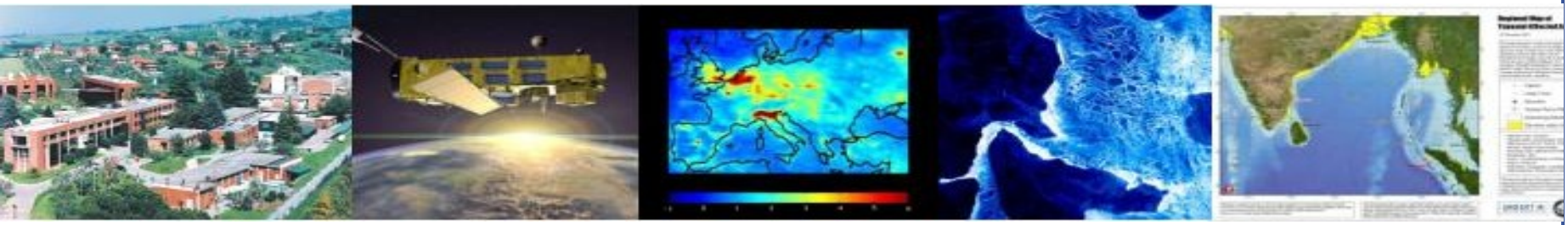
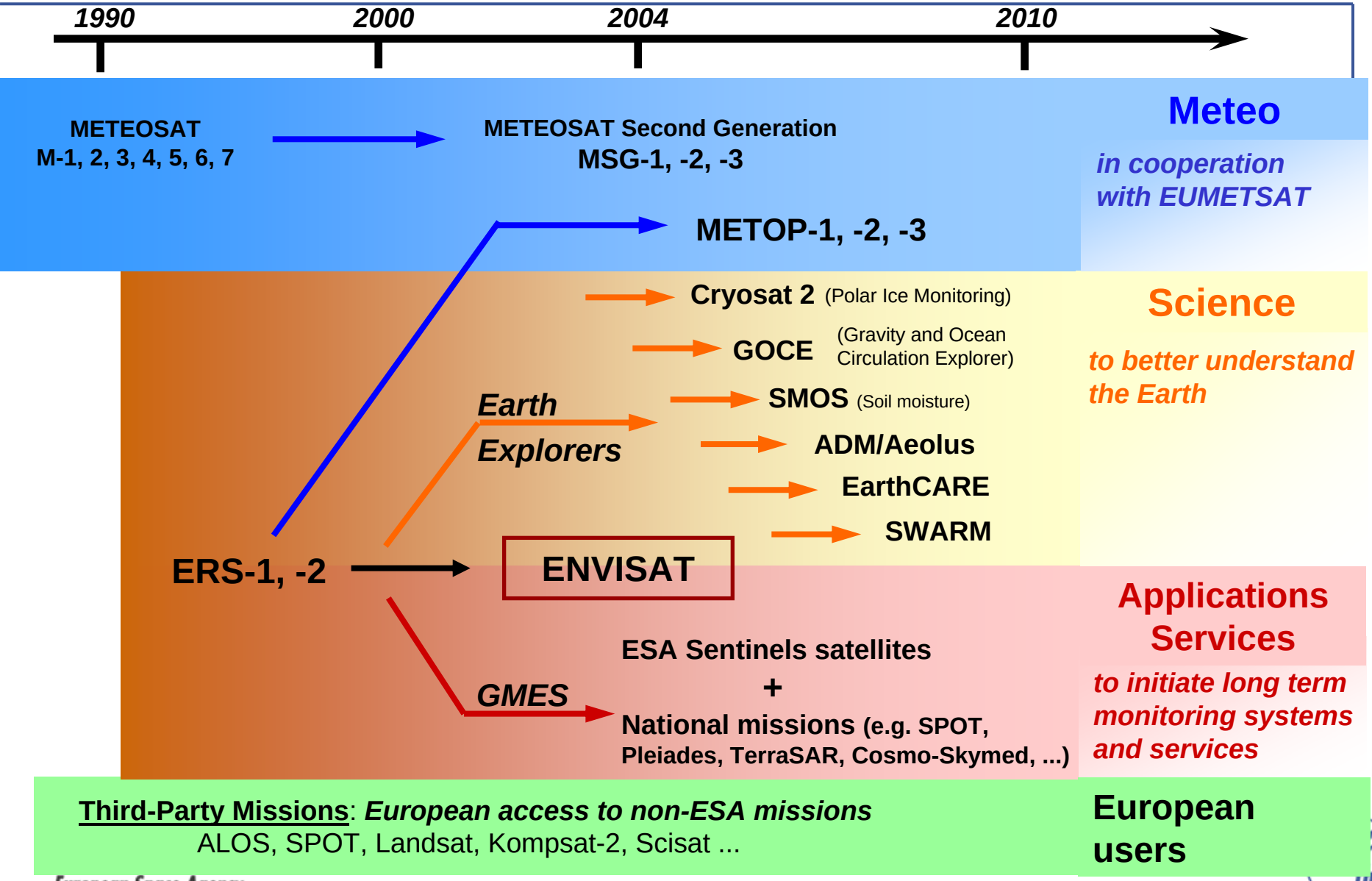
The Earth Observation Programme at ESA



24-October-2007,
International Ice Charting Working Group Meeting
Simon.Jutz@esa.int
Earth Observation Programmes Directorate
European Space Agency

EO missions handled by ESA

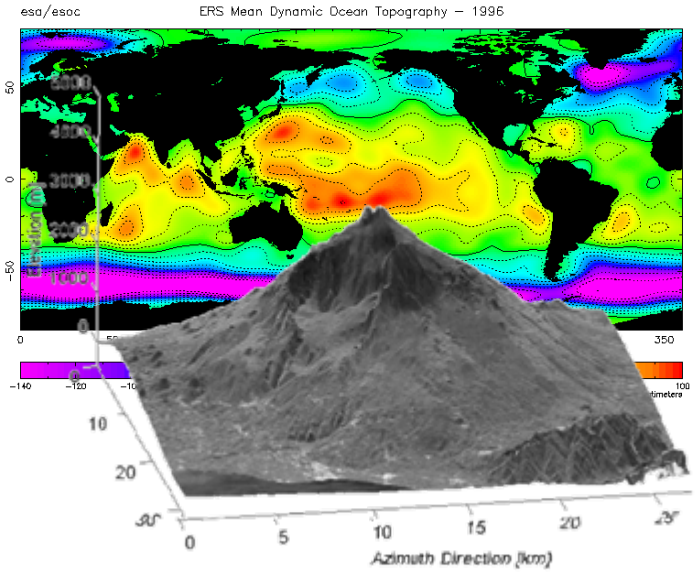


ERS 1 (1991 – 2000):
Oceans, sea ice, cryosphere, land surface & climatology

ERS 2 (1995 – still operational):
***(…) plus* global ozone & terrestrial biosphere monitoring**

Results of 16 years ERS missions:

- basis for long-term environmental monitoring → "climate change" research results from ERS have been of relevance for IPCC
- wealth of science and application results
- consolidation of a large EO community



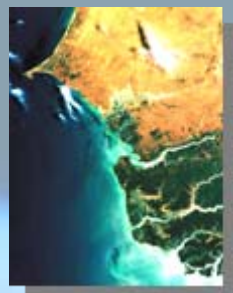
ERS-2 mission

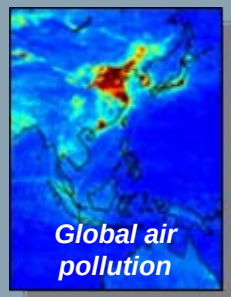
- **ERS-2 after 12 years mission:**
  - technically ERS-2 is performing well, however power budget needs to be monitored
  - LBR station extension continues
  - All missions fully supported; since 2006 also the classical interferometry
  - ERS-2 SAR mission is one of the “fastest” SAR mission. Planning request in the morning results in data on disk in the evening

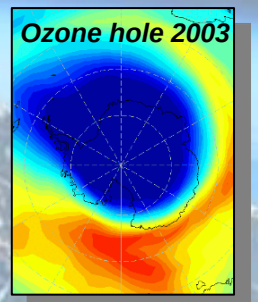
- Some problems with the platform (gyroscope in 2001, tape recorder in 2003) but all instruments still functioning well
  → engineering solutions have been developed:
  - new 'gyro-less' working mode
  - set up of a station network for Low Bit Rate data recovery

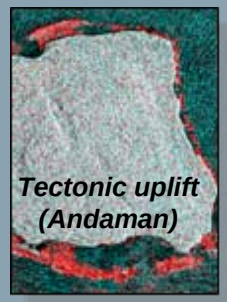
ENVISAT mission: 5 years !

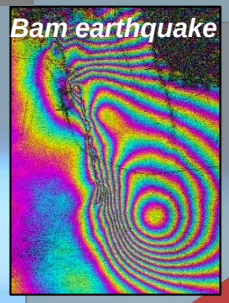
First images

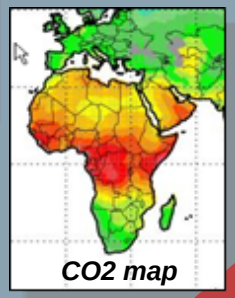


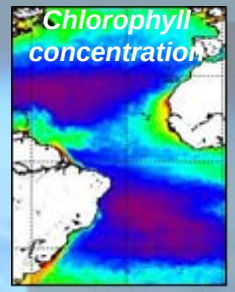












~1200 scientific projects

+ several GMES pre-operational projects

Launch — Mar 02

Calibration Review — Sep 02

Validation Workshop — Dec 02

MERIS Workshop — Nov 03

InSAR Workshop — Dec 03

Envisat Symposium Salzburg (A) — Sep 04

MERIS (A)ATSR Workshop — Sep 05

InSAR Workshop — Dec 05

Altimetry Conference — Mar 06

Atmospheric Science Conference — May 06

Envisat Symposium Montreux (CH) — Apr 07

ENVISAT mission

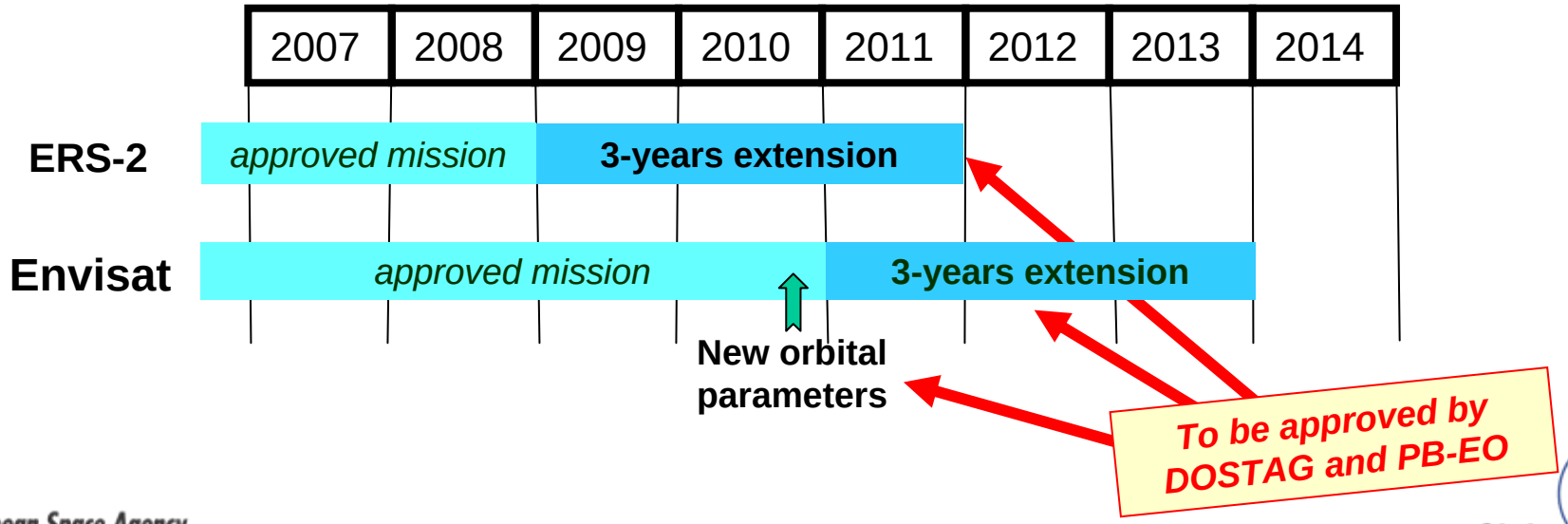
- Envisat operations funding until 2010
- 78 different types of ESA Envisat data products
- 280 Gigabytes of data products generated per day at ESA
  → *500 Terabytes to date*
- Envisat mission: http://envisat.esa.int
- Category 1 use registration or proposal:
  http://eopi.esa.int
- ESA web portal: http://www.esa.int
- Envisat images: http://earth.esa.int/earthimages
  http://miravi.eo.esa.int

Envisat & ERS-2 missions extension

- **The proposal for the EO Envelope Programme – 3rd Period (2008-2012) includes, in its Development and Exploitation component, the provision for operating the ERS-2 satellite until 2008 and the Envisat satellite until 2010.**

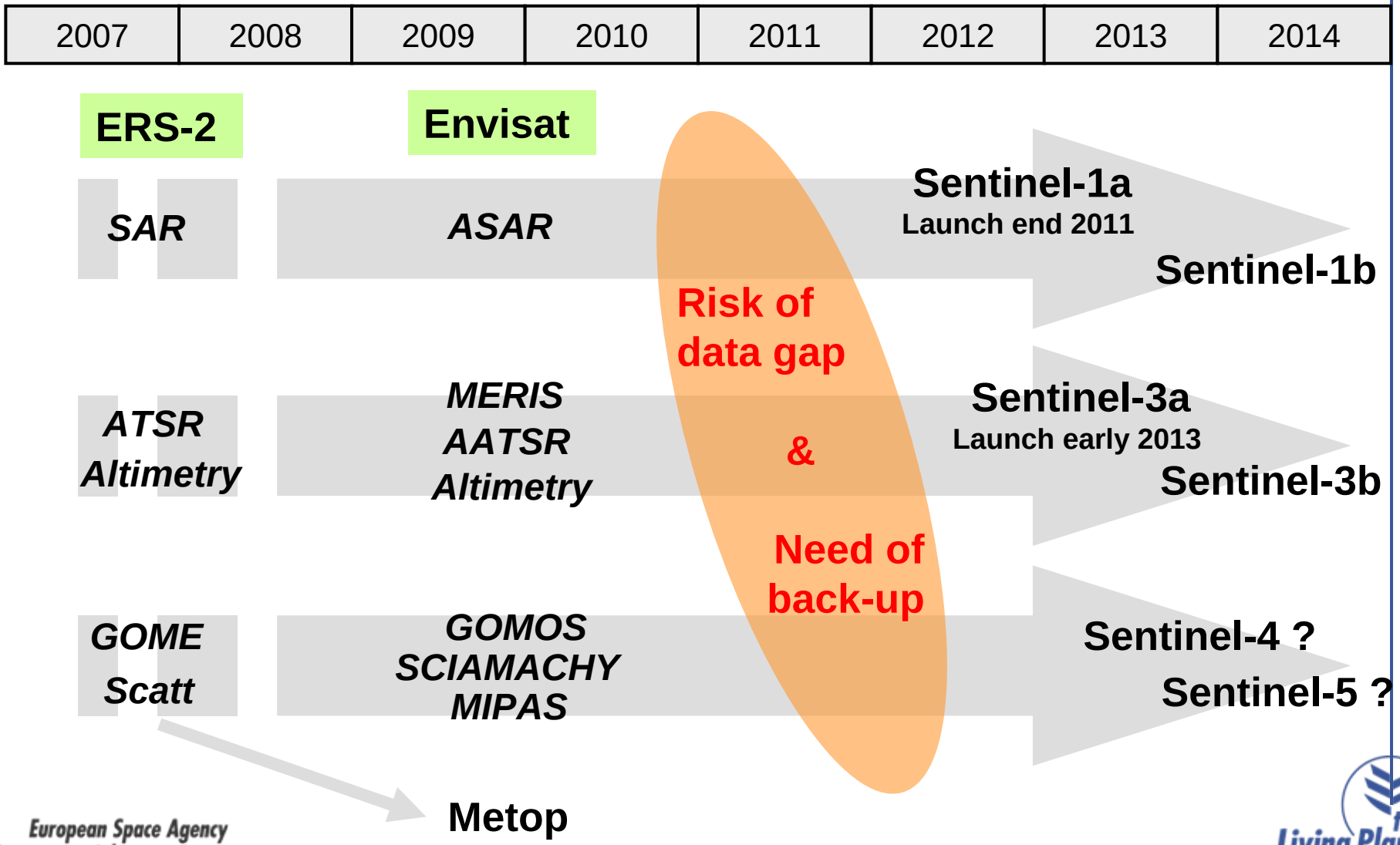
- **The current spacecraft status allows to further extend the operations of both missions by 3-years in order to respond to the user communities demand, i.e. until 2011 for ERS-2 and until 2013 for Envisat.**

- **The Envisat 3-years extension requests a modification of the orbital parameters in 2010 as the on-board hydrazine will be almost completely consumed by 2010.**



Envisat 3-years extension [2011-2013]

The context



Extension scenario

. End of phase E3 (i.e. nominal mission): ***(56 kg ± 15 kg remaining fuel)***
~ October 2010

. Altitude change: -17.4 km ***(~34 kg needed fuel)***

. Phase E4 (i.e. "extended" mission): ***(22 kg ± 15 kg available fuel)***

- **. Repeat cycle: 30 days / 431 orbits**
- **. Orbit control: altitude only, inclination drift**
- **. MLST variation: first, 22:00 to 22:10, then 22:10 to 21:50**
- **. Artemis availability expected up to 2013** (to be confirmed with Artemis team)

. End of phase E4: ~ mid 2014 ***(00 kg ± 15 kg remaining fuel)***

Global Monitoring for Environment and Security (GMES)

European independence in data sources for environment and security monitoring

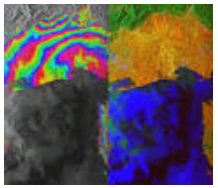
and

The European contribution to the Global Earth Observation System of Systems (GEOSS)

Content of the GMES Space Component Programme

- **Development, launch and IOV of the Sentinels**
  - Sentinel 1
  - Sentinel 2
  - Sentinel 3
  - Sentinel 4 *(instrument on MTG, tbc)*
  - Sentinel 5 *(instrument on Post-EPS, tbc)*
- **Ground Segment**
  - Access to EO data for ESA, Eumetsat, Member States' missions and TPM for GMES services (Fast Track)
  - Development of Sentinel GS

The GMES Sentinels

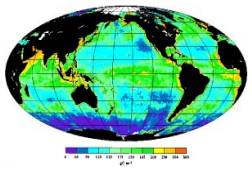


Sentinel 1 – SAR imaging

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

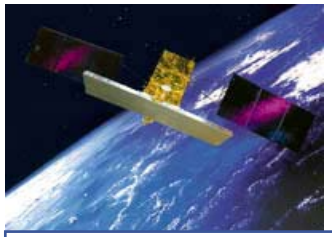
Sentinel 4 – Geostationary atmospheric

Atmospheric composition monitoring, trans-boundary pollution

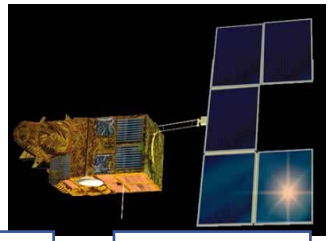
Sentinel 5 – Low-orbit atmospheric

Atmospheric composition monitoring

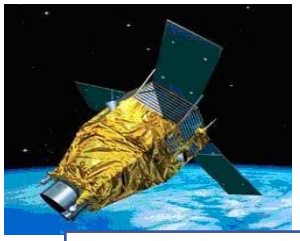
National, Eumetsat and Third Party Missions for GMES (excerpt)



CosmoSkymed

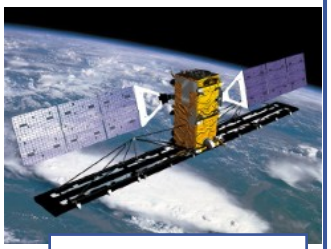


SPOT

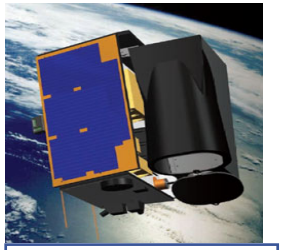


Pleiades

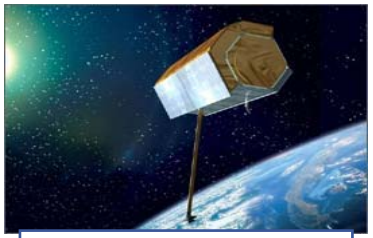
Jason-2



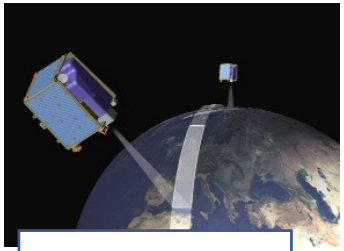
Radarsat



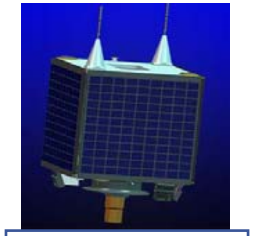
TopSat



Terrasar-X



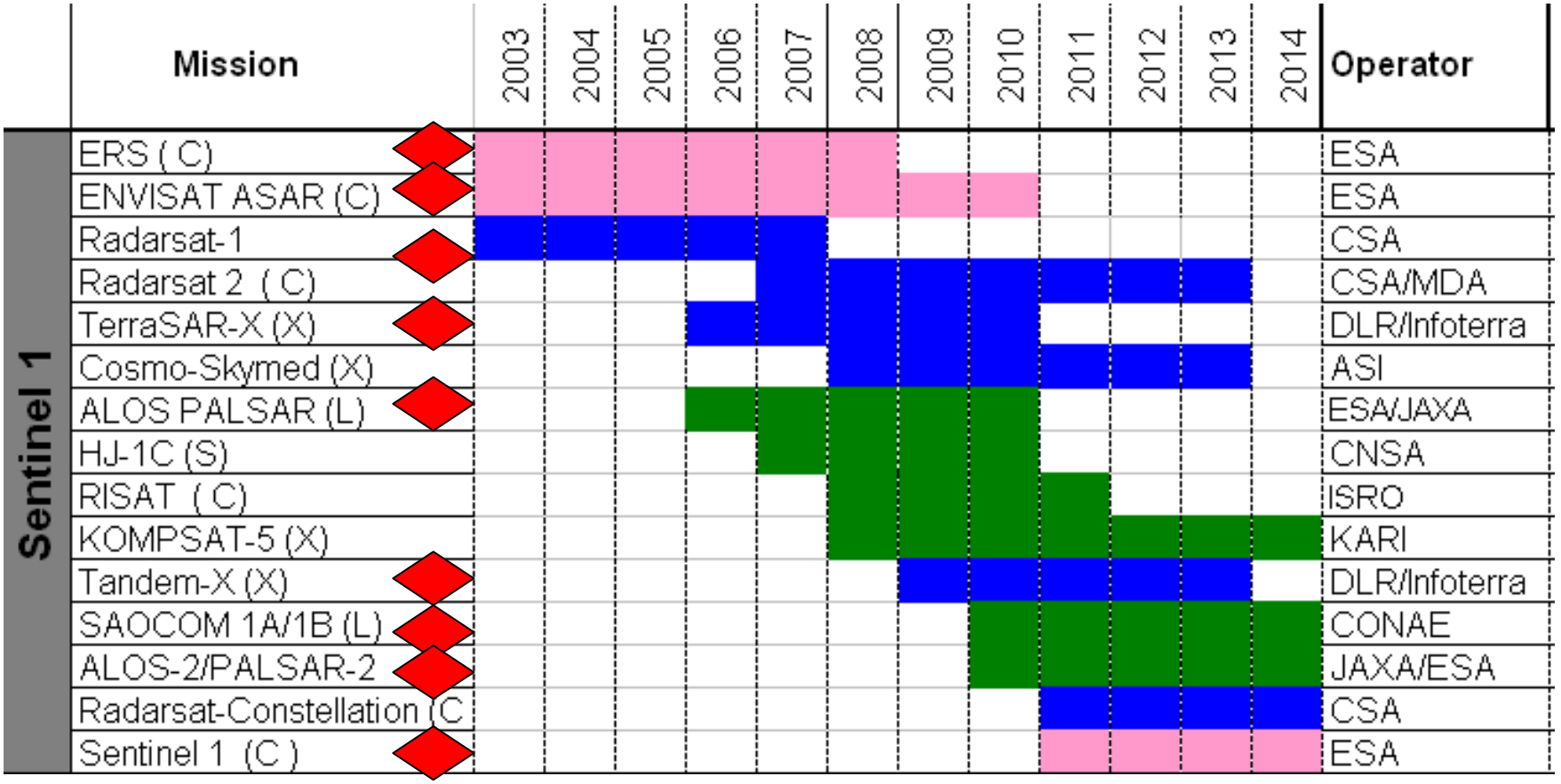
Rapideye



UK-DMC

METOP

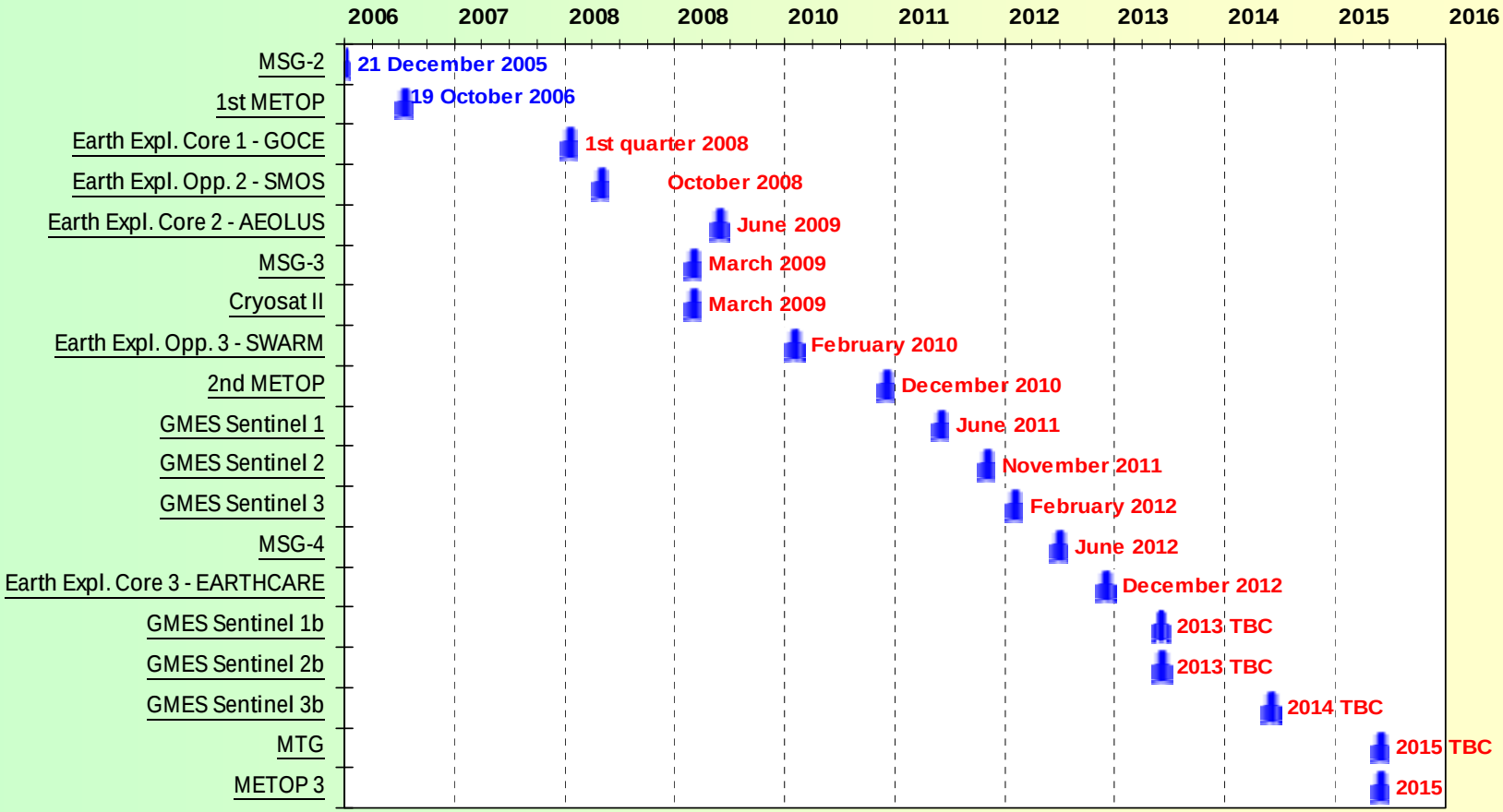
Sentinel-1 like missions



= already Cat-1 approved

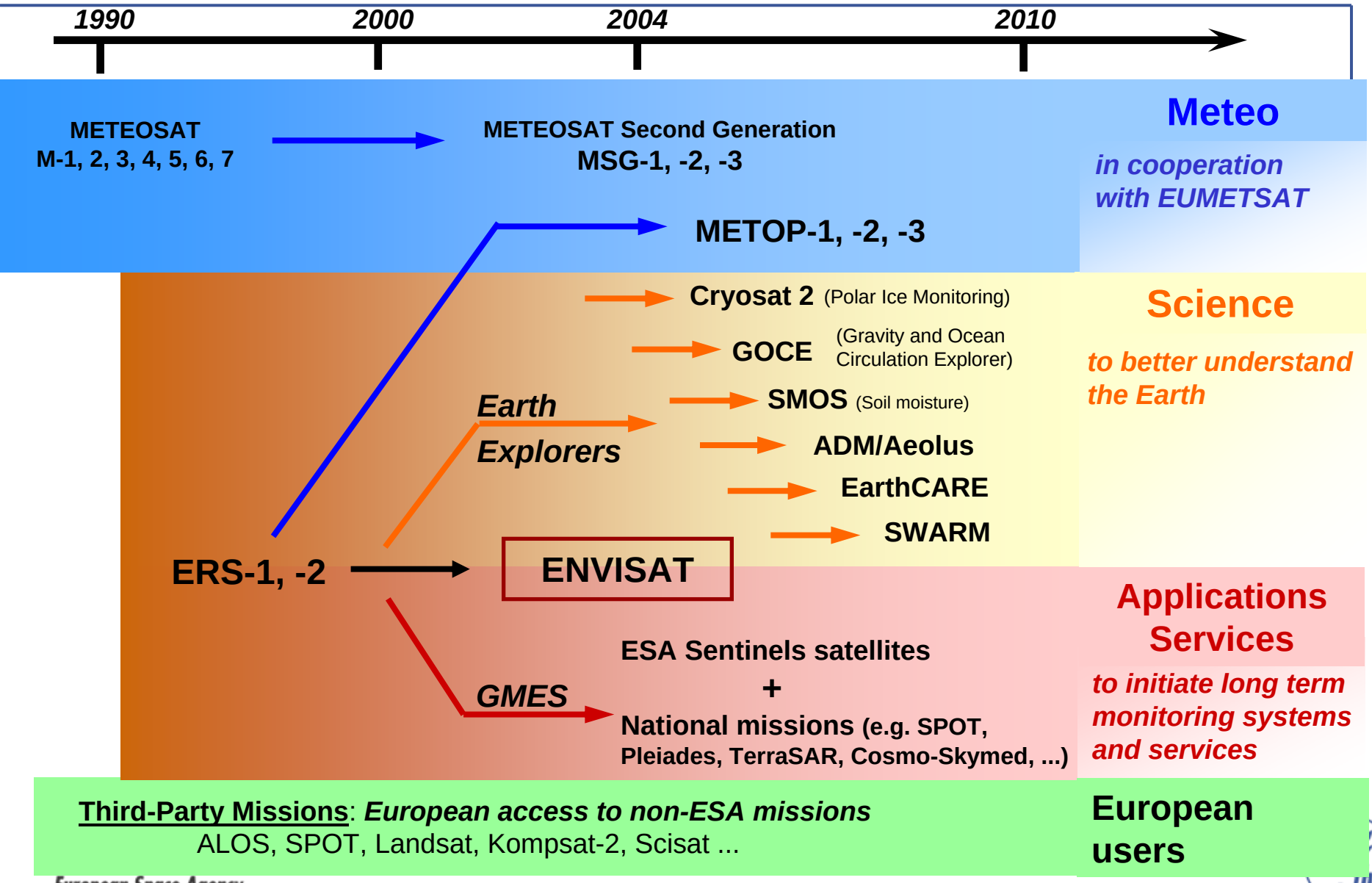
ESA EO missions launch schedule

e D / EOP Overall Launch Schedule



More missions are in the planning, yet not included due to not yet defined launch dates: Sentinel-4, Sentinel-5 and the 7th Earth Explorer

EO missions handled by ESA



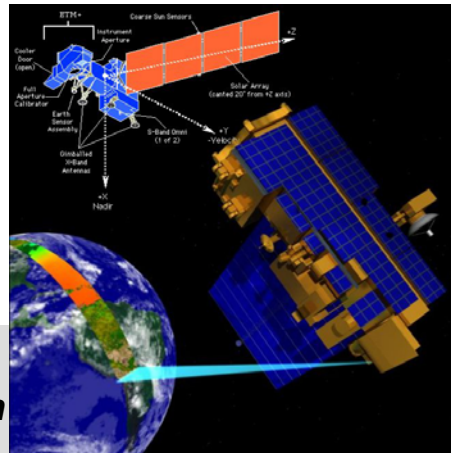
The Earthnet Programme

Objectives:

- Serving European users with **non-ESA / non-European data**
- Fostering European user communities and science competence
- Synergistic use and joint exploitation of ESA and Third Party data
- Complementing existing ESA Earth Observation Missions
- Setting up Ground Segment co-operation (e.g. contingency agreements, joint mission planning)

- **Long-term** commitment:

EARTHNET has been established 30 years ago!



The historical JERS-1 mission

Third Party Missions

- Missions **not operated by ESA**
- for which ESA assumes some **responsibility** / contributes financially *(sharing of Ground Segment facilities or operations cost)*
- for which ESA assumes a **data distribution responsibility**, mainly towards the European Scientific User Community

Historical/Operational Third Party Missions

	Missions	Sensor	Data Coverage	Time coverage	Today available on
Historic	**IRS-P3**	MOS	Maspalomas station circle	1998-2004	on-demand, media
	JERS-1	OPS SAR	European station coverage	1992-1998	on-demand, media
	NIMBUS	CZCS	European station coverage	1978-1986	on-demand, media
Operational	**Proba**	CHRIS HRC	Global Global	2001-today	systematic online, ftp
	Landsat	MSS, TM, ETM	European coverage	~1990, ~2000	systematic online, ftp
	KOMPSAT-1	EOC	European cities	1999-2004	systematic online, ftp
	SCISAT-1	FTS MAESTRO	Global Global	2003-today	systematic online, ftp
	Terra/Aqua	MODIS	Europe/North Africa	2001-today	on-demand, media
	NOAA	AVHRR	Europe/North Africa	1984-today	on-demand, media
	QSCAT	SeaWinds	Global	2000-today	systematic online, ftp
	Orbview	SeaWifs	Europe/North Africa	1998-2004	on-demand, media

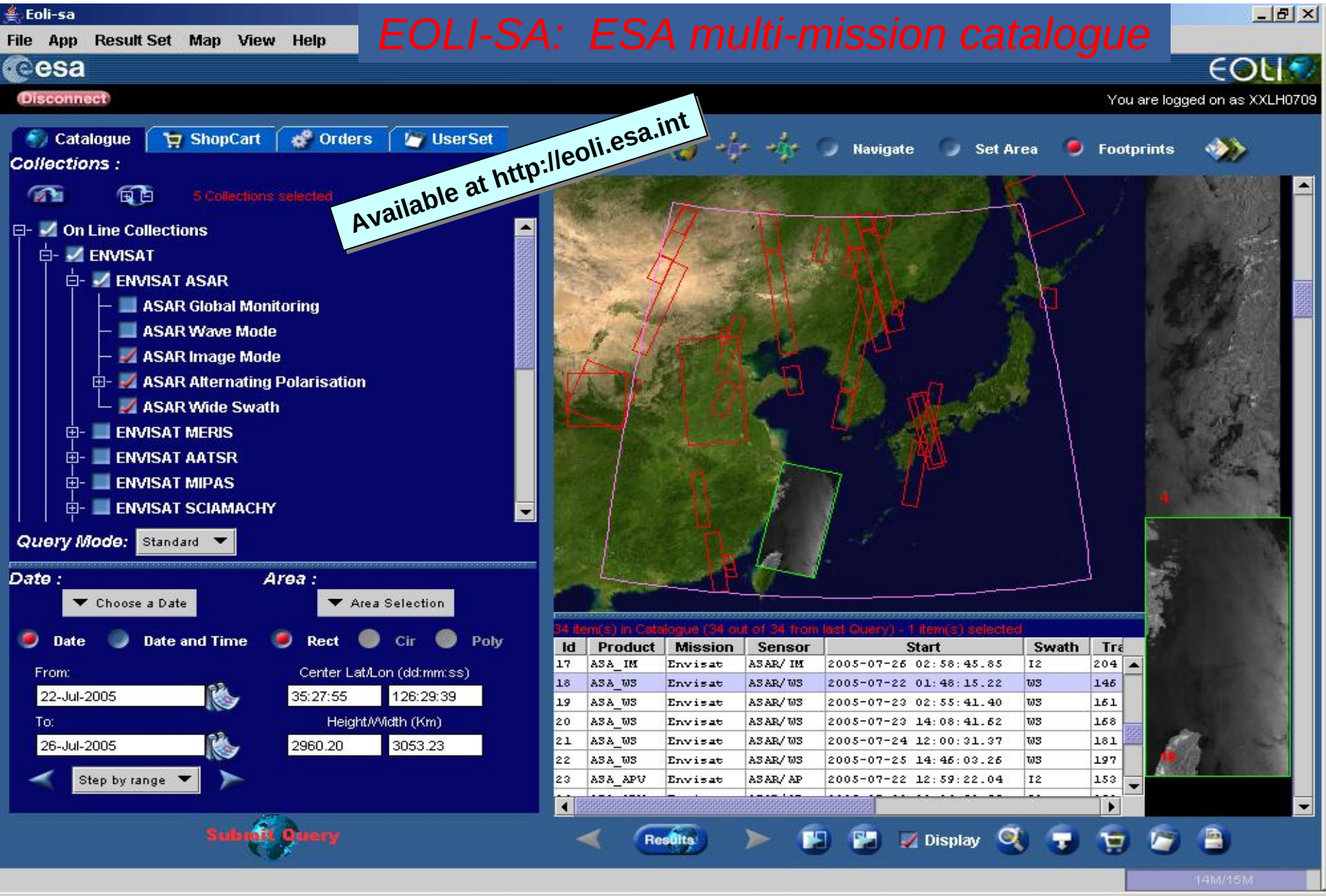
New Third Party Missions and Data

	Missions	Sensor	Data Coverage	Time coverage	Today available on
	SPOT: Opening of online L1A SPot2-SPot4 archive on 19-Mar-2007 with > 11.000 products!! **• 10m pan** **• 20m multispectral** **+ capacity for new acquisition planning**				
	SPOT-1,-2,-3,-4*	HRV(IR)	additional cost)	today	access
	ALOS	PALSAR AVNIR-2 PRISM	Worldwide	Oct 2006 - today	Media, ftp, on-demand
	KOMPSAT-2	MSC	Europe, Africa, some	TBD	on-demand, FTP (default), media (on request)

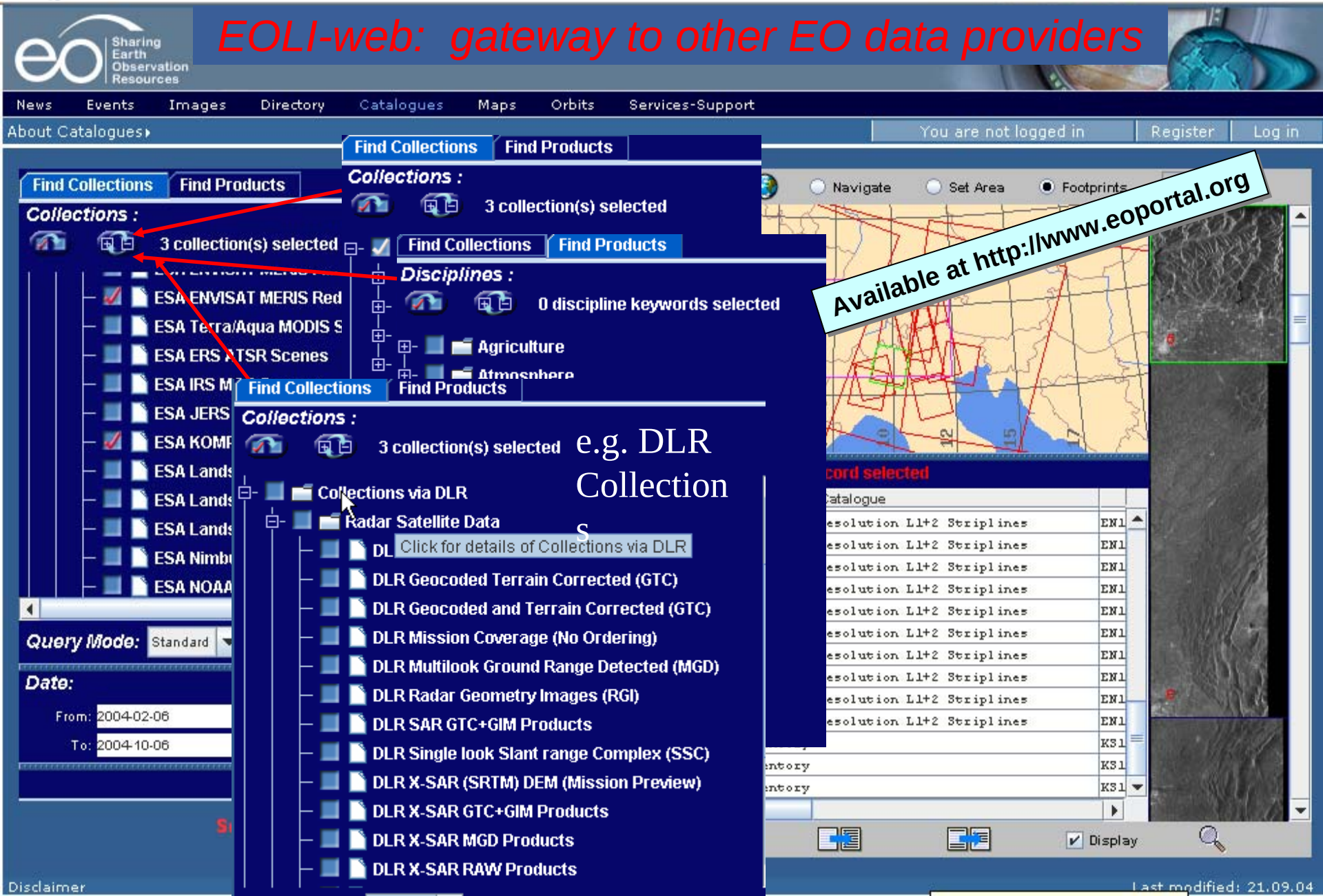
Access to ESA Earth Observation data

(past and current missions)

Access to data catalogue (1/2)



Access to data catalogue (2/2)



Facilitating access to Earth Observation data

A constant objective:

→ *ease access to Earth Observation data*

- **Common objective for all missions data handled by ESA:**
  Envisat, ERS, Earth Explorers,
  and Third Party Missions (e.g. ALOS, SPOT-4, PROBA, …)

- **Simplified data application procedures for Category 1 use**

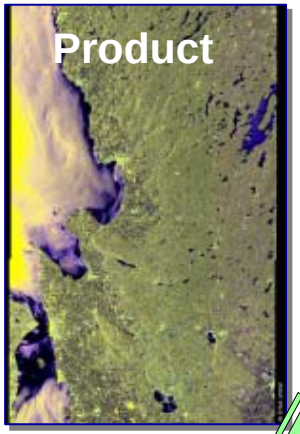
- **Internet access to all Near Real Time (NRT) data**

- **Internet access to archived data gradually implemented (new dataset, new access systems)**

- **Development of alternative ways to provide data (e.g. processing on demand, toolboxes)**

→ *the recent results of Envisat Symposium demonstrated that ESA EO data access has largely improved during the last years.*

Access to data in general

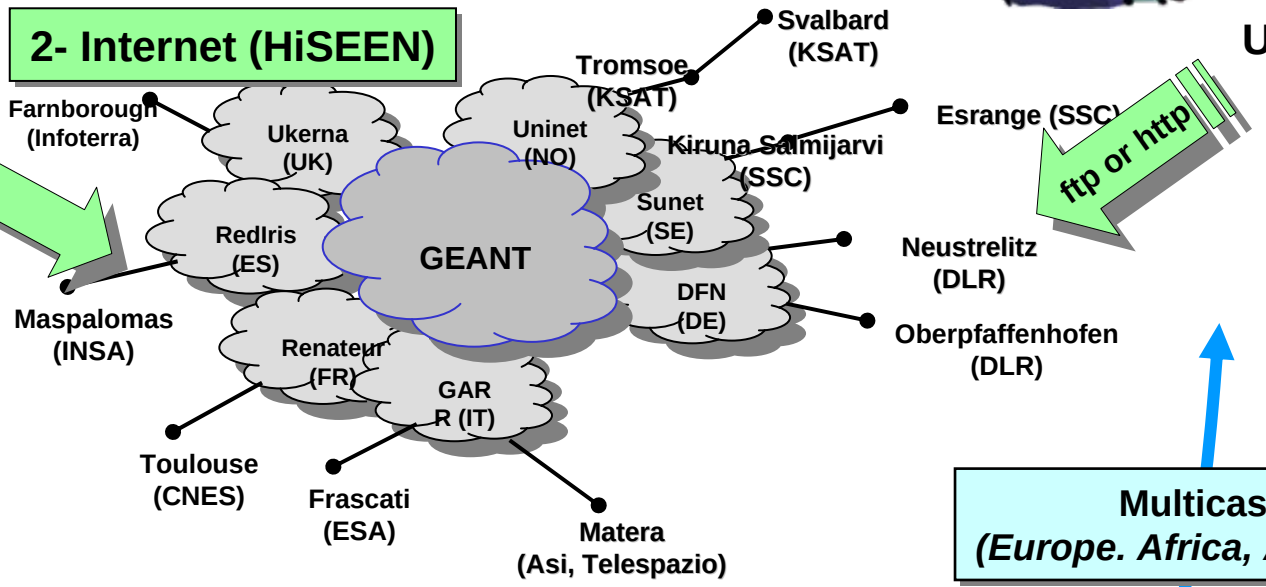


1- Physical media

CD-ROM, DVD-ROM, Discs…

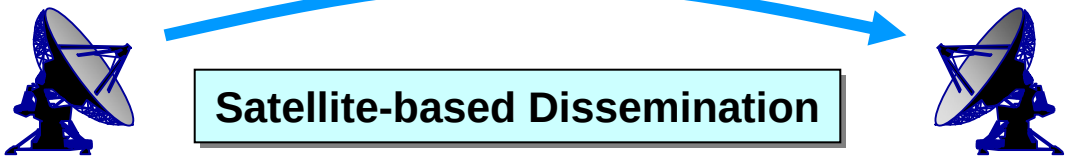
USERS

2- Internet (HiSEEN)



Multicast
(Europe. Africa, America)

3- DDS



Satellite-based Dissemination

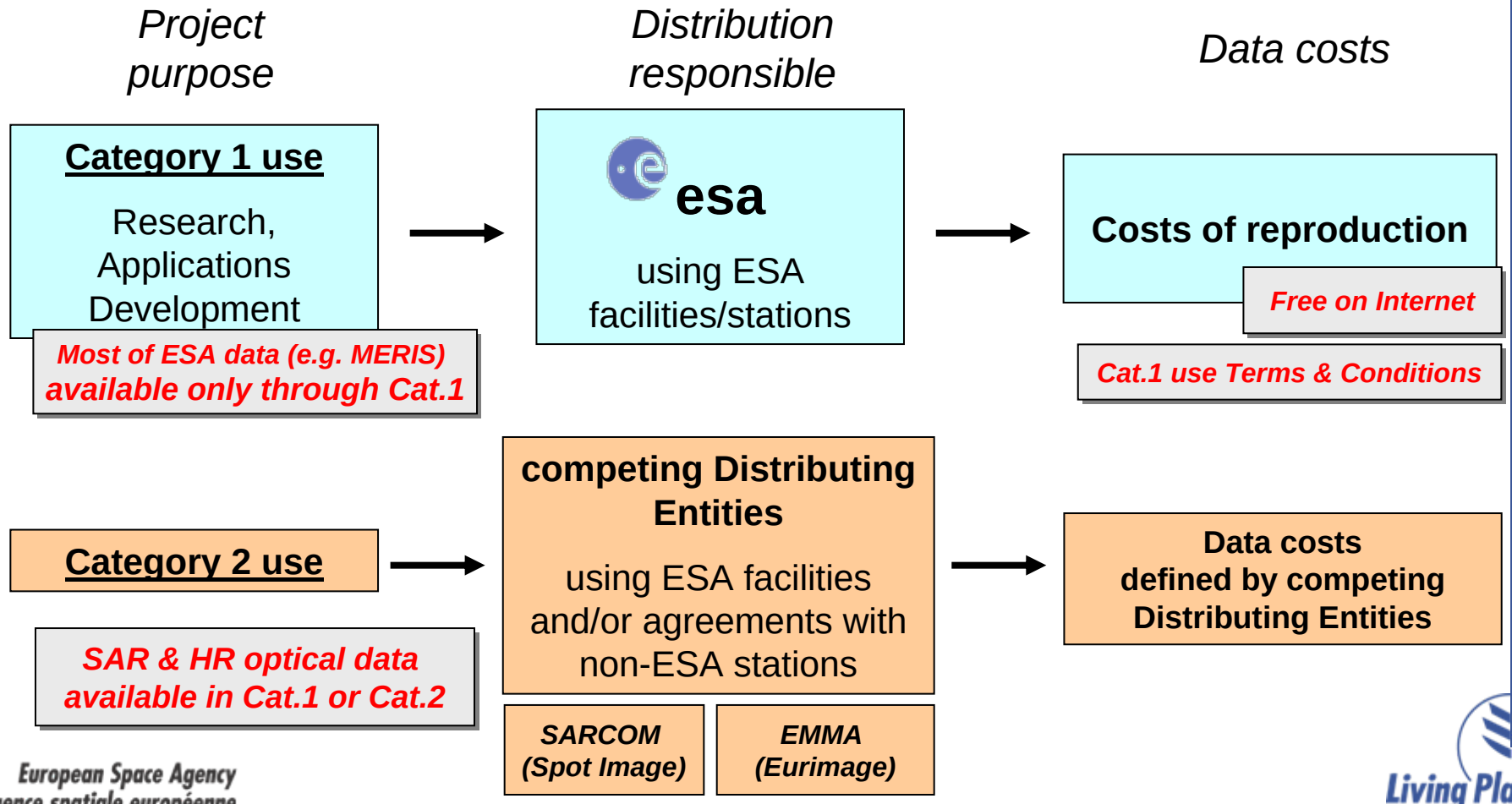
Currently different systems and interfaces providing direct access to EO data for download:

Objective: to simplify user interfaces for on-line data access

ESA Earth Observation Policy

Data policy defined by ESA Member States:

- **to stimulate a balanced development of Science, Public Utility and Commercial Applications, consistent with the mission objectives,**
- **to maximize the beneficial use of data from ESA EO satellites.**



How to apply for data access within a Category 1 use framework ?

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

Category 1 use : fast registration or full proposal ?

The International Charter on Space and Major Disasters

- Initiated by CNES and ESA, joined by CSA, NOAA & USGS, ISRO, CONAE, BNSC/DMCII, JAXA, and CNSA
- **Unified system of space data acquisition / delivery in case of natural or human-made disasters**
- **Data delivery to civil protection agencies, emergency & rescue services; UN cooperating body since 2003**
- Operational since 2000: 24 hrs on-duty-operator, data resources from all Charter members, 181 activations until September-2007
- *Recent Examples of Charter Activation:*
- **Bam Earthquake 2003**
- **Darfur Crisis 2004**
- **Tsunami Catastrophe 2004/2005**
- **Hurricane Katrina 2005**


esa
http://www.esa.int
http://earth.esa.int
http://envisat.esa.int
http://www.eoportal.org
eohelp @ esa.int
European Space Agency
Agence spatiale européenne
the Living Planet