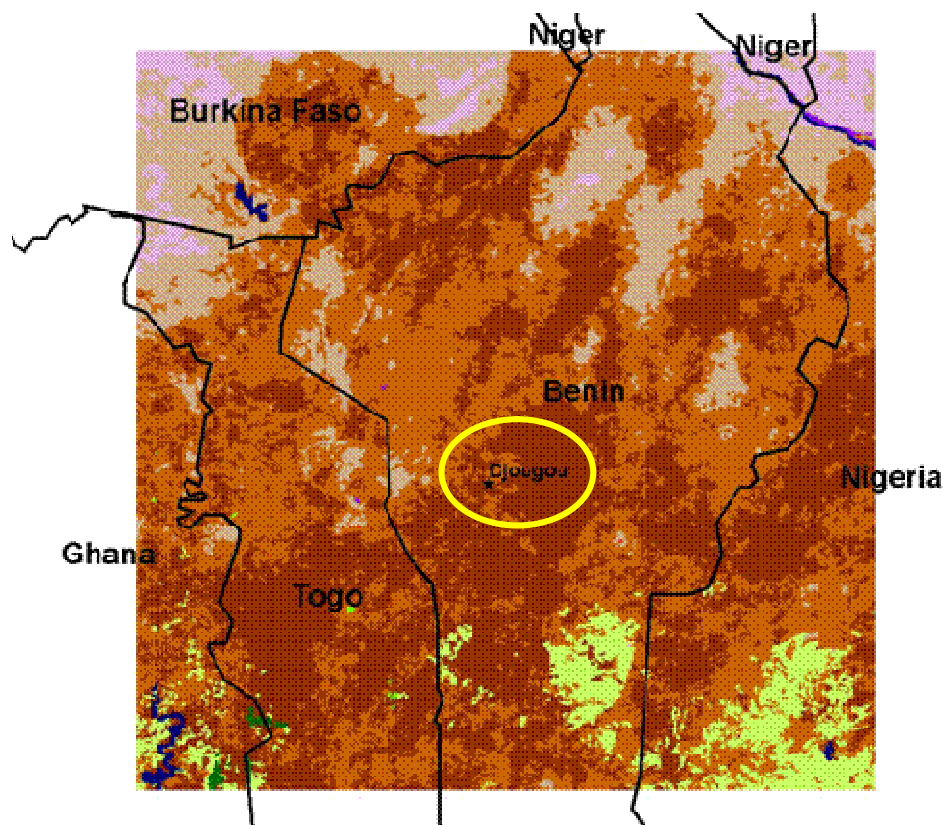
No complete maps for vegetation cover

- Issue 1: area burnt inside the pixel
- Issue 2: burning efficiency (% fuel load)

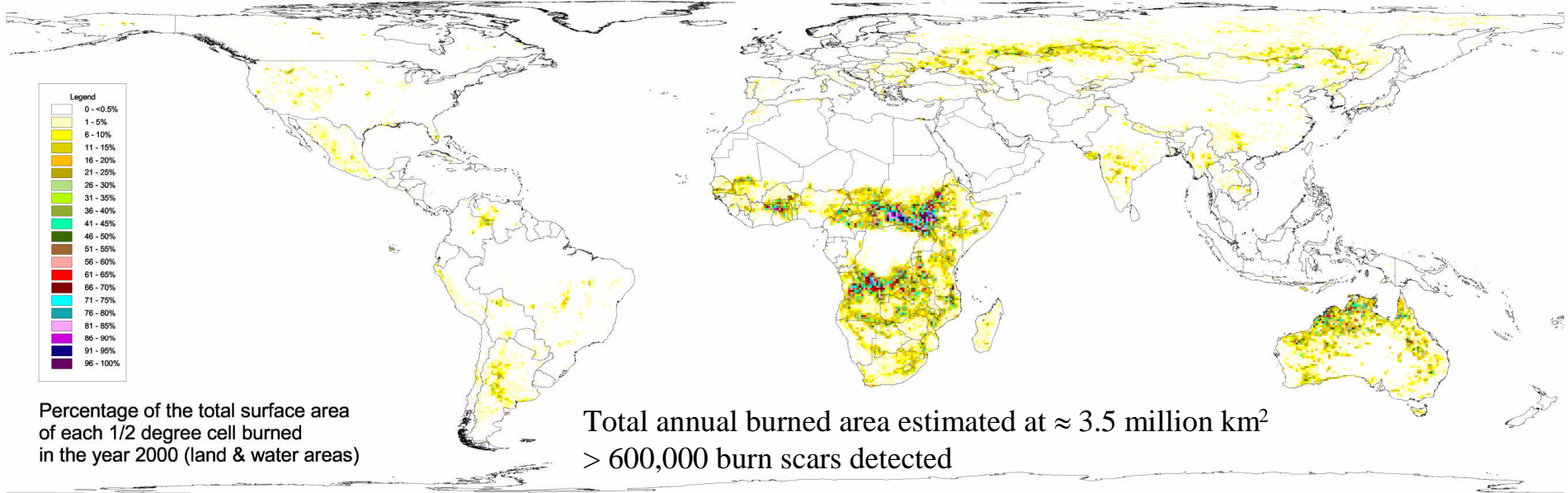
Fire intensity

Global Vegetation Monitoring Unit (GVM)
Terrestrial Ecosystem Monitoring in EU development-assistance regions (TEM)

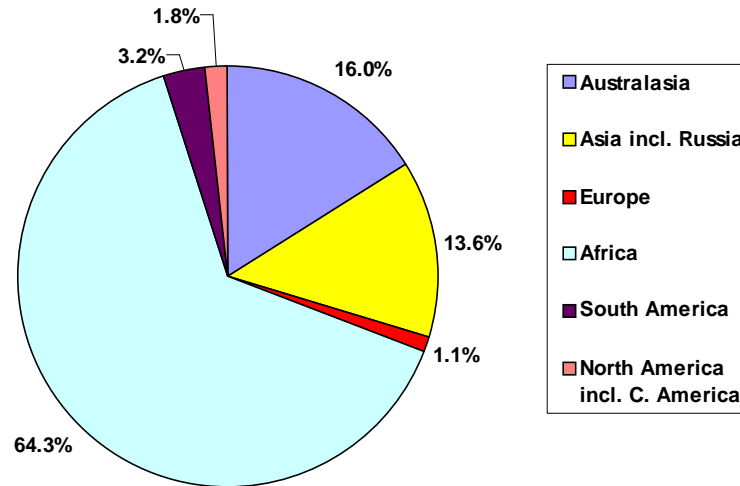
Diurnal cycle of fire activity: a case study in West Africa



400 x 400 km : (8N-12N; 0E-4E)

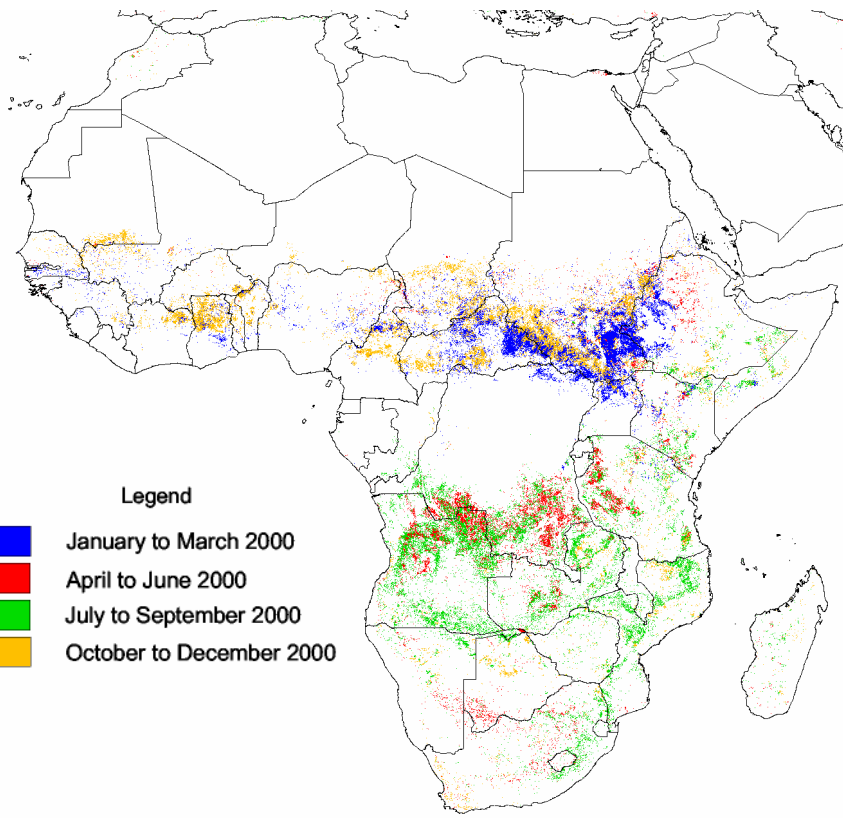


% of burned area in the year 2000 in six continents





Seasonal distribution of burning activity in Africa for the Year 2000

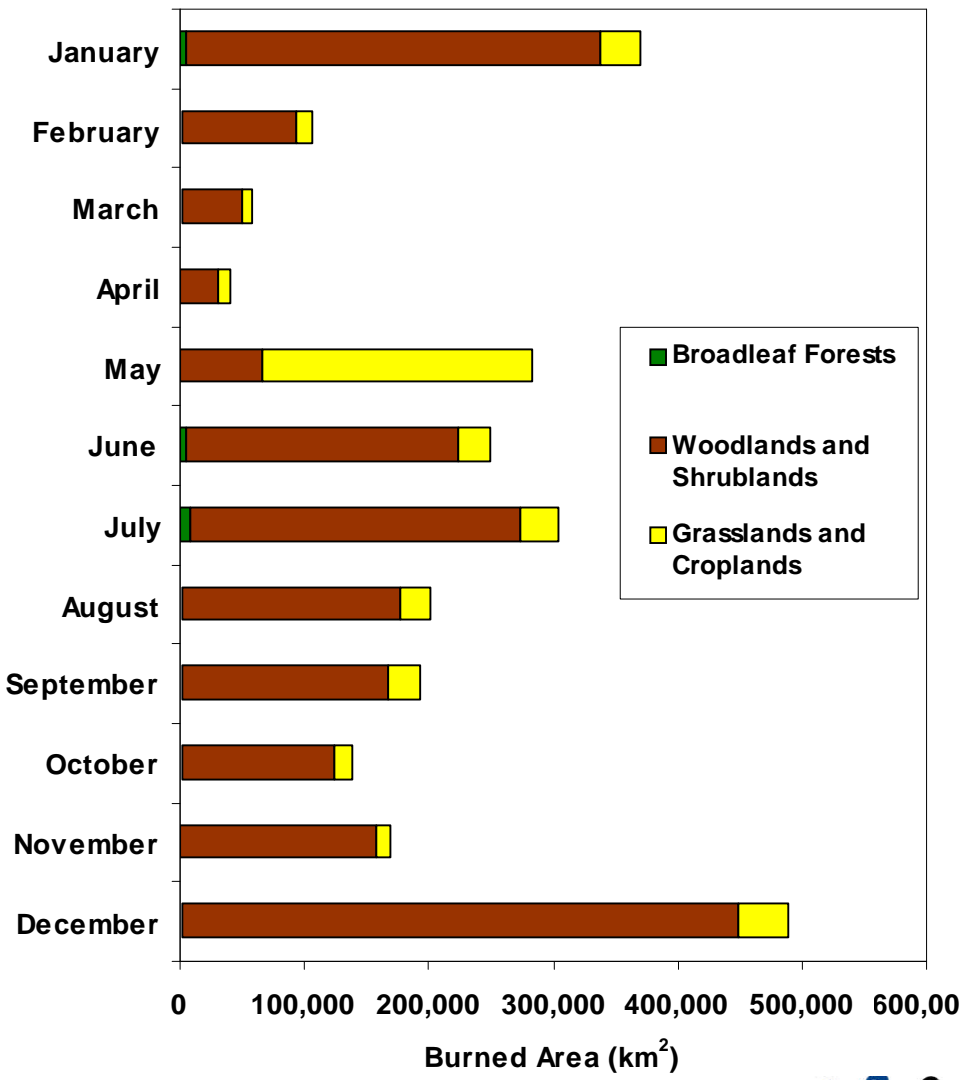


Legend

- January to March 2000
- April to June 2000
- July to September 2000
- October to December 2000

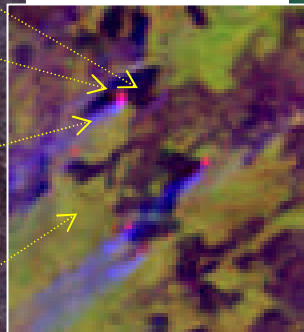
Total annual burned area estimated at ≈ 2.6 million km²
> 300,000 burn scars detected

Monthly estimates of burned areas in Africa for three grouped vegetation classes in the year 2000





Helicopter view - Australia



SPOT-VGT 1 km resolution – RCA Sudan border - ~ 500 km x 500 km

