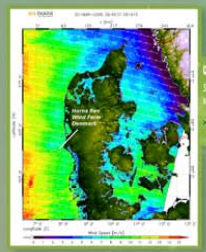
SPACE for UNFCCC

Space for Renewable Energy

One of the major challenges faced by the Renewable Energy industry today is to deliver secure and reliable power while managing uncertainties related to fluctuations and intermittency of the energy source.

Earth Observation from space can help energy managers meeting this challenge by providing them with global, synoptic, and verifiable data on energy resources, environmental parameters and weather conditions affecting the energy yield.

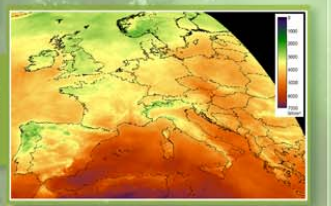
The following EO application projects supported by ESA are beginning to demonstrate the real benefits of EO to renewable energy industry, spanning the whole life cycle of energy production, from the technical and investment feasibility stages up to the distribution and trading of electricity. See *www.esa.int/eomd* for more information.



Quantifying offshore wind resources

Satellite measurements of ocean wind provide energy manager with a global and long-term time series of wind climatology, helping them to identify the best potential sites and designs of wind farms.

>>> *High-resolution coastal wind field derived from ASAR / ENVISAT. Courtesy ESA and BOOST Technologies*



Optimising solar energy plants

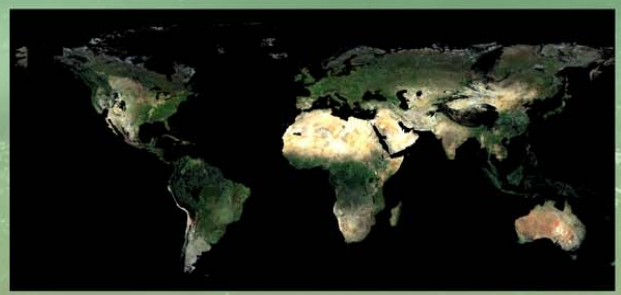
The Meteosat Second Generation satellite provides global maps of available solar resources up to 1km resolution every 15 minutes. Such data helps managers of Photovoltaic plants to optimize operations and automatically detect possible faults.

>>> *Ground solar irradiance derived from SEVIRI / MSG. Courtesy Bet Oldenburg*

Forecasting hydropower energy production

Satellites provide timely information on precipitation and snow cover conditions, thereby helping hydropower manager to quantify how much fuel (water) is available. Improved monitoring from space also leads to improve forecasting of water run-off, and thereby more effective management of operations and the grid.

>>> *Snow cover extent derived from MERIS / ENVISAT. Courtesy ESA*



Working with Parties

Kyoto Protocol reporting on land use and forestry

SOUTH AFRICA

POLAND

ITALY

GREECE

GERMANY

FRANCE

NETHERLANDS

SWITZERLAND

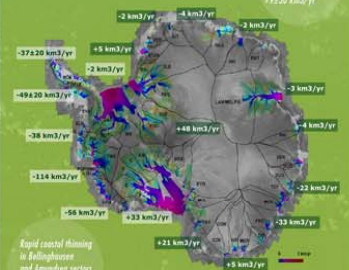
SPAIN

Global observations

Antarctic Ice Mass Flux from InSAR

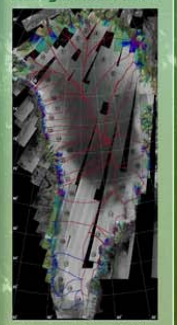
SLR 0.4 to 0.6 mm/yr
Peninsula: loss in Graham land, gain in Palmer land

Interior thickening and peripheral thinning in East Antarctica
+9±30 km3/yr



Rapid coastal thinning in Bellingshausen and Amundsen sectors of West Antarctica
-177±30 km3/yr

Rignot and Kanagaratnam 2005



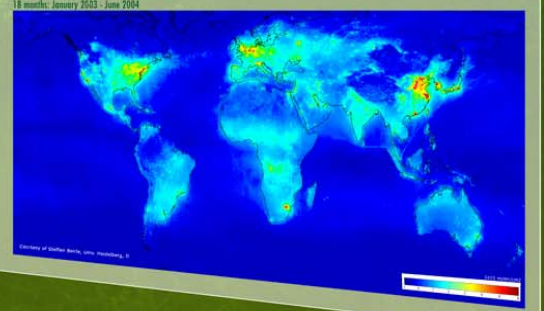
Recent example - Rignot et al., Science, 16 Feb. 2006

Acceleration of Greenland glaciers flow during last 10 years, suggesting that existing estimates of future sea-level rise are too low.

> based on ERS SAR data acquired in 1995 & Radarsat-1 + Envisat SAR data acquired in 2005.

NO_2 concentration

18 months: January 2003 - June 2004



www.esa.int/eo

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olivier.arino@esa.int

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Living Planet Programme

1991 — ERS 1

1995 — ERS 2

2002 — ENVISAT

Oceans
Glace de mer
Cryosphere
Surface terrestre
Climatologie

+ *Ozone*
+ *Biosphere*

+ *Couleur de l'ocean*
+ *Chimie de l'atmosphere*

* mission tierces archive, e.g Landsat from the 80s + SPOT + autres

Earth Watch Missions

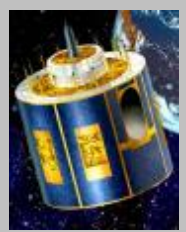
- **Long-term operational Earth monitoring Missions**
- Cooperation with **Eumetsat:**

  Meteosat and MetOp

- *and now cooperation with the **EC**: **GMES***

Meteosat

Since ’78, 8 ESA developed Meteosat satellites have been launched



MSG-1

29.8.2002

MetOp

Europe’s first polar orbiting satellite for op. meteorology

MetOp-1

19.10.2006

and now

GMES

Global Monitoring for Environment and Security (GMES)

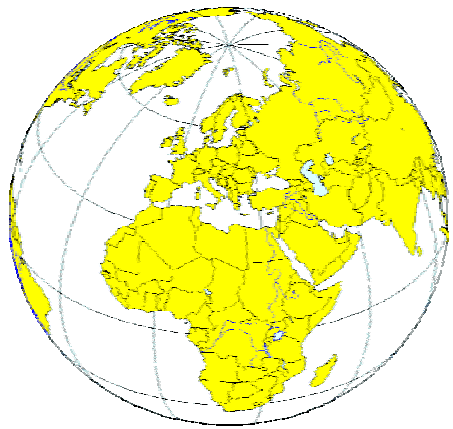
"GMES is a joint initiative of ESA and the EC to respond to the need to establish, by 2008, a European Capacity for Global Monitoring of Environment and Security to support the public policy maker's need for global access to reliable, accurate and up-to-date information on issues of environment and security"

EC Communication COM(2001)264, 15 April 2001

EO

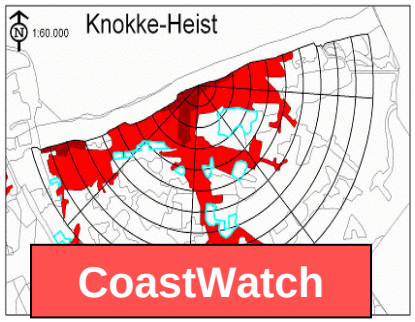
Needs

Solutions

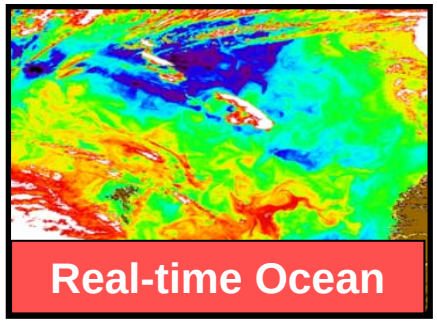


Public Policy

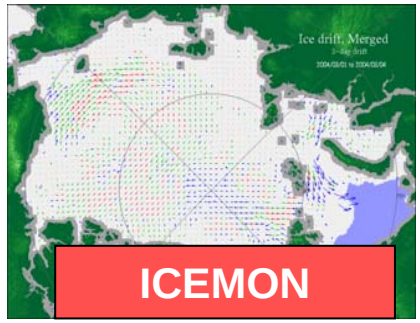
GMES Services



CoastWatch

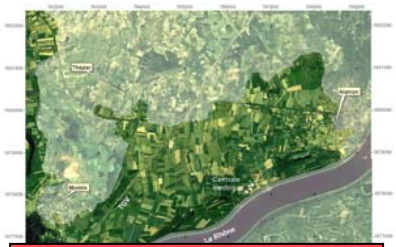


Real-time Ocean

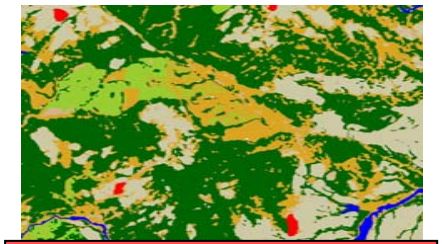


ICEMON

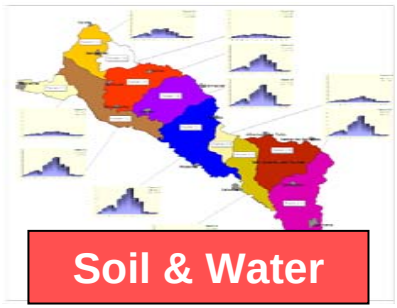
Northern View



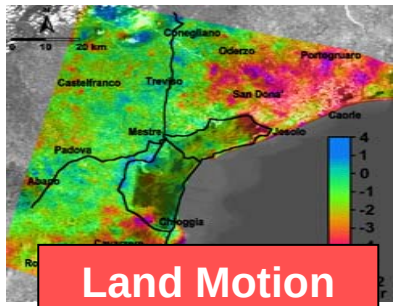
Risk fire & flood



Forest Monitoring



Soil & Water

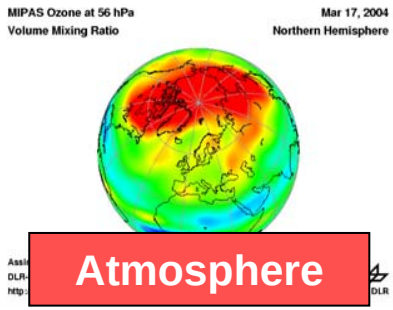


Land Motion

Urban Services

Humanitarian Aid

Food Security



Atmosphere

European Space Agency
Agence spatiale européenne

the Living Planet

GMES Land Requirements

Policy

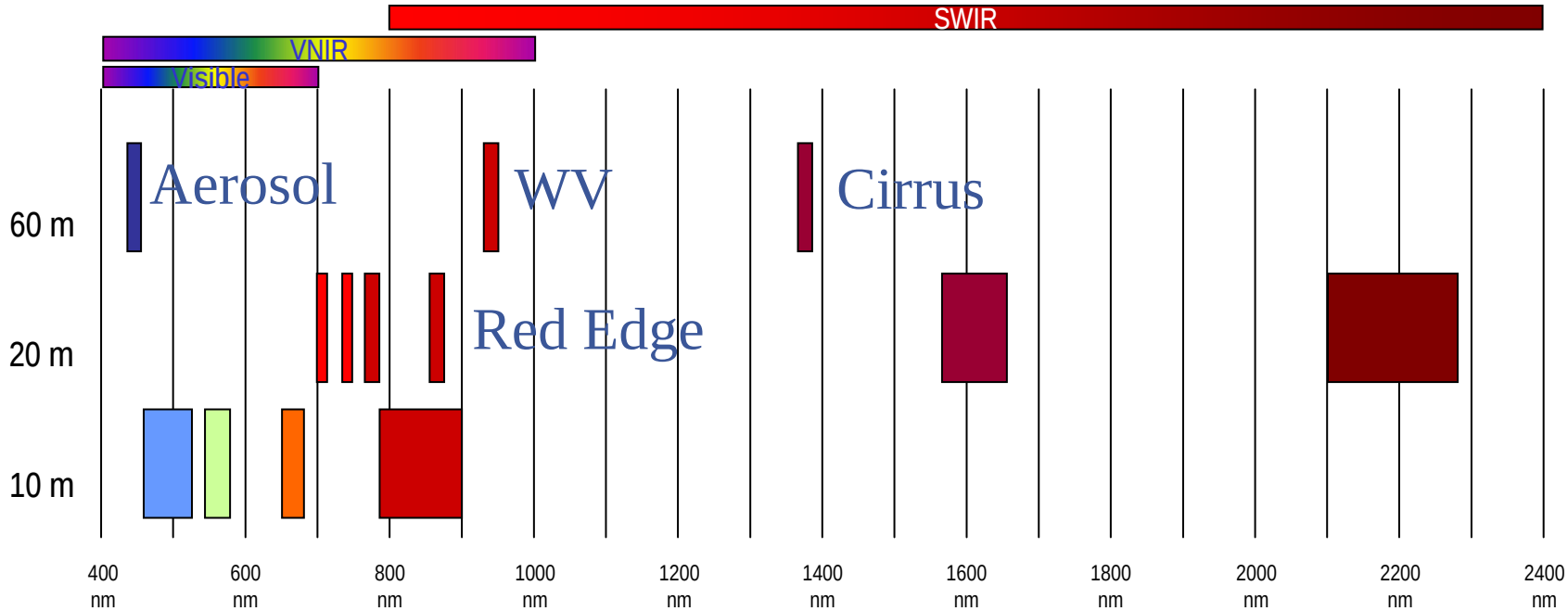
- Forestry and national reporting for Kyoto protocol
- Spatial planning for Soil Thematic Strategy
- Natura 2000 (and Ramsar Convention)
- Water Framework Directive
- Common Agriculture Policy

Observables

- CORINE Land Cover (every 3 years); 1-5 ha
- Soil Sealing (yearly); 0.25 -1ha
- Forest (yearly); 0.05-1 ha (mostly 0.5) minimum forest area
- Urban Atlas (yearly); 0.25 - 1 ha
- Natura 2000 and Ramsar (4 time/year – spread over Europe); 0.1-1 ha
- Water directive (4 time/year – full Europe); 1 – 5 ha
- Natural Hazards (twice yearly per fire mapping, floods at events); 0.1 – 1 ha

GMES Land Mission

Spectral bands



⇒**10 days revisit (i.e. 300 km swath)**

⇒***Fully coherent with Landsat continuity mission***

⇒ ***Ensure SPOT-5 spectral bands continuity***

⇒ ***Evolution: red edge and atmospheric correction***

⇒***Launch 2012***

ESA Third Party Mission

ESA provides access to data from non-ESA satellites

Missions	Sensor	Data Coverage	Time coverage	Today available on
JERS-1	OPS	European station coverage	1992-1998	on-demand, media
	SAR			
Proba	CHRIS	Global	2001-today	systematic online, ftp
	HRC	Global		
Landsat	MSS, TM, ETM	European coverage	1984-today	systematic online, ftp
Terra/Acqua	MODIS	Europe/North Africa	2001-today	on-demand, media
NOAA	AVHRR	Europe/North Africa	1984-today	on-demand, media
SPOT-1,-2,-3,-4*	HRV(IR)	European	From Nov 2005	on-demand, media
		Global (additional cost)		
ALOS	PALSAR	ADEN Zone (= Europe & Africa & Middle East) + restricted out-of-ADEN	From Dec 2006	on-demand, media
	AVNIR-2			
	PRISM			

Provide Data Access

ESA
Earth Observation Data
current and historic

European Users

Coherently manage ESA and ESA Third Party Mission Programmes

Manage and share EO GS Infrastructure

European Ground Segment Facilities

Non-European Ground Segment Facilities

EO Data User Interface and Support

Facilitate the user access

Non-ESA
Earth Observation Data
curent and historic

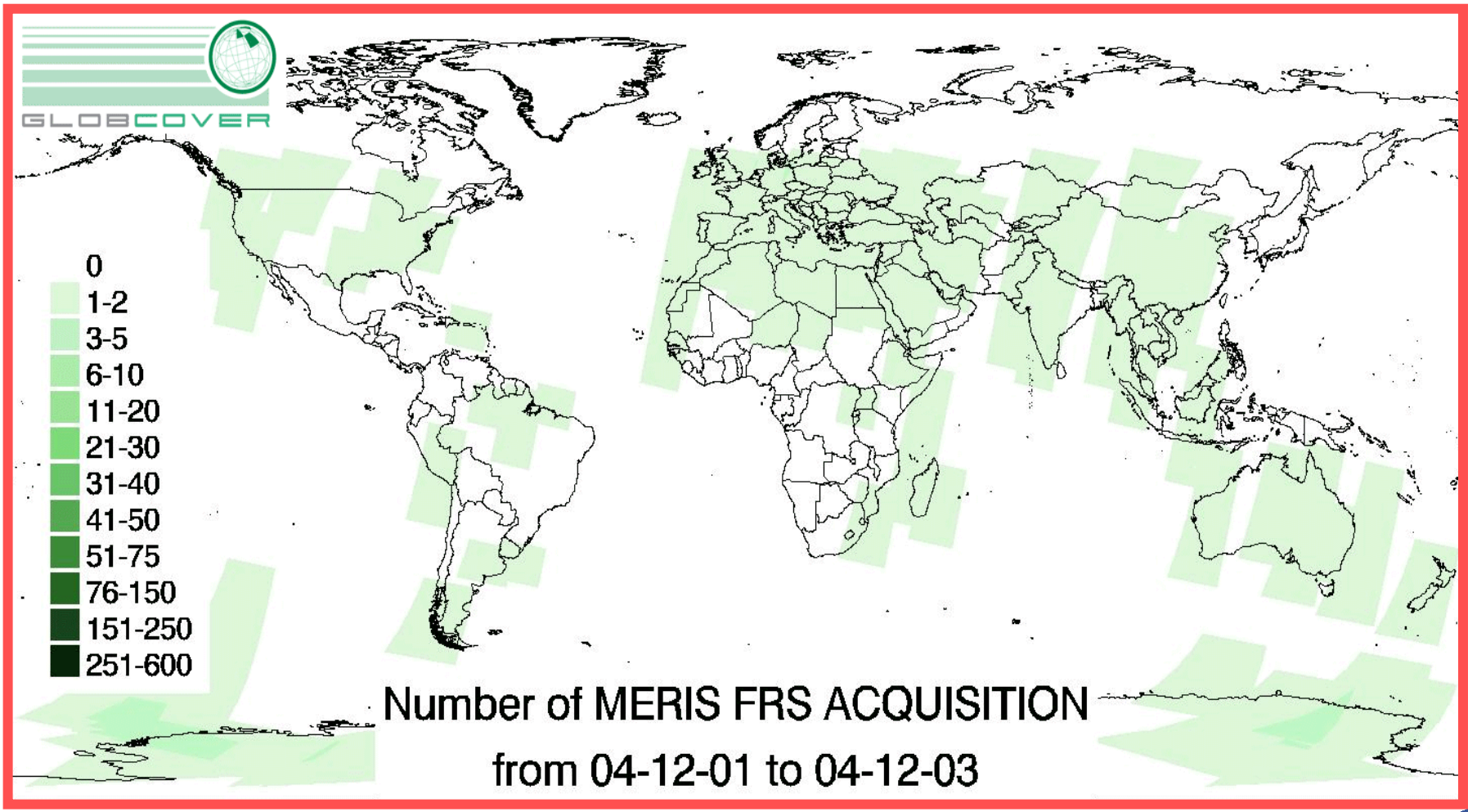
Worldwide Users

ESA Data Access

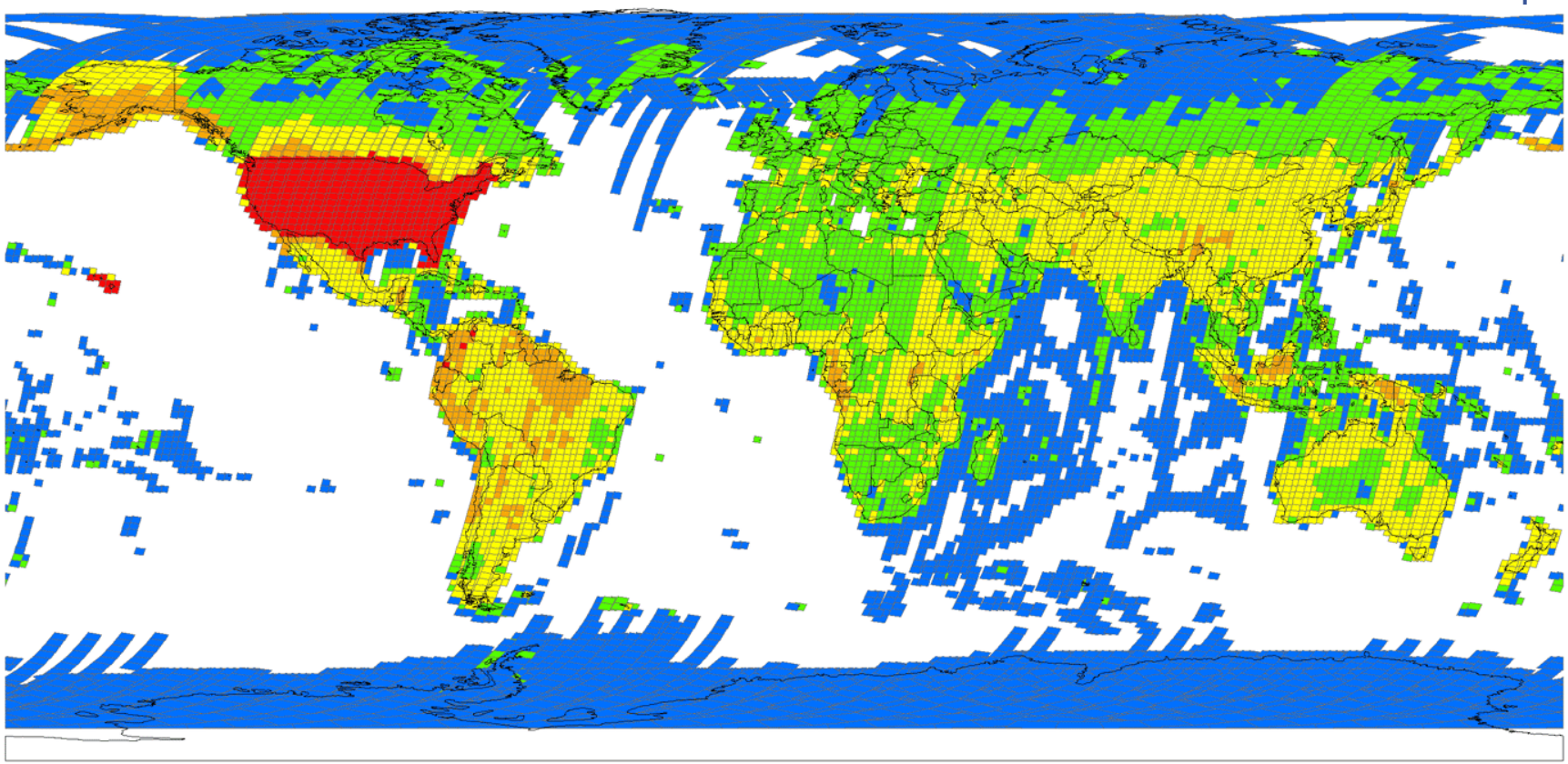
Application for Category 1 use data access can be submitted to ESA at any time using the ESA Earth Observation Principal Investigator portal (http://eopi.esa.int)

MERIS 300 m Data

Acquisition status: ***MERIS L0 data in ESA archive since 1st December 2004***



USGS Landsat 7 Archive



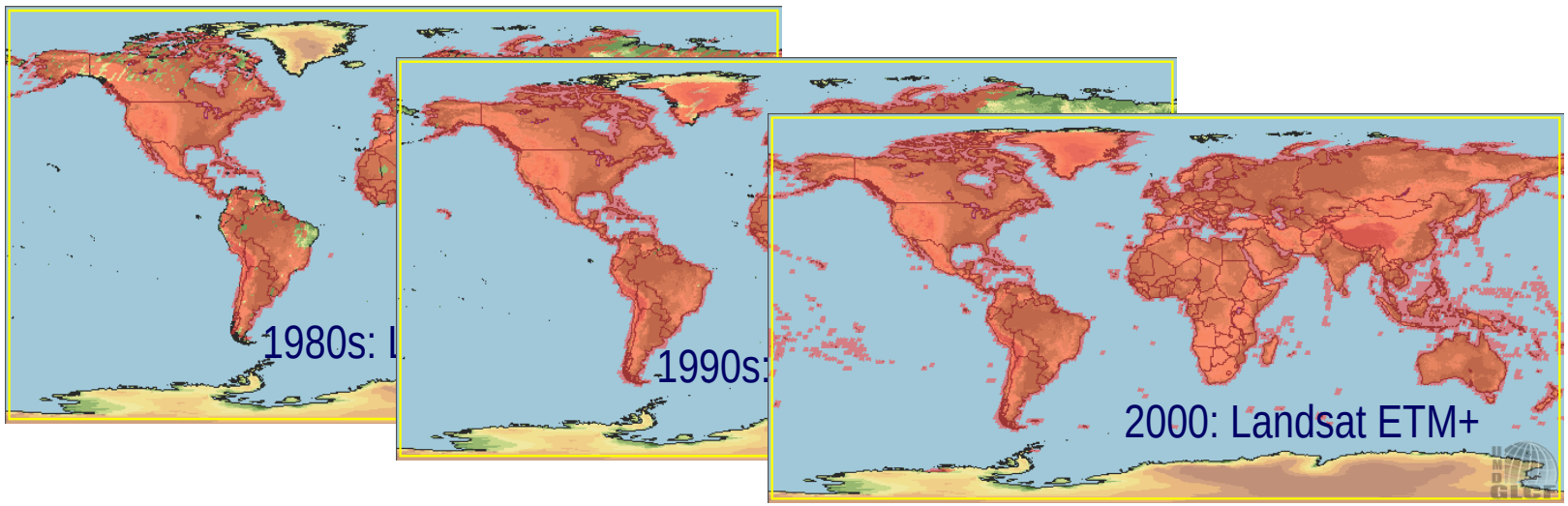
Daytime scenes available per path/row of Landsat orbit
June 1, 1999 - March 2, 2006

1 - 30 | 31 - 60 | 61 - 90 | 91 - 120 | 121 - 150

NASA Landsat Access

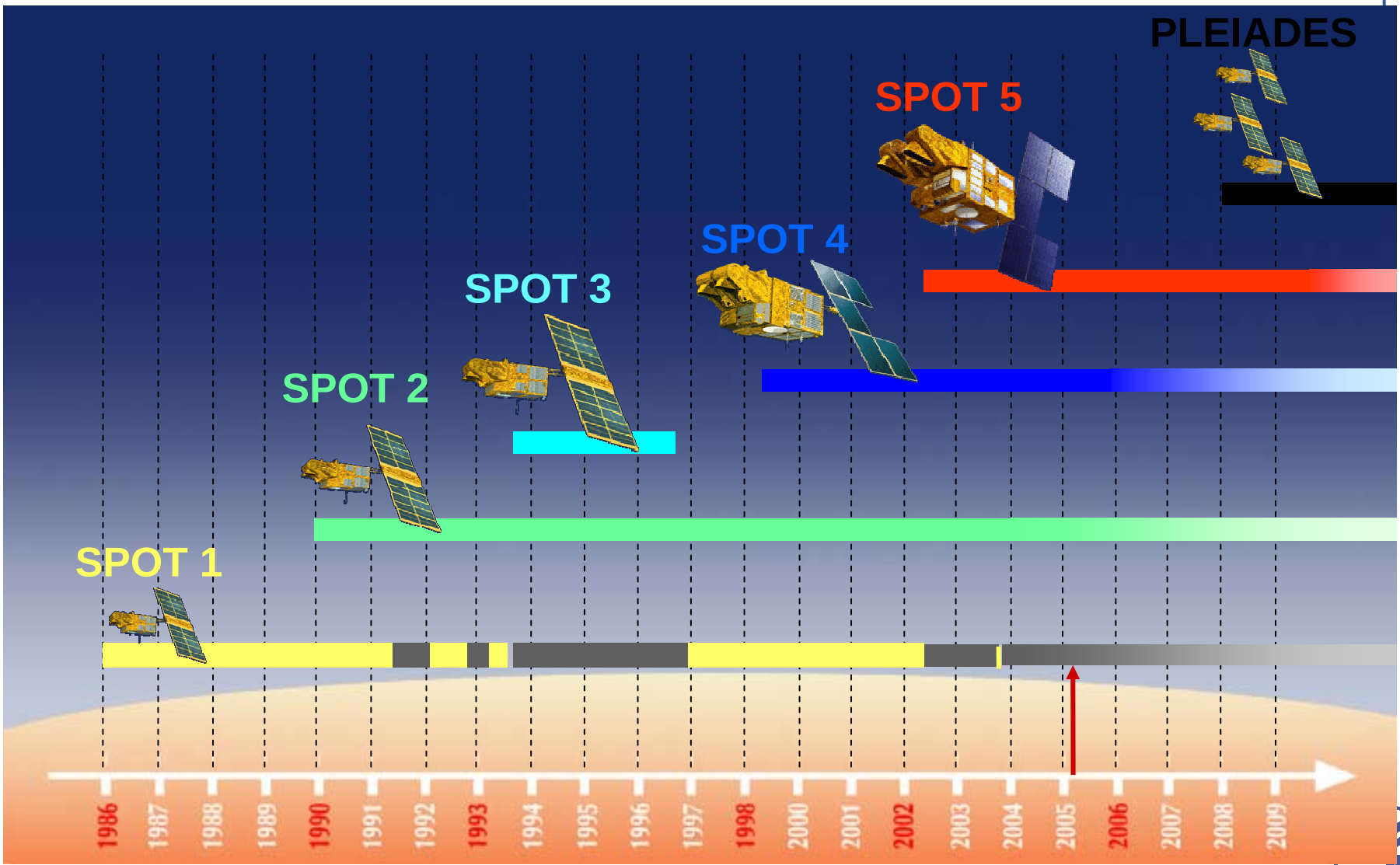
1. Historical datasets: free Global Landsat coverage for 1980s, 1990s and 2000

- Global Landsat mosaics produced from NASA
  - **around-years 1990 and 2000**
  - **in production for 2005/2006**
  - available at: https://zulu.ssc.nasa.gov/mrsid/mrsid.pl
- 27,841 images are available at Global Land Cover Facility

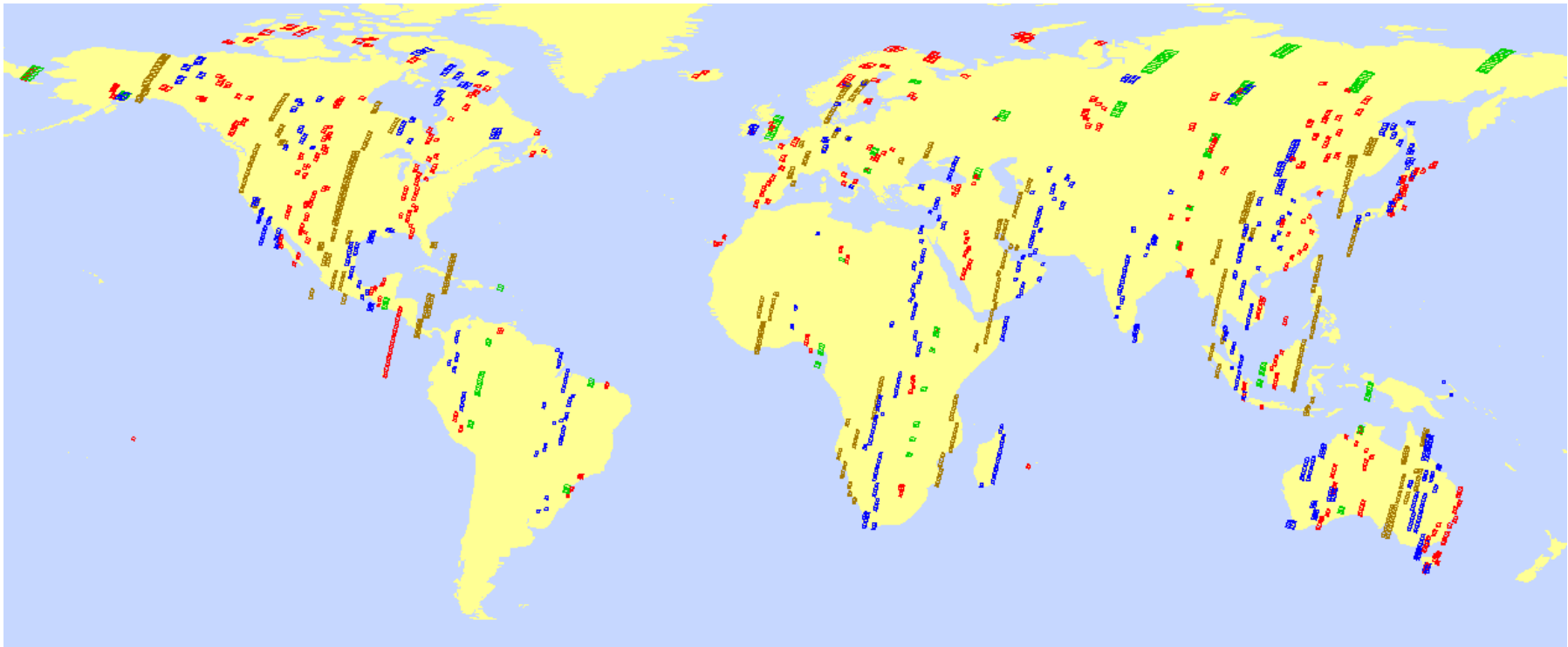


2. Recent data: availability is good where sufficient cloud-free periods or 'dry seasons'

Spot Programme



One day SPOT acquisitions



- SPOT 5
- SPOT 4
- SPOT 2

total: 16 675 000 km² / day

Visit our stand

European Space Agency
Agence spatiale européenne

olivier.arino@esa.int

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Serving the Global Change

33 organizations e.g. IPCC, IGBP, WCRP, GODAE, ECMWF, GOFC; participate in projects addressing the monitoring of Global Change on the different elements of the Earth system

GLOBCARBON

GLOBWETLAND

GLOBCOVER

GLOBCOLOUR

GLOBAEROSOL

GLOBiCE

GlobCover 300 m

May 2005 World
Collaboration ESA, JRC, FAO, UNEP, IGBP, GOFC
170 Gbyte

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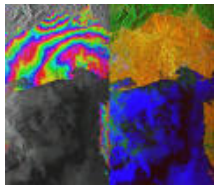
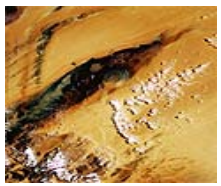
GMES Future Missions



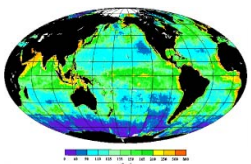
Sentinel 1 – SAR imaging

All weather, day/night applications, interferometry



Sentinel 2 – Superspectral imaging

Continuity of Landsat, SPOT & Vegetation-type data



Sentinel 3 – Ocean monitoring

Wide-swath ocean color and surface temperature sensors, altimeter

Sentinel 4 – Geostationary atmospheric

Atmospheric composition monitoring, trans-boundary pollution

Sentinel 5 – Low-orbit atmospheric

Atmospheric composition monitoring