Outline

- Overview
  - Data continuity – defined
  - Data continuity - Coarse, medium and high resolution sensors
  - Satellite sensors useful for fire research
  - Discussion points

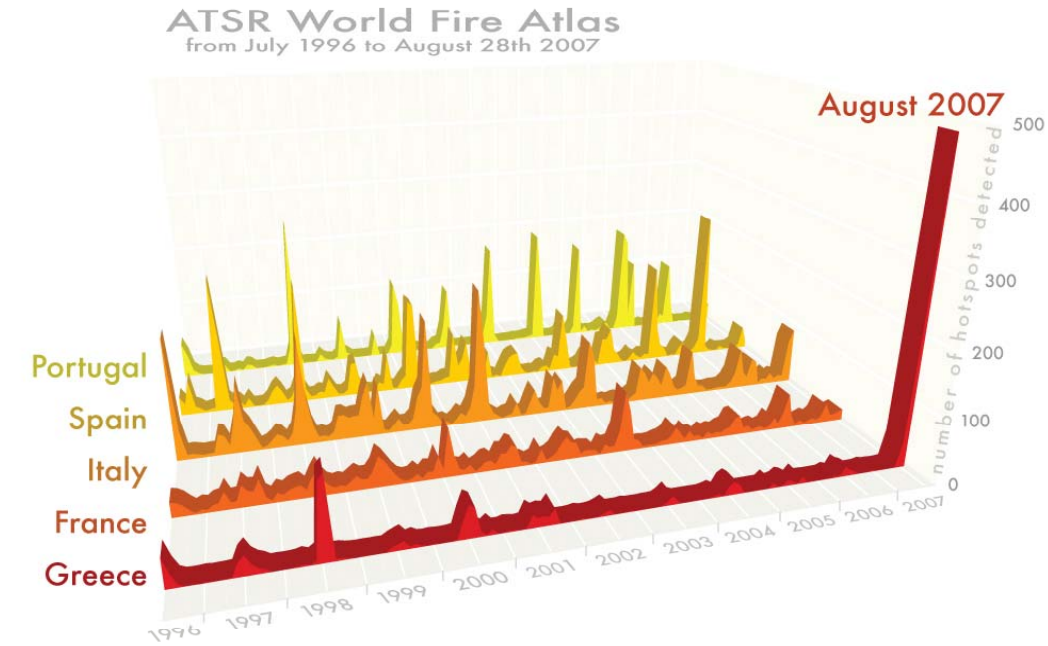
Data Continuity - Defined

During 1992, in US, the Congress and White House agreed to fund the procurement of Landsat 7. The Land Remote Sensing Policy Act of 1992 (Public Law 102-555) designated NASA and the USGS as the agencies responsible for managing Landsat 7. A major purpose of the Act was to ensure Landsat data continuity.

The Act defined 'data continuity' as:

...the continued acquisition and availability of unenhanced data which are, from the point of view of the user – *(A) sufficiently consistent (in terms of acquisition geometry, coverage characteristics, and spectral characteristics) with previous Landsat data to allow comparisons for global and regional change detection and characterization;* and *(B) compatible with such data and with methods used to receive and process such data.*

Greece 2007



Greece, August 2007

- 64 casualties
- Thousands of homeless
- **More than 160,000 ha burned in a few days only in the Peloponnesus**
- **More than 260,000 ha overall**
- Rapid Burn Scar Maps produced by DLR (D) and SERTIT (F)

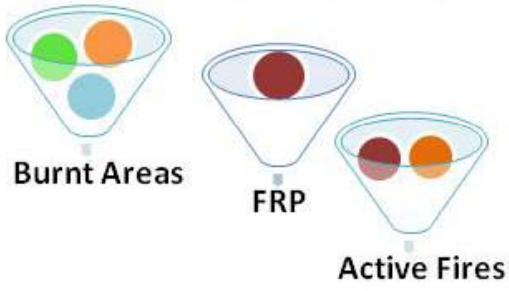
Greece 2009

Envisat's Medium Resolution Imaging Spectrometer (MERIS) Greece on 24 August 2009 at 09:14 UTC
A new large smoke plume is visible west of Athens, pushed southerly by strong winds.

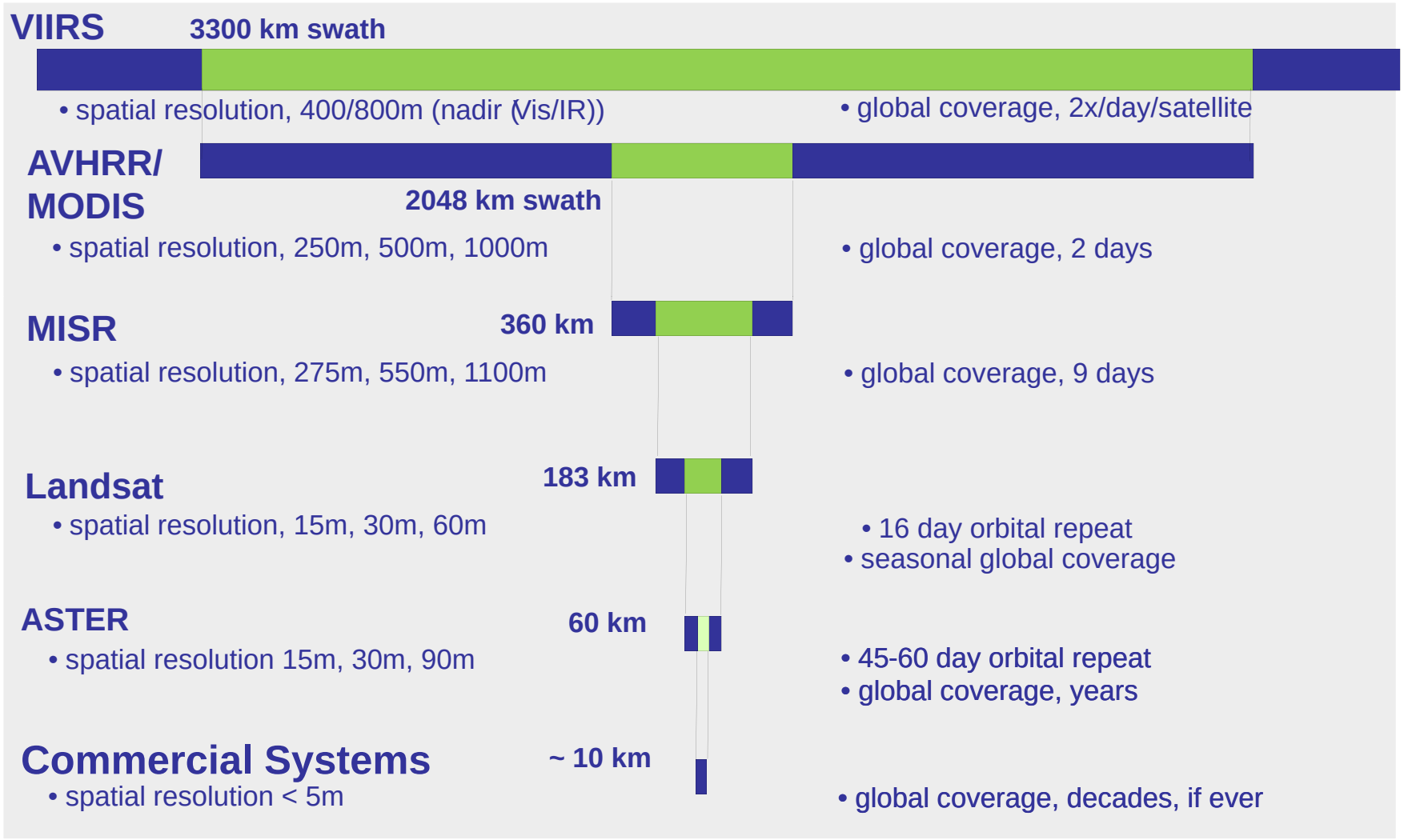
Spectral bands and Fire products

Satellites	VIS	NIR	SWIR	MIR	TIR	Spatial
Disaster Monitoring Constellation	●	●				32m
ENVISAT-MERIS	●	●				300m
DMSP-OLS	●	●				2-3km
TRMM VIRS	●	●	●			2km
SPOT-VGT	●	●	●			1km
Bird		●		●	●	185-370m
ERS-2 ATSR ENVISAT-2 AATSR	●	●	●	●	●	1km
TERRA/AQUA/MODIS	●	●	●	●	●	250-1km
NOAA/METOP/AVHRR	●	●	●	●	●	1km
GMES-Sentinel-SLST	●	●	●	●	●	500-1km
NPP/NPOESS VIIRS	●	●	●	●	●	375-250
LDCM	●	●	●	●	●	30m

Several combinations also exist!
Burn severity (NBR)
= NIR-MIR/NIR+MIR



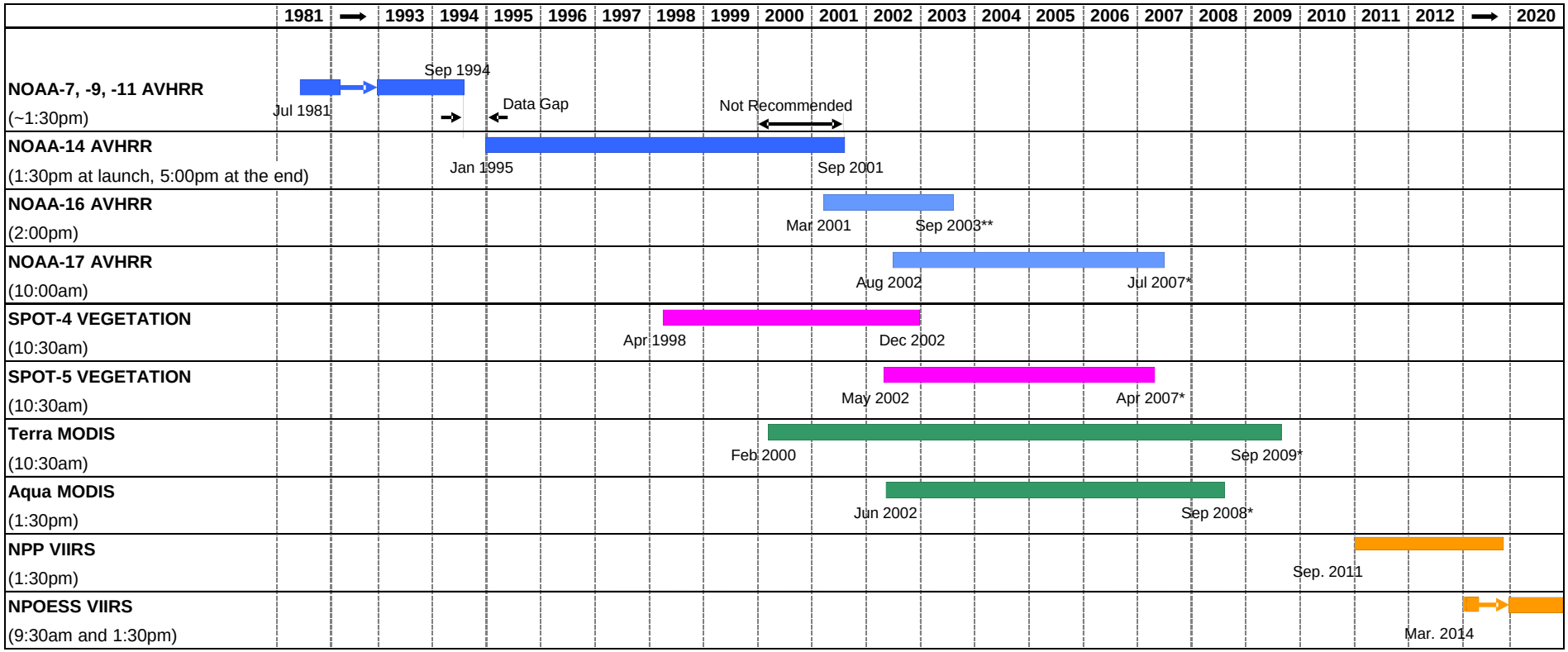
Land Remote Sensing and Data



Compromise between resolution of the sensor and spatial coverage.

Palatiello, 2007

Land Remote Sensing and Data



THE AVHRR DATA RECORD

AVHRR provides the start of the Long Term Data Record continued by MODIS and VIIRS

Some important issues

- 1982-1998 SPANNED BY NOAA SATELLITES 7, 9, 11, 14.
- Equatorial crossing time allowed to drift within each series, steadily increasing solar zenith angle.
- Calibration coefficients are different for each AVHRR sensor.
- Aerosol variability from El Chichon 1982, Pinatubo 1991, biomass burning, dust etc., need to be considered.
- Data can be affected by sub-pixel cloud contamination
- Different algorithms were used for compositing: Max NDVI Compositing: FASIR: middle 9 day interval. IMMS: average both 15 day intervals.

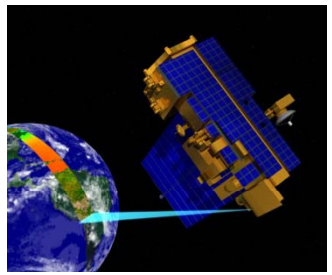
Moderate Resolution Imaging Spectroradiometer

Orbit:	705 km, 10:30 a.m. descending node or 1:30 p.m. ascending node, sun-synchronous, near-polar, circular
Scan Rate:	20.3 rpm, cross track
Swath Dimensions:	2330 km (across track) by 10 km (along track at nadir)
Telescope:	17.78 cm diam. off-axis, afocal (collimated), with intermediate field stop
Size:	1.0 x 1.6 x 1.0 m
Weight:	250 kg
Power:	225 W (orbital average)
Data Rate:	11 Mbps (peak daytime)
Quantization:	12 bits
Spatial Resolution:	250 m (bands 1-2)
(at nadir):	500 m (bands 3-7), 1000 m (bands 8-36)
Design Life:	5 years

Primary Use	Band	Bandwidth[1]	Spectral Radiance[2]	Required SNR[3]
Land/Cloud	1	620-670	21.8	128
Boundaries	2	841-876	24.7	201
Land/Cloud	3	459-479	35.3	243
Properties	4	545-565	29.0	228
	5	1230-1250	5.4	74
	6	1628-1652	7.3	275
	7	2105-2155	1.0	110
Ocean color/	8	405-420	44.9	880
Phytoplankton/	9	438-448	41.9	838
Biogeochemistry	10	483-493	32.1	802
	11	526-536	27.9	754
	12	546-556	21.0	750
	13	662-672	9.5	910
	14	673-683	8.7	1087
	15	743-753	10.2	586
	16	862-877	6.2	516
Atmospheric	17	890-920	10.0	167
Water Vapor	18	931-941	3.6	57
	19	915-965	15.0	250

Primary Use	Band	Bandwidth[1]	Spectral Radiance[2]	Required NEΔT(K)[3]
Surface/Cloud	20	3.660-3.840	0.45	0.05
Temperature	21	3.929-3.989	2.38	2.00
	22	3.929-3.989	0.67	0.07
	23	4.020-4.080	0.79	0.07
Atmospheric	24	4.433-4.498	0.17	0.25
Temperature	25	4.482-4.549	0.59	0.25
Cirrus Clouds	26	1.360-1.390	6.00	150[4]
Water Vapor	27	6.535-6.895	1.16	0.25
	28	7.175-7.475	2.18	0.25
	29	8.400-8.700	9.58	0.05
Ozone	30	9.580-9.880	3.69	0.25
Surface/Cloud	31	10.780-11.280	9.55	0.05
Temperature	32	11.770-12.270	8.94	0.05
Cloud Top	33	13.185-13.485	4.52	0.25
Altitude	34	13.485-13.785	3.76	0.25
	35	13.785-14.085	3.11	0.25
	36	14.085-14.385	2.08	0.35

[1]Bands 1 to 19, nm; Bands 20-36, μm
[2](W/m^2-μm-sr)
[3]SNR=Signal-to-noise ratio
NEΔT=Noise-equivalent temperature difference } Performance goal is 30%-40% better than required
[4]SNR



- T(4μm) is high - absolute signal
- T(4μm) - T(11μm) is large -spectral contrast
- T(4μm) and/or T(4μm) - T(11μm) differ significantly from surrounding background – spatial contrast
- tests to minimize false detection (VIS/NIR reflectance; internal cloud mask; water mask; sun-glint test etc.)

MODIS Fire products

1). Active Fires – 1-km, daily and 8 day summaries (2001-present)

2). Burnt Areas-500m global monthly (2001-present).

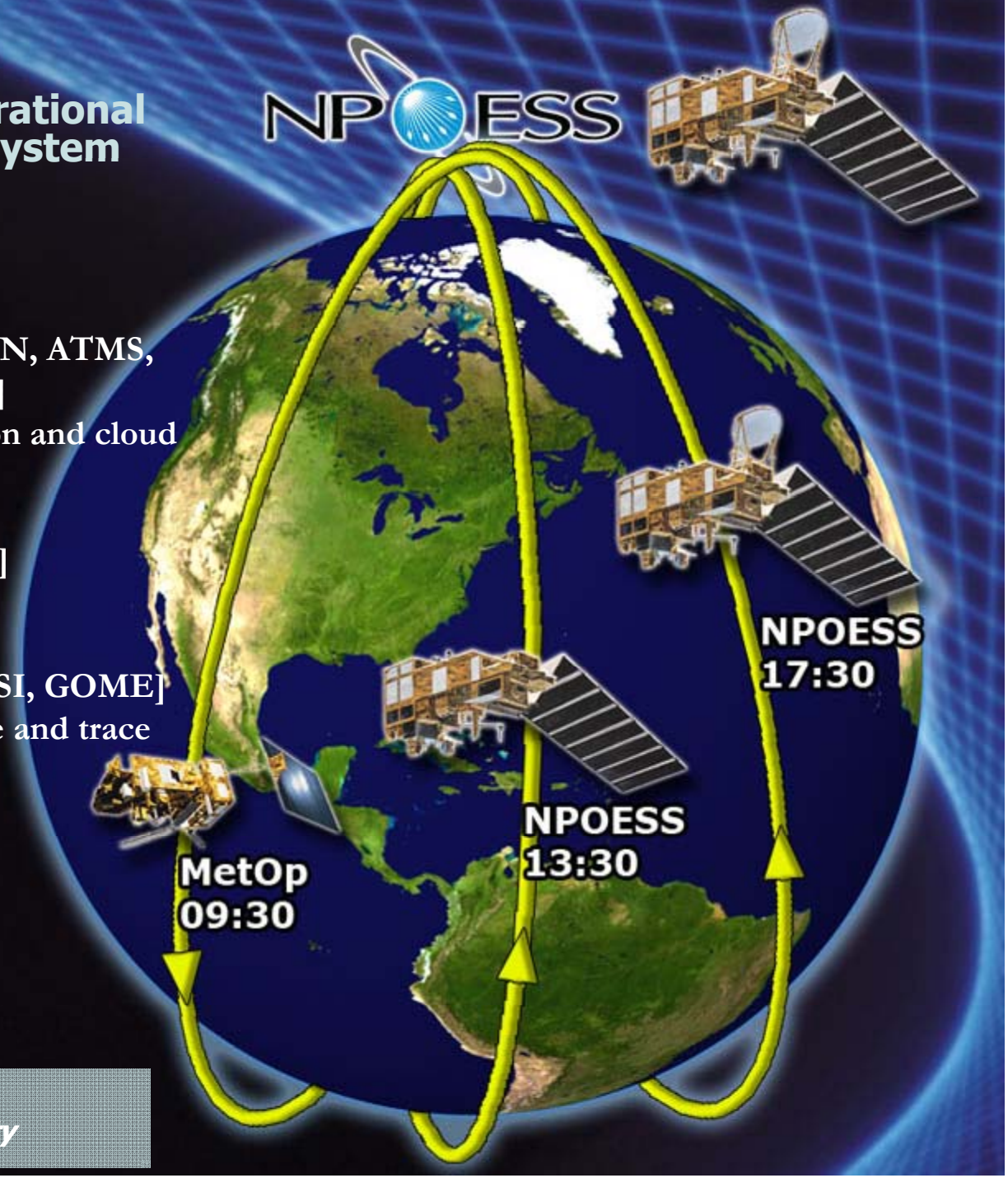
3). Fire Radiative Power – 1km, Daily (2001-Present)

T4 = 22 (330k saturation
= 21 (500k
T11 = 32(400k)

National Polar-Orbiting Operational Environmental Satellite System

- 1330 [VIIRS, CrIS, CERES, OMPS-N, ATMS, SARSAT, ADCS, SEM]
  - Column ozone, Earth radiation and cloud observations
- 1730 [VIIRS, MIS, SARSAT, ADCS]
  - Advanced cloud imagery
- 09:30 orbit by MetOp [AVHRR, IASI, GOME]
  - Cloud imagery, column ozone and trace gases

Single satellite design with common sensor locations.



NPOESS Ensures Climate Data Continuity

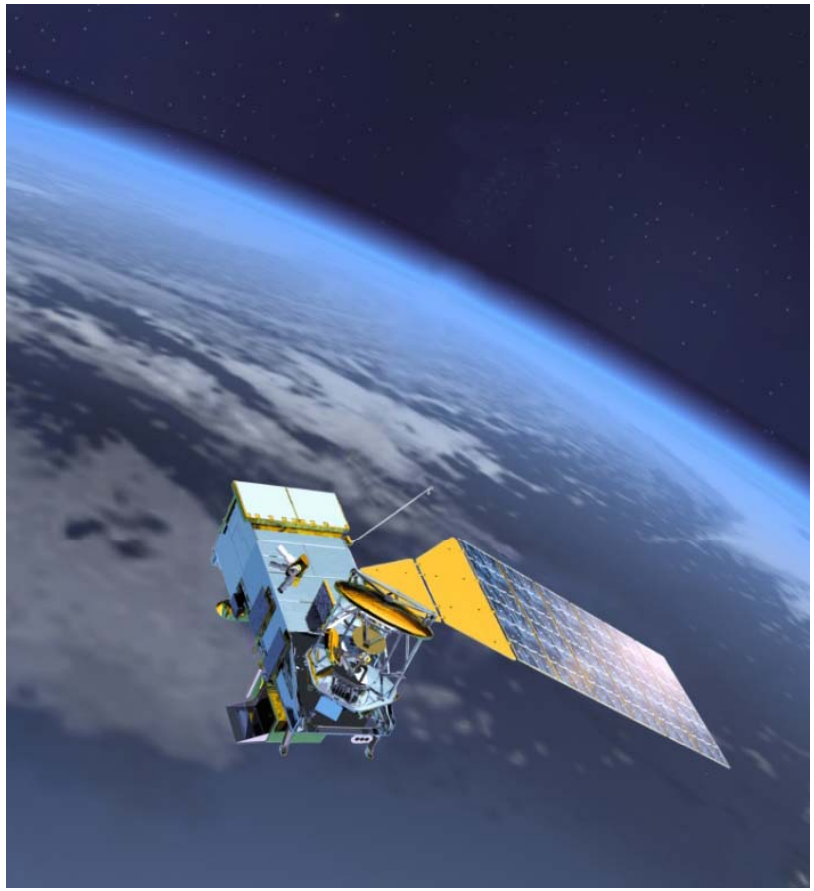
VIIRS Overview – Launch September, 2011

PURPOSE: Global operational observations of land, ocean, & atmosphere parameters.

PREDECESSORS: AVHRR, OLS, MODIS, SeaWiFS

Instrument

- Multi-spectral crosstrack scanning instrument
- Flies on every NPOESS satellite, NPP
- 23 of 55 EDRs – land, ocean, atmosphere
- 3 of 6 Key Performance Parameters
  - Imagery, Sea Surface Temperature, Soil Moisture
- Imagery and radiometry
  - "Fine" (imaging) 0.4 km resolution (nadir)
  - "Moderate" (radiometry) 0.8 km resolution
  - 12 bit quantization
- 22 spectral bands (0.4 – 12.5 μm)
  - 15 "reflective" VNIR-SWIR bands 0.4 – 2.3 μm
  - 3 "mixed" MWIR bands 3.5 – 4.1 μm
  - 4 "emissive" LWIR bands 8.4 – 12.5 μm
  - Automatic dual VNIR & triple DNB gains
- EDR-dependent swath widths
  - 1700, 2000, and 3000 km



VIIRS Bands and Products

VIIRS 22 Bands:

16 M_ Band, 5 I_Band and 1 DNB

VIIRS Band	Spectral Range (um)	Nadir HSR (m)	MODIS Band(s)	Range	HSR
○ DNB	0.500 - 0.900				
○ M1	0.402 - 0.422	750	8	0.405 - 0.420	1000
○ M2	0.436 - 0.454	750	9	0.438 - 0.448	1000
M3 ○	0.478 - 0.498	750	3 10	0.459 - 0.479 0.483 - 0.493	500 1000
M4	0.545 - 0.565	750	4 or 12	0.545 - 0.565 0.546 - 0.556	500 1000
○ I1	0.600 - 0.680	375	1	0.620 - 0.670	250
M5	0.662 - 0.682	750	13 or 14	0.662 - 0.672 0.673 - 0.683	1000 1000
M6	0.739 - 0.754	750	15	0.743 - 0.753	1000
○ I2	0.846 - 0.885	375	2	0.841 - 0.876	250
M7	0.846 - 0.885	750	16 or 2	0.862 - 0.877 0.841 - 0.876	1000 250
M8	1.230 - 1.250	750	5	SAME	500
M9	1.371 - 1.386	750	26	1.360 - 1.390	1000
I3	1.580 - 1.640	375	6	1.628 - 1.652	500
M10	1.580 - 1.640	750	6	1.628 - 1.652	500
M11	2.225 - 2.275	750	7	2.105 - 2.155	500
I4	3.550 - 3.930	375	20	3.660 - 3.840	1000
M12	3.660 - 3.840	750	20	SAME	1000
M13 ○	3.973 - 4.128	750	21 or 22	3.929 - 3.989 3.929 - 3.989	1000 1000
M14	8.400 - 8.700	750	29	SAME	1000
M15	10.263 - 11.263	750	31	10.780 - 11.280	1000
I5	10.500 - 12.400	375	31 or 32	10.780 - 11.280 11.770 - 12.270	1000 1000
M16	11.538 - 12.488	750	32	11.770 - 12.270	1000

○ Dual gain band

VIIRS 24 EDRs

Land, Ocean, Atmosphere, Snow

Name of Product	Group	Type
Imagery *	Imagery	EDR
Precipitable Water	Atmosphere	EDR
Suspended Matter	Atmosphere	EDR
Aerosol Optical Thickness	Aerosol	EDR
Aerosol Particle Size	Aerosol	EDR
Cloud Base Height	Cloud	EDR
Cloud Cover/Layers	Cloud	EDR
Cloud Effective Particle Size	Cloud	EDR
Cloud Optical Thickness/Transmittance	Cloud	EDR
Cloud Top Height	Cloud	EDR
Cloud Top Pressure	Cloud	EDR
Cloud Top Temperature	Cloud	EDR
Active Fires	Land	Application
Albedo (Surface)	Land	EDR
Land Surface Temperature	Land	EDR
Soil Moisture	Land	EDR
Surface Type	Land	EDR
Vegetation Index	Land	EDR
Sea Surface Temperature *	Ocean	EDR
Ocean Color and Chlorophyll	Ocean	EDR
Net Heat Flux	Ocean	EDR
Sea Ice Characterization	Snow and Ice	EDR
Ice Surface Temperature	Snow and Ice	EDR
Snow Cover and Depth	Snow and Ice	EDR

Global Fire Products – Continuity?

- **The world fire web (October 1996-2001)**
  - Provide global active fires mapping on a daily coverage from AVHRR at a spatial resolution of 0.5 by 0.5 degrees.

- **The World Fire Atlas (WFA) (Experimental 1991-November 1995-current)**
  - Developed by ESA and includes active fires detected at 1 km spatial resolution from the ERS Along Track Scanning Radiometer (ATSR) at night-time.

- **The TRMM VIRS fire product (Jan-1998 to Aug-2000)**
  - Includes global active fires dataset compiled using data from the Visible and Infrared Scanner (VIRS) onboard the Tropical Rainfall Measuring Mission (TRMM) satellite, given as a spatial resolution of 0.5 by 0.5degree.

- **The MODIS fire products (2000 to Current)**
  - A suite of global MODIS products including the burned area and the active fire product.

- **The GBA 2000 (Global Burned Area -2000)**
  - Includes globally burned areas mapping at a monthly time step for the year 2000, using 1 km satellite imagery provided by the SPOT-Vegetation

Global Fire Products – Continuity?

- **GlobScar (Global Burned Area – 2000)**
  - Globally burned areas mapping at a monthly time step for the year 2000, using 1 km satellite imagery provided by the ATSR-2 sensor
- **GlobCarbon (Global Burned Areas 1998-2007)**
  - Global burned areas at a monthly time step including day of detection for years 1998-2007, using 3 algorithms, fire hotspots and ATSR-2, AATSR and SPOT-Vegetation
- **MODIS (Global Burned Areas 2000-present)**
  - Global inventory of burnt area from MODIS sensor
- **L3JRC product (Global Burnt Areas 2000-2007)**
  - Includes a global inventory of the daily burnt area for seven fire seasons for the years 2000 to 2007, at moderate spatial resolution (1 km2) from the SPOT Vegetation sensor
- **The Experimental Wildfire ABBA Fire Product**
  - Includes active fires detection products for the Western Hemisphere in real time from GOES satellite with a resolution of 30 min.

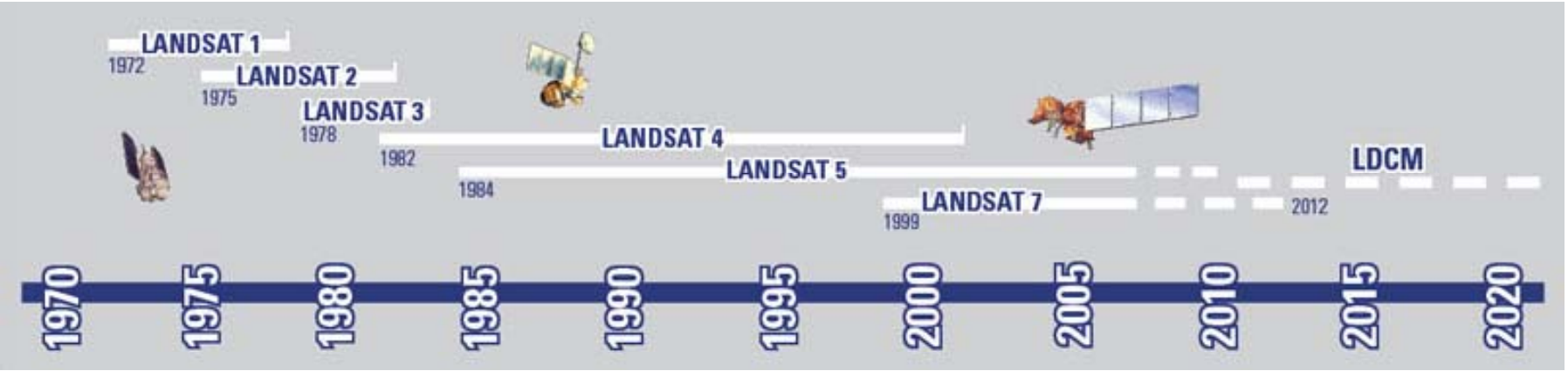
- ***Can we come up with an ensemble fire product***

Medium-Spatial-Resolution-Sensors

- Landsat – Earth Resources Technology Satellite (ERTS-1)
- Spot – Systeme Pour l'Observation de la Terre
- IRS – Indian Remote Sensing Satellite
- Aster – Advanced Spacebourne Thermal Emission and Reflection Radiometer

36+ Years of Continuous Landsat Global Observation

- Landsat 1 was launched July 23, 1972 (MSS)
- Landsat 2 was launched January 22, 1975 (MSS)
- Landsat 3 was launched March 5, 1978 (MSS)
- Landsat 4 was launched July 16, 1982 (TM)
- Landsat 5 was launched March 1, 1984 (TM)
- Landsat 6 was launched October 5, 1993, but never reached orbit
- Landsat 7 was launched April 15, 1999, May 2003 SLC-Off (ETM+)
- Landsat 8 is scheduled for launch in December 2012

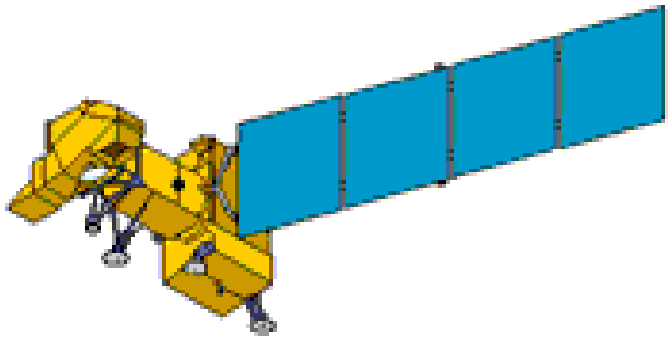


http://landsat.usgs.gov

Landsat Data Continuity Mission

Landsat…36 yrs of data

- Landsat 5 – 25 years since launch (March 1, 1984)
  - TM - functioning normally
  - No on-board data recorders
- Landsat 7 – nearly 5 years beyond design life
  - 1999 Launch
  - ETM+ - Scan Line Corrector Failure
  - Robust global acquisitions.
  - Both Landsat-5 and 7 satellites have enough fuel to operate till 2012.
  - EROS data center is providing Gap-Filled data at nominal price.
- Data of 36-years available at No-Cost *(Mid Decadal Global Land Survey Project)*.
  - GeoTIFF format
  - Orthorectified “GIS-ready”
  - Calibrated across missions and instruments
  - Global datasets for 2005 already available.
  - 2010 in progress



- Landsat data are accessible from:
  - GloVis (glovis.usgs.gov)
  - Earth Explorer (earthexplorer.usgs.gov)

Gutman et al., PERS, 2005, 74, 6-10.

Data gaps and possible sources

- **Landsat quality data gap is increasing**
  - Earliest launch date of the LDCM (2012). No mechanism finalized yet for acquisition or purchase of data from international assets. *However MOU between UMD and ISRO (NRSC) that is already established can aid in filling such gap (Thanks to Chris and Badarinath).*

- **USGS Landsat Data Gap Readiness Plan**
  - Define a set of options and capabilities to acquire Landsat-like data in the event of the loss of Landsat 5 and/or Landsat 7.

Performance Parameter	Performance Goal: LDCM Specification	Acceptable Specification*
Radiometry	<5% error at-sensor radiance	<15% error at-sensor radiance
Spatial Resolution	30m GSD VNIR-SWIR; 15m	100m GSD
Geographic Registration	<65m circular error	<65m circular error
Band-band registration	uncertainty <4.5m (0.15 pixel)	uncertainty <0.15 pixel
Spectral Bandpass (nm)	Blue 433-453	
	Blue 450-515	
	Green 525-600	
	Red 630-680	√
	NIR 845-885	√
	SWIR 1560-1660	√
	SWIR 2100-2300	
	SWIR 1360-1390	
	Pan 500-680	
Global Coverage	Seasonal (4X annually), substantially cloud-free global acquisition Includes U.S. acquisition every 16 days	Global, substantially cloud-free acquisitions twice per year (2 seasons annually)

USGS

Landsat data continuity and gap fillers

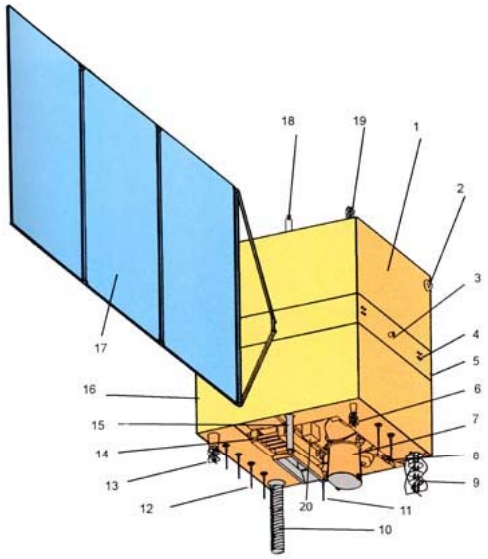
KEY:																		
meets spec	OK																	
does not meet spec	X																	
need more information	?																	
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Annual Global Coverage	Spatial Resolution	Spectral Coverage	Data Quality*
ResourceSat-1																OK	OK	OK	?
ResourceSat-,2																OK	OK	OK	?
CBERS 2																?	OK	OK	?
CBERS 2A																?	OK	OK	?
CBERS 3																?	OK	OK	?
CBERS 4																?	OK	OK	?
RapidEye 1,2,3,4,5																?	OK	X	?
Terra/ASTER																X	OK	OK	OK
EO-1/ ALI																X	OK	OK	OK
SPOT 4																?	OK	OK	OK
SPOT 5																?	OK	OK	OK
ALOS																?	OK	X	?
DMC Algeria																X	OK	X	?
DMC Nigeria																?	OK	X	?
DMC UK																?	OK	X	?
DMC China																X	OK	X	?

**Data quality is acceptable if verified to meet acceptable specifications for radiometric and geographic accuracy, band-to-band registration as well as global coverage (USGS).*

Resourcesat and SPOT

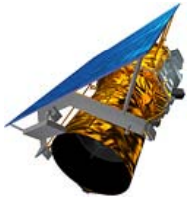
- **India's ResourceSat-1 Launched 10/03**
  - High Resolution Linear Imaging Self-Scanner (LISS-IV) – 5.8m VNIR SWIR
  - Medium Resolution Linear Imaging Self-Scanner (LISS-III) - 23m - VNIR SWIR
  - Advanced Wide Field Sensor (AWiFS) -56m – VNIR SWIR
  - Follow-on planned

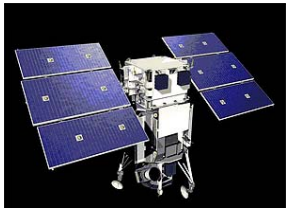
- **China-Brazil CBERS launched 10/03**
  - High resolution CCD camera-20m VNIR
  - Infrared Multispectral Scanner-80m SWIR, 160m TIR
  - Wide field Imager – 260m VNIR
  - Follow-on Planned



High Resolution Sensors

Satellites	Launch Date	Resolution	Bands	Swath Width	Average revisit	Life
IKONOS	Sep 24th, 1999	1m PAN 4m MS	Pan: 450-900 nm Blue, Green, Red, NIR).	11km at Nadir	3-5 days	7 years
Quickbird	Oct-18, 2001	61 cm PAN 2.44m MS	Pan: 450-900 nm Blue, Green, Red, NIR).	16.5km at Nadir	1-3.5 days	8 years
Worldview-1	September, 2007	0.55m Pan	Pan – 450-900nm	60 x 110 km mono 30 x 110 km stereo	5.9 days	7 years
GeoEye-1	Sep-06, 2008	0.41 Pan 1.65 MS	1 Pan 4 MS	15.2km at Nadir	0.42 - 8.3 days 0.52-2.8 days 0.59- 2.1 days	7 years
Worldview-2	Oct-8, 2009	0.55m Pan	8 Multispectral (R, G, B,NIR, red edge, coastal, yellow, near-IR2)	16.4 km at Nadir	1.7 days	7 years
GeoEye-2	To be launched	0.25m	1PAN			

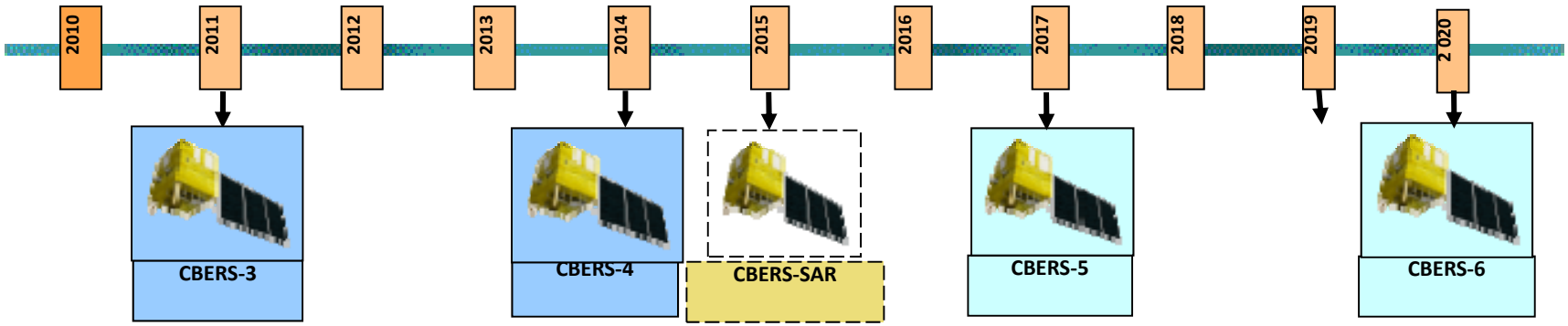




IRS data and continuity

IRS-1A	IRS-1B	IRS-P2	IRS-1C	IRS-P3	IRS-1D	IRS-P4	IRS-P6	IRS-P6
1988								
1989								
1990								
1991	1991							
	1992							
	1993	1993						
	1994	1994						
	1995	1995	1995					
	1996	1996	1996	1996				
	1997		1997	1997	1997			
	1998		1998	1998	1998			
	1999		1999	1999	1999	1999		
	2000		2000	2000	2000	2000		
	2001		2001	2001	2001	2001		
			2002	2002	2002	2002		
			2003	2003	2003	2003	2003	
			2004		2004	2004	2004	
			2005		2005	2005	2005	2005
			2006		2006	2006	2006	2006
			2007		2007	2007	2007	2007
								2008
								2009
								2010

INPE-Brazil-China Collaboration– CBERS



CBERS-1

September 1999 – March 2003

CBERS-2

October 2003 – March 2009

CBERS-2B

Launched in September, 2007

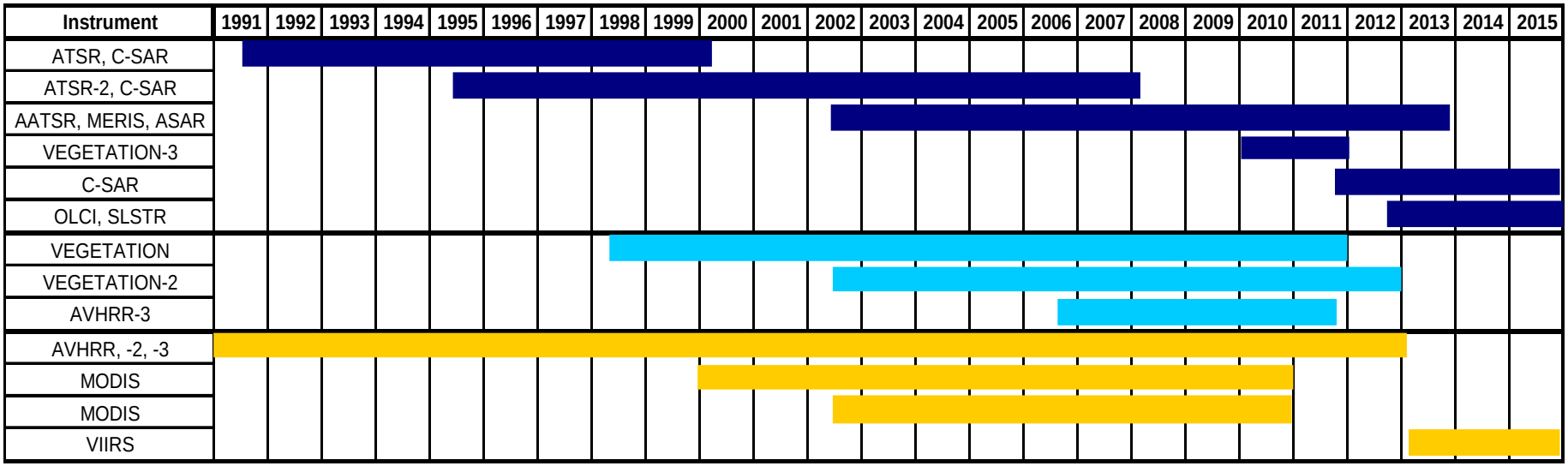
CBERS-3

Scheduled for June, 2011

CBERS-4

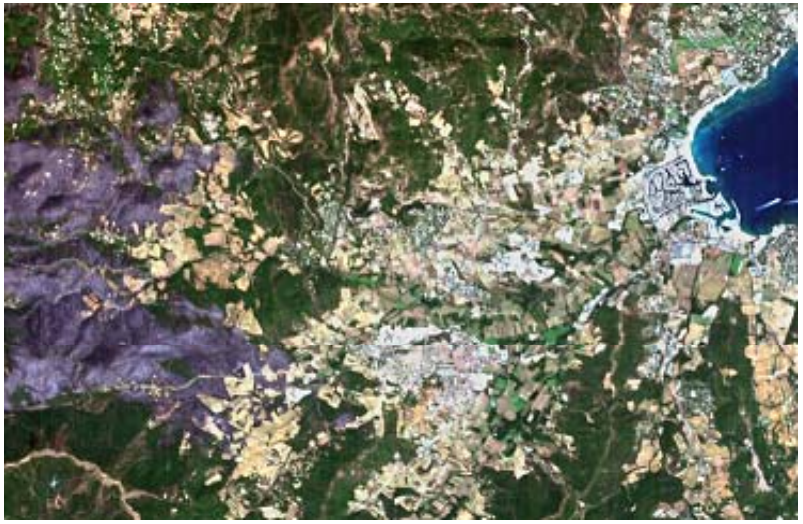
Scheduled for September, 2014

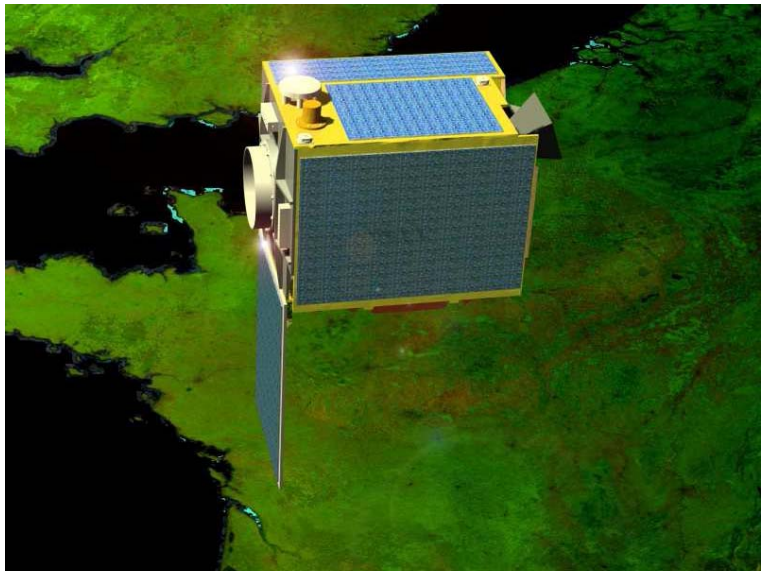
Satellite Data Continuity Europe



GCOS Objectives		**Current Status**
• Accuracy:	5% error in omission/commission	Unknown, high regional variation
• Spatial resolution:	250m	1 km
• Temporal resolution:	daily	monthly with Day of Detection
• Stability:	5%	Unknown, high regional variation

PROBA Continuity of VEGETATION





Key requirements of the PROBA-V mission

- **Data and service continuity**:
  from SPOT-VGT to Sentinel-3
- **Spectral and radiometry**:
  Identical to VGT
- **Spatial Resolution**:
  1 km mandatory, improved GSD is highly desirable: 300 m (VNIR bands), 600 m (SWIR band).
- **Image quality and geometry**:
  Equal to or better than SPOT-VGT
- **Temporal Resolution**:
  Daily coverage > ±35º.
  Global in two days.

Sentinel-1 Continuity of SAR

Satellite	Instrument	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ERS-1	C-Band SAR												
ERS-2	C-Band SAR												
ENVISAT	C-Band SAR												
Sentinel-1	C-Band SAR												

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	~	2030

Envisaged first launch in 2012 and followed by the second satellite a few years later.

Coverage over Europe and Canada in less than two days.

Radar data delivery: 1 hour of acquisition

Sentinel-2 Continuity of SPOT

Satellite	Instrument	86-91	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
SPOT-1,2,3	HRV												
SPOT-4	HRV												
SPOT-5	HRV												
Sentinel-2	MSI												

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	~	2030

First launch in 2013.
Multi-Spectral Imager (MSI) with a swath of 290 km.
13 spectral bands (VNIR to SWIR)
4 spectral bands at 10m, 6 bands at 20m and 3 bands at 60m spatial resolution.
All land surfaces every 5 days under cloud-free conditions

Sentinel–3 Continuity for MERIS/AATSR

Satellite	Instrument	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ERS-1	ATSR												
ERS-2	ATSR-2												
ENVISAT	AATSR, MERIS												
SPOT-4	VEGETATION												
SPOT-5	VEGETATION-2												
PROBA-V	VEGETATION-3												
Sentinel-3	OLCI, SLSTR												

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	~	2030

The first launch in 2013, followed by a second to provide maximum coverage.
Global coverage in 2 days. Improved Swath and dedicated Fire detection (FRP, Day/Night Fire and BA)

Discussion – Dr. Plummer

Data Continuity – Discussion Points

Sensors/Platforms

A. Calibration

Data from satellite sensors used to create a long time series data should be well-characterized, stable, and inter-calibrated. Fine words but reality?

B. Error

Error traceability and detection capability needs fundamental consideration. Is this ever actually done?

Quality needs relating to instrument ability and temporal extension of product availability. Ever assessed?

C. Horses for courses

Instrument value depends on defining precisely what you are aiming to measure in relation to subsequent use? GCOS – should be climate but is it? These also not appropriate for Civil Protection.

Data Continuity – Discussion Points

Algorithms

A. Active Fires:

We do not measure same thing with each satellite – need to focus on quality of individual detection and then synthesis and how? (Polar orbiting, Geostationary, Geostationary+Polar orbiting). Exploit what you have for long time series.

B. Burnt areas:

Quality of detection (uncertainty) and limits – multiple approaches to build confidence, active fires. No fixed thresholds! Quality related to number of observations (BRDF!)? Make sure users know what the product is.

C. FRP:

How to build up geostationary and polar orbiting and prepare for future?

D. Ancillary Information:

What was it like before? How severe? How long does it stay 'altered'? Atmospheric associated information – injection?

Data Continuity – Discussion Points

Fire Products, Calibration and Validation protocols

A. Several fire products available.

Once we have a protocol – for what it is appropriate?

Do we need an all-encompassing calibration and validation protocol?

Can we address spatio-temporal variability in fires in diverse ecosystems?

How do we report error?

B. Protocols require application.

Free and fair and independent?

Representative (temporal and spatial)

C. Protocols require data.

Do GOFC or CEOS actually provide this and how is it made available? How if no money!! Who is responsible for providing it? Who for processing??

GOFC/CEOS Initiatives

A. Evaluate fire product accuracy over similar study area / years (Global Product Inter-comparison exercise for burnt area). Round-robin approach – data sets standardised.

B. Active fire synthesis – can we put together 'the time series' and start filling in the diurnal behaviour?