

ESA Earth Observation and the need for high speed networking

Pisa, 11th May 2005

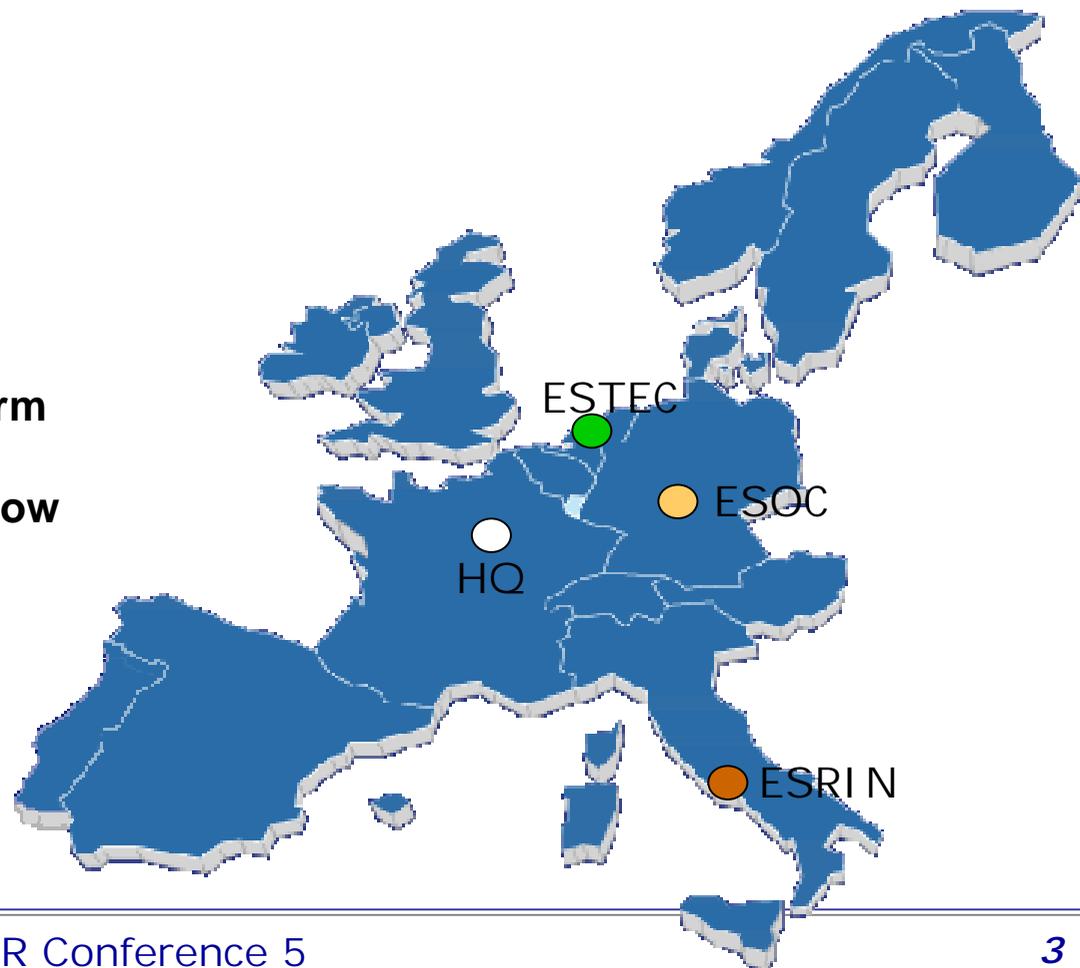
ESA Earth Observation

The European Space Agency promotes the exploration and development of space activities in Europe

Funded in 1969

15 members states

The member states can perform more ambitious programmes while combining their know-how and financial resources



Which are the ESA activities ?

- Increase the knowledge of the:
 - solar system and universe
 - Earth and its environment
- Develop technologies based in the satellites use
- Promote the European industry activities



HUBBLE (1990)

Universe exploration



SOHO (1995)

Sun observation

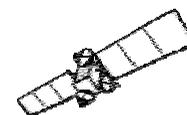


MARS EXPRESS (2003)

Looking for live signs in Mars

COLUMBUS (2004)

Scientific laboratory for the ISS



ARTEMIS (2001)

New telecommunication technologies

GALILEO (2004, 2008)

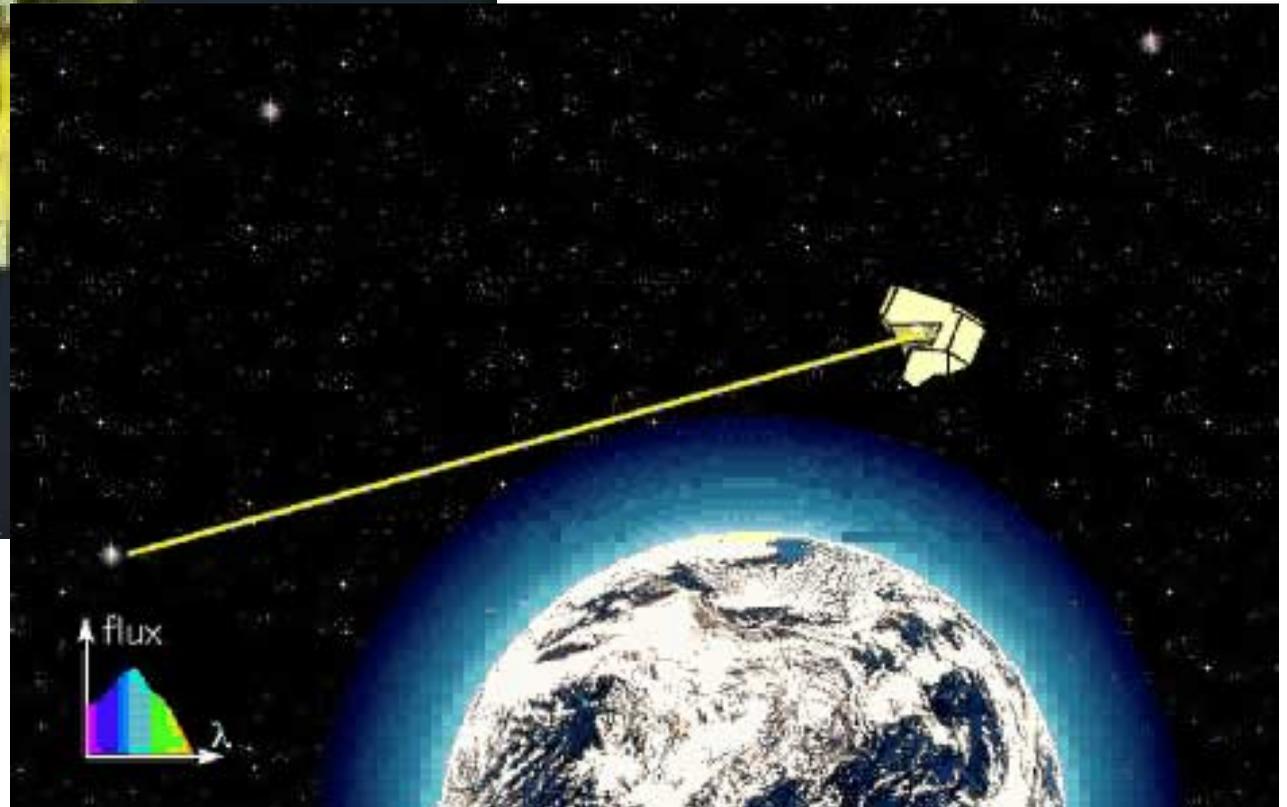
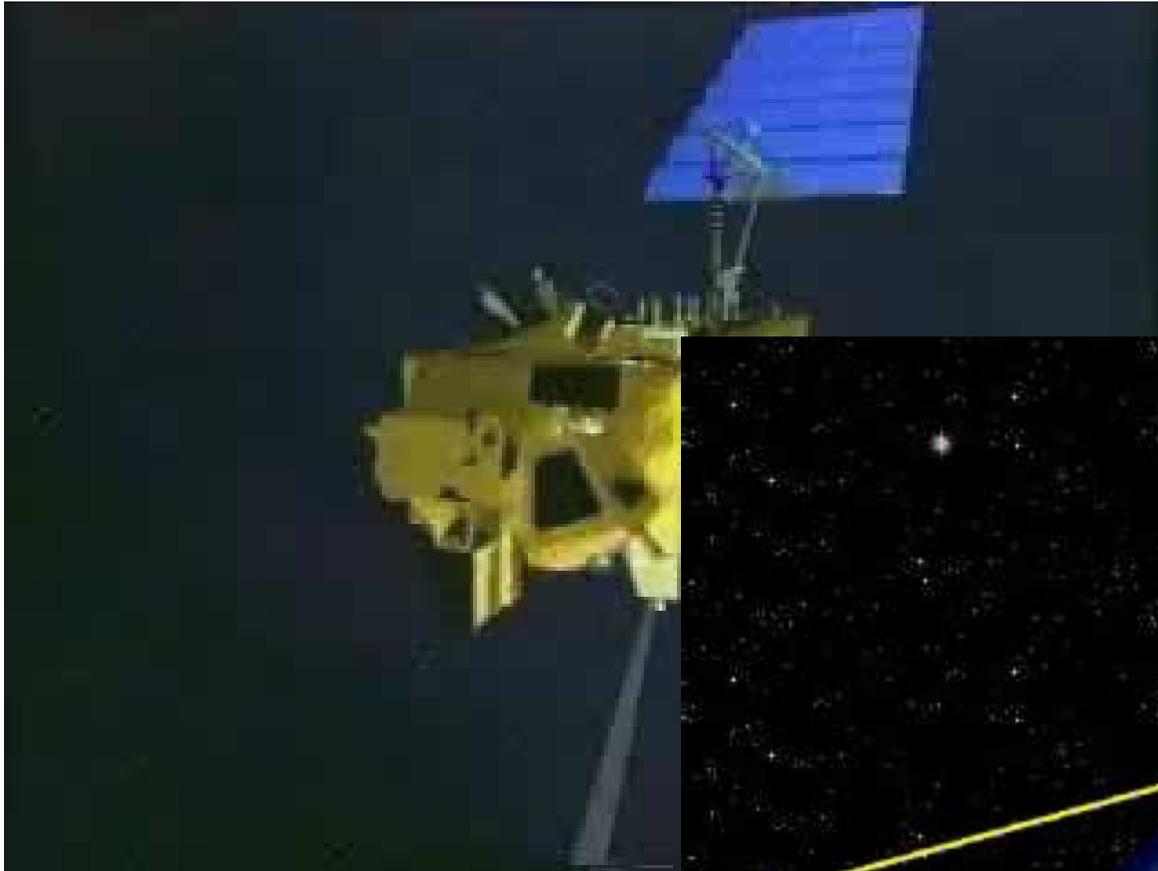
The European satellite navigation system



**ERS (1991,1995),
ENVI SAT (2002)**

Earth Study





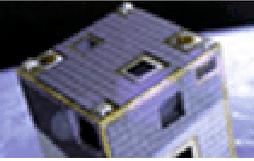


ENVI SAT (ENVIronmental SATellite)



ERS (European Remote Sensing Satellites): 10 years.

- ERS-1 was launched in July 1991
- ERS-2 was launched in 1995 and is the current operational satellite



Proba

- The Project for On-Board Autonomy (Proba) is a technology demonstration mission



Third Party Missions

- The data from these missions are distributed under specific agreements with commercial distributors, or under agreements made in the framework of ESA announcements of opportunities



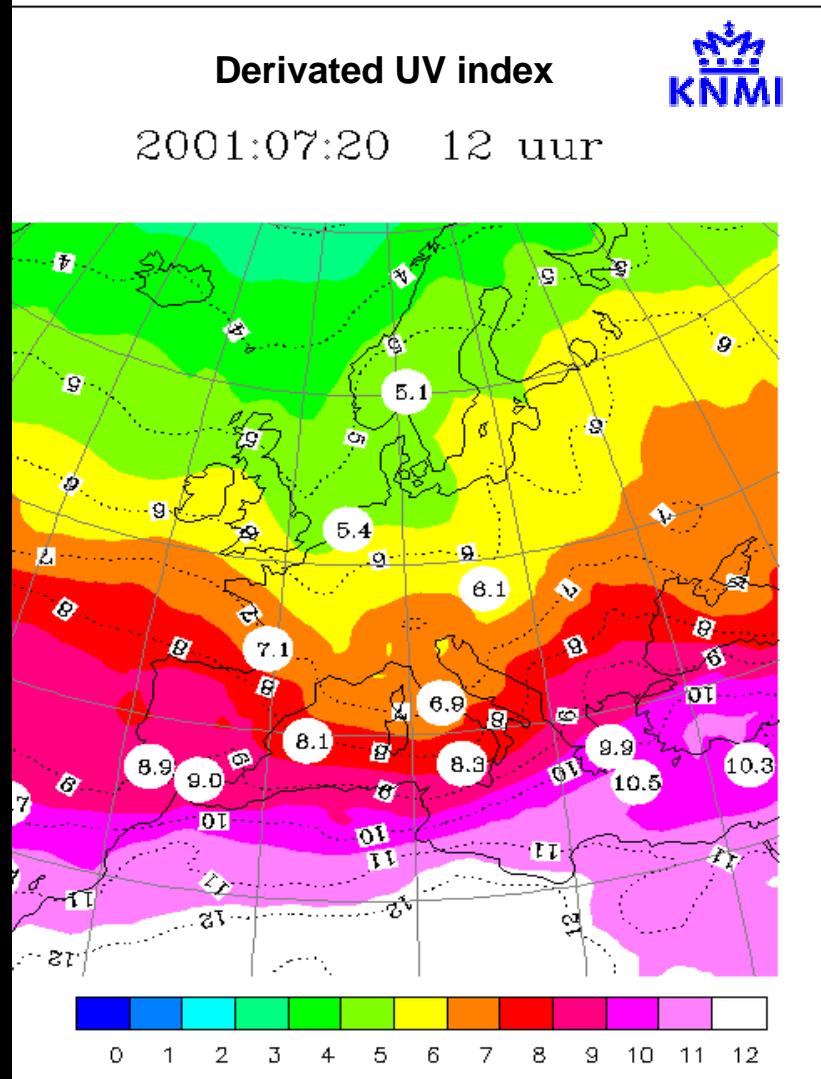
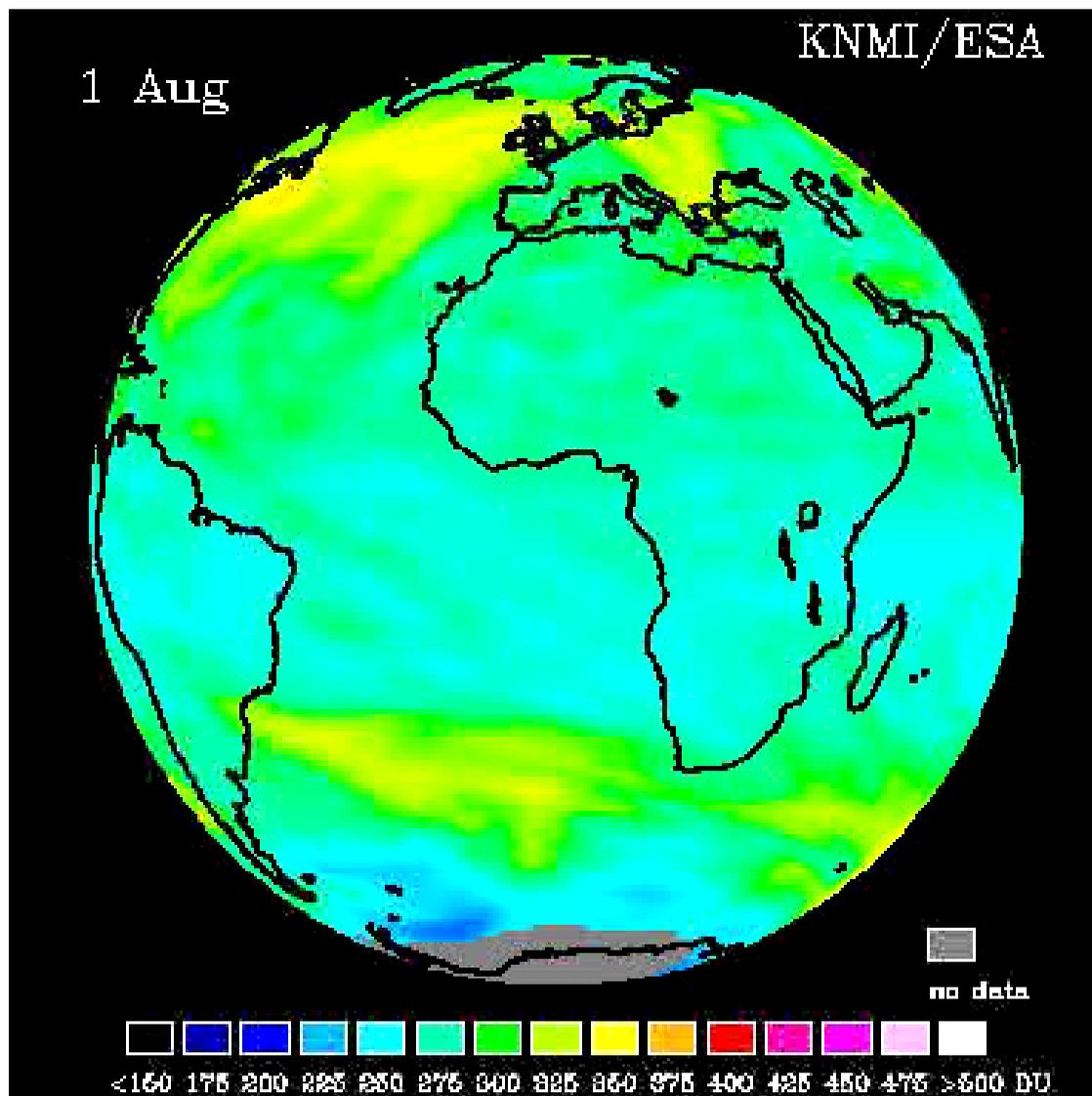
MSG (Meteosat Second Generation)

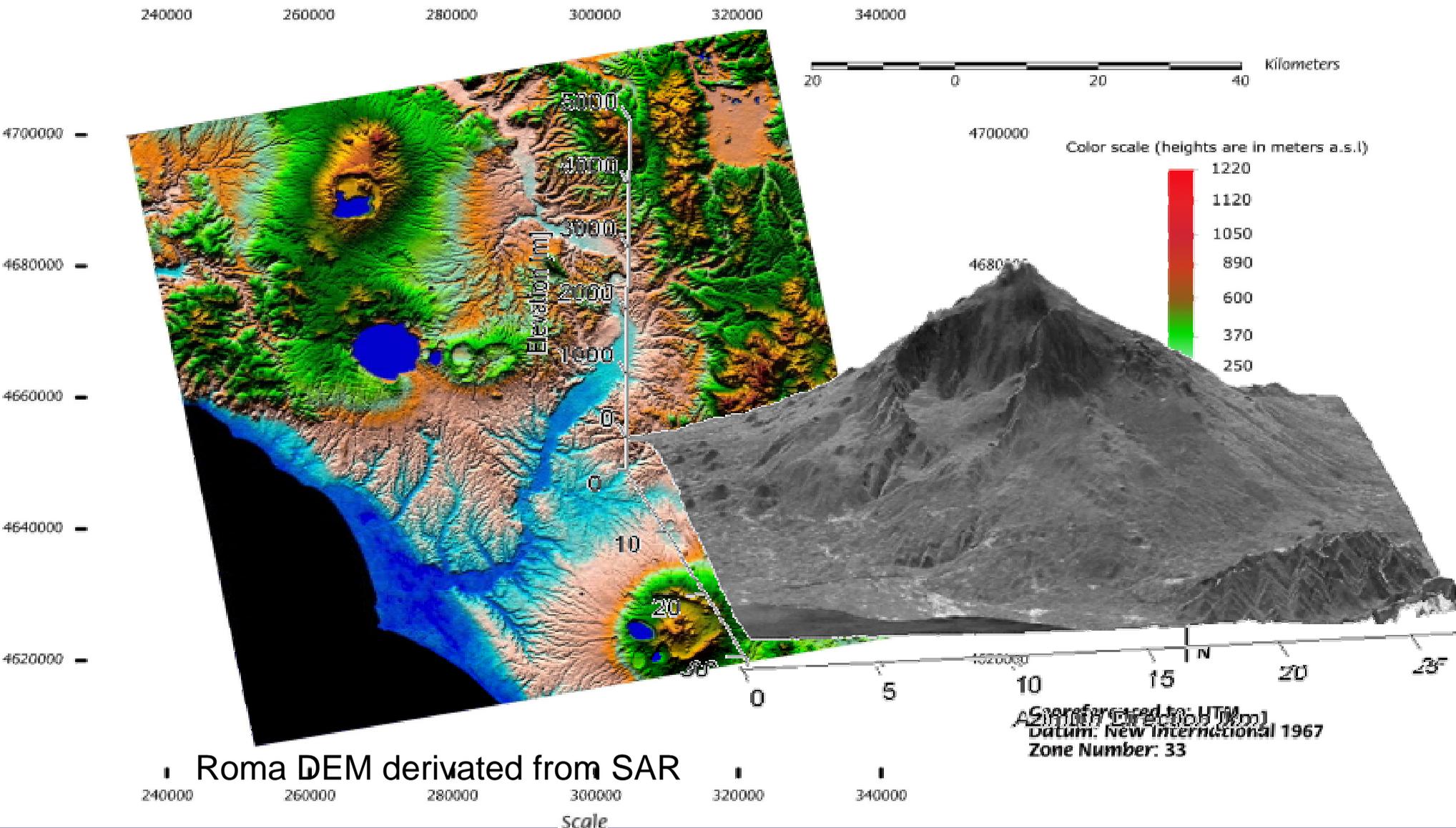
- The ESA MSG Programme, started in 1994



MetOp

- first polar-orbiting satellite for operational meteorology.
- 3 satellites to be launched over 14 years, starting in 2005





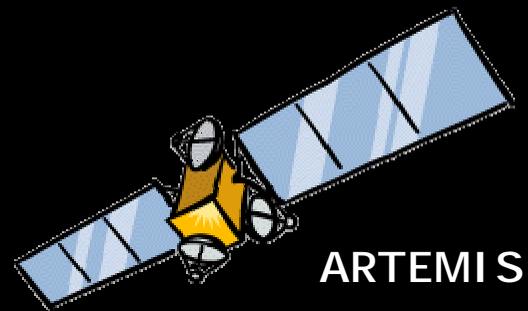


Amsterdam Airport

(TFC 015 05)



02



ARTEMIS



Ka-Band

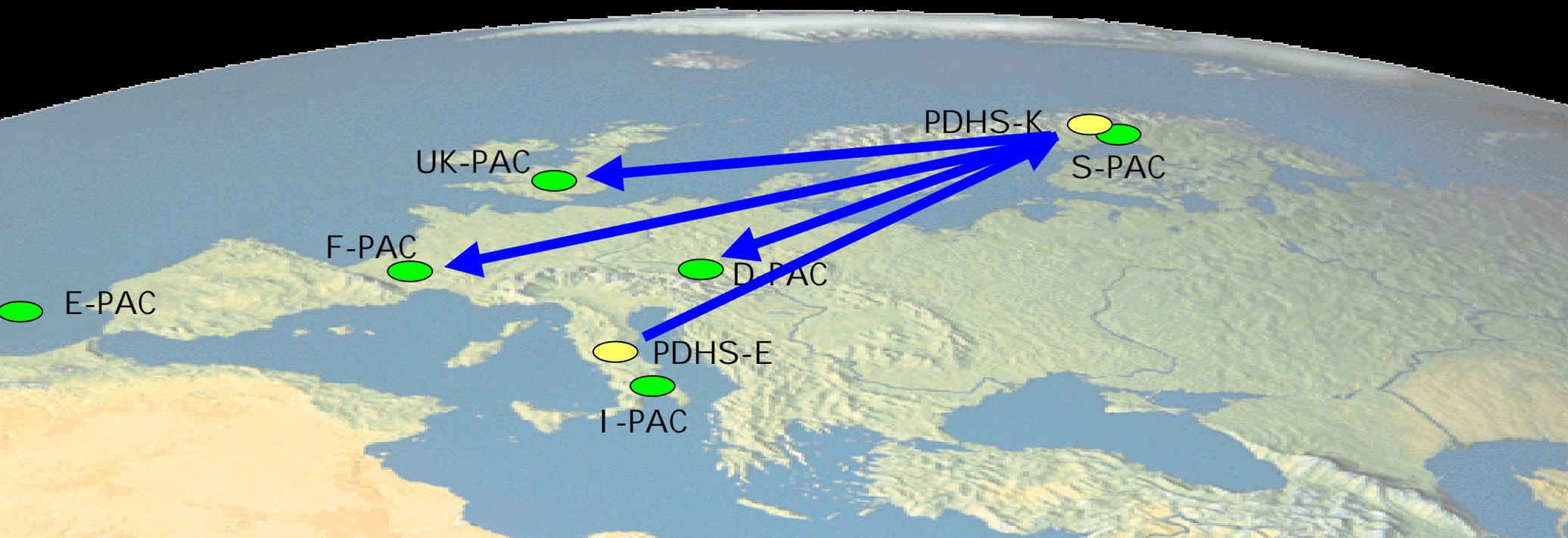


ENVISAT



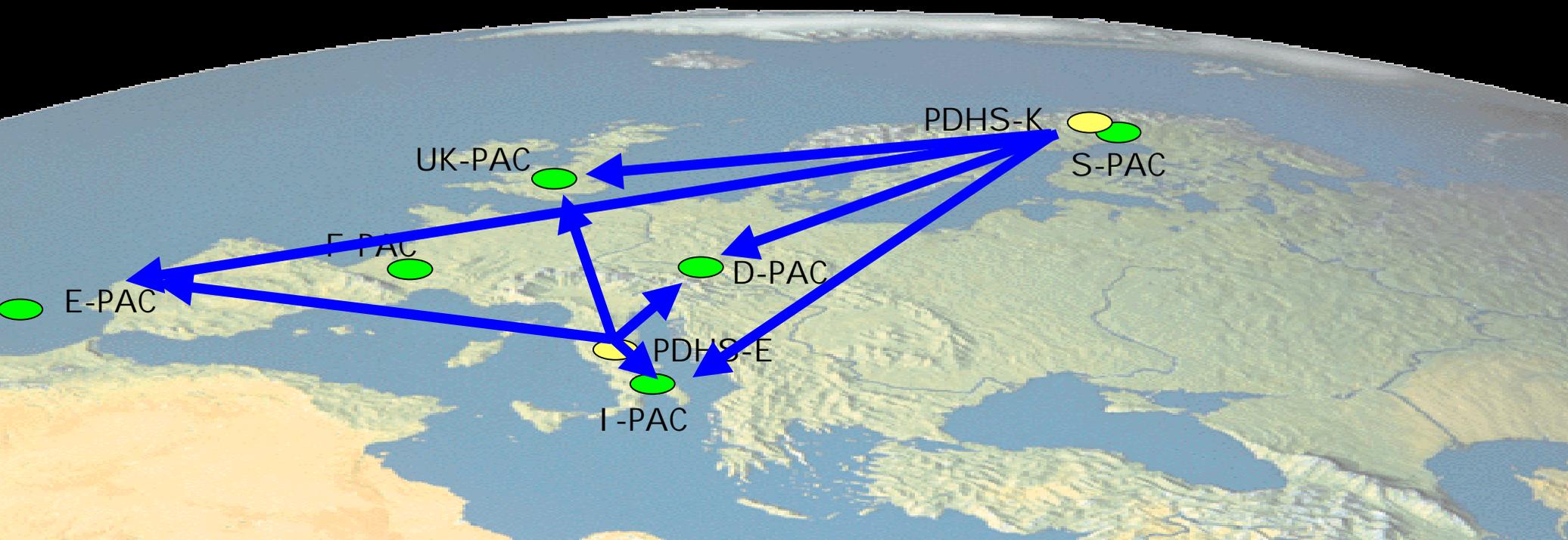


- NRT Processing Centres at ESRIN and Kiruna
- Processing and Archiving Centres (PAC) in different European locations





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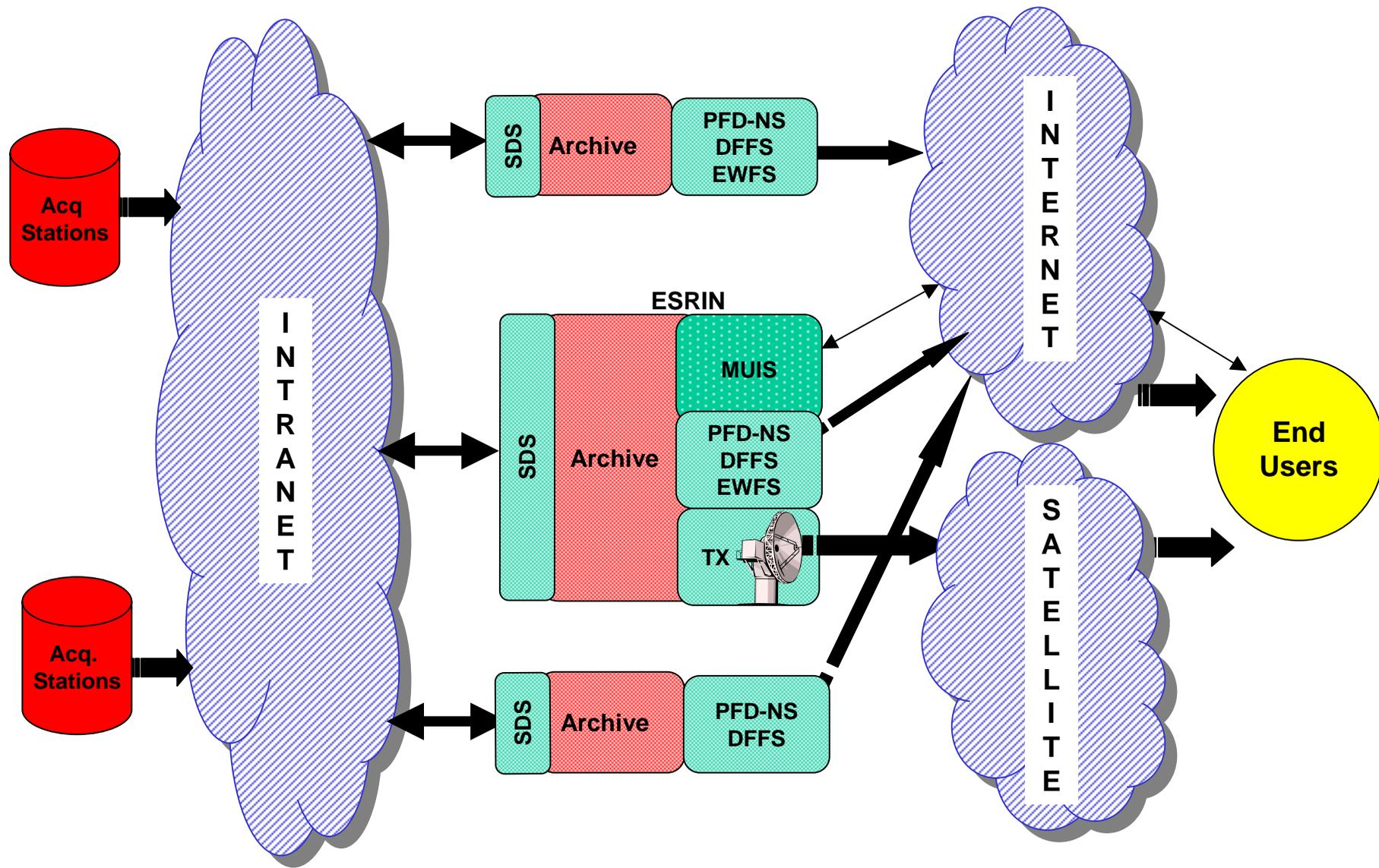


- The EO products shall be distributed electronically to the end users located around the world
- The EO data shall be primarily distributed in the Payload Data Segment electronically
- Phase 1 – 2005
 - On-demand products distribution
 - Electronic data circulation between centres
- Phase 2 – 2006
 - Interactive online data request and retrieval
 - Integration of non-ESA missions

- On-line Archive: Mass Storage Tape Libraries or on disk
- User data request via Internet (order or subscription)
- Product retrieval via Internet:
 - High speed Internet backbone (GEANT/NREN)
 - ISP augmented with load-balancing and re-routing COTS
- Product distribution via Satellite

- Electronic data distribution between GS Centers using High Speed Intranet VPN (based on GEANT/NREN)

- Security
 - Detect and avoid unauthorized use of EO data
 - User authentication
 - Standard COTS encryption (IP VPN)
 - Accounting of data downloaded
 - Protection from malicious intrusion
 - ESA Network Security policy as baseline with Intrusion Detection System



	Centre Location	Missions
1	Frascati, Italy	ERS, Envisat
2	Kiruna Salmijarvi, Sweden	ERS, Envisat, Cryosat
3	Kiruna ESRANGE, Sweden	Landsat MMS, ALOS
4	Oberpfaffenhofen, Germany	ERS, Envisat, MODIS, DLR missions
5	Farnborough, UK	ERS, Envisat
6	Matera, Italy	ERS, Envisat, Landsat TM/ETM
7	Maspalomas, Spain	Envisat, ERS, SeaWiFs, NOAA
8	Toulouse, France	Envisat, CNES missions, Cryosat
9	Neustrelitz, Germany	TPM, ALOS
10	Svalbard/Tromsoe, Norway	Envisat, TPM

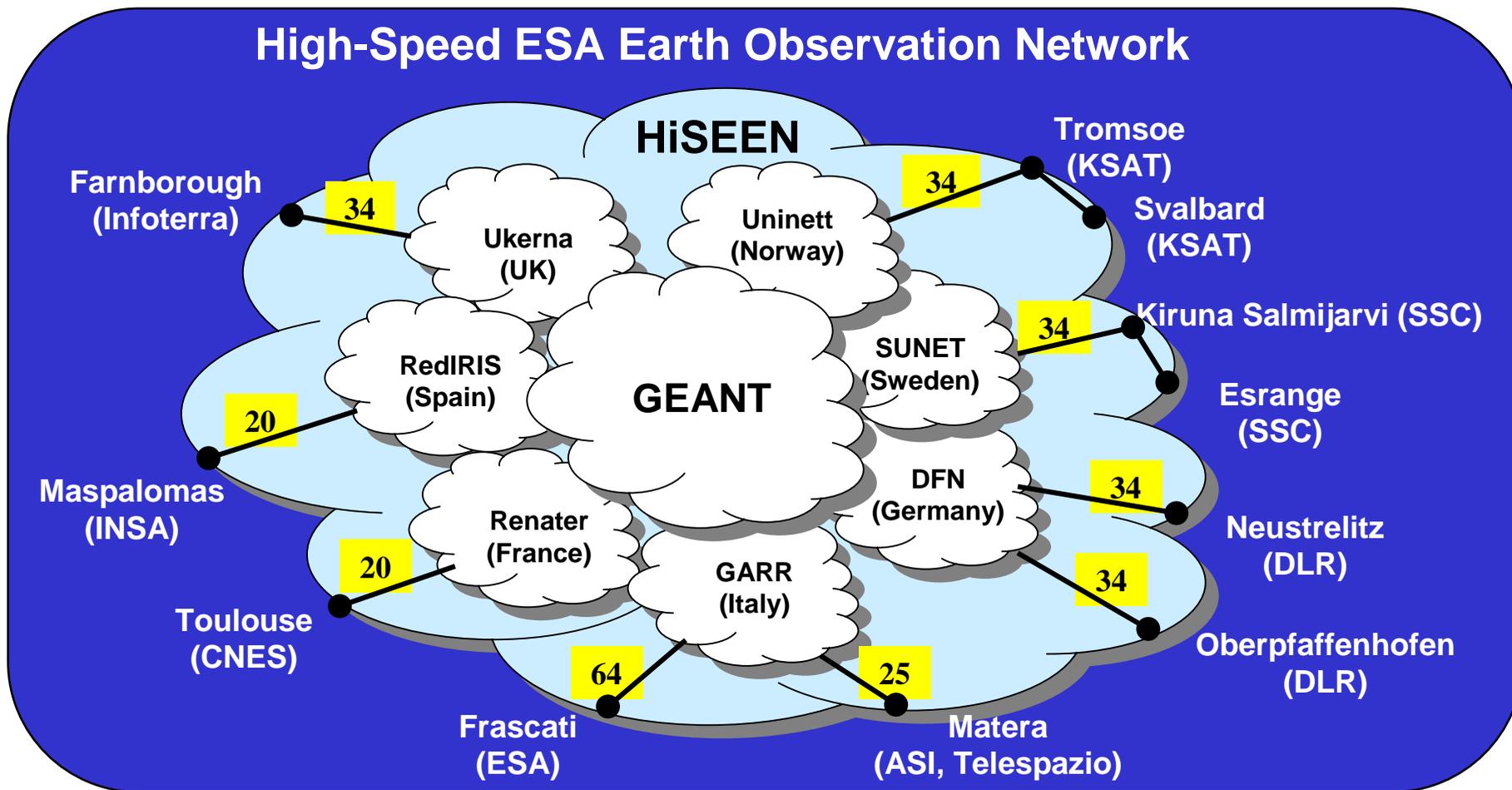
Estimates for 2006

<i>EO Centre</i>	EDS		User Distribution		Total	
	In [Mbps]	Out [Mbps]	In [Mbps]	Out [Mbps]	In [Mbps]	Out [Mbps]
Frascati	1	31	0	58	1	89
Kiruna	2	54	0	14	2	68
Oberpfaffenhofen	16	2	0	31	16	33
Farnborough	19	0	0	36	19	36
Matera	16	2	0	30	16	32
Maspalomas	2	2	0	2	2	4
Toulouse	6	0	0	21	6	21
Neustrelitz	6	0	0	0	6	0
Svalbard	0	0	0	0	0	0

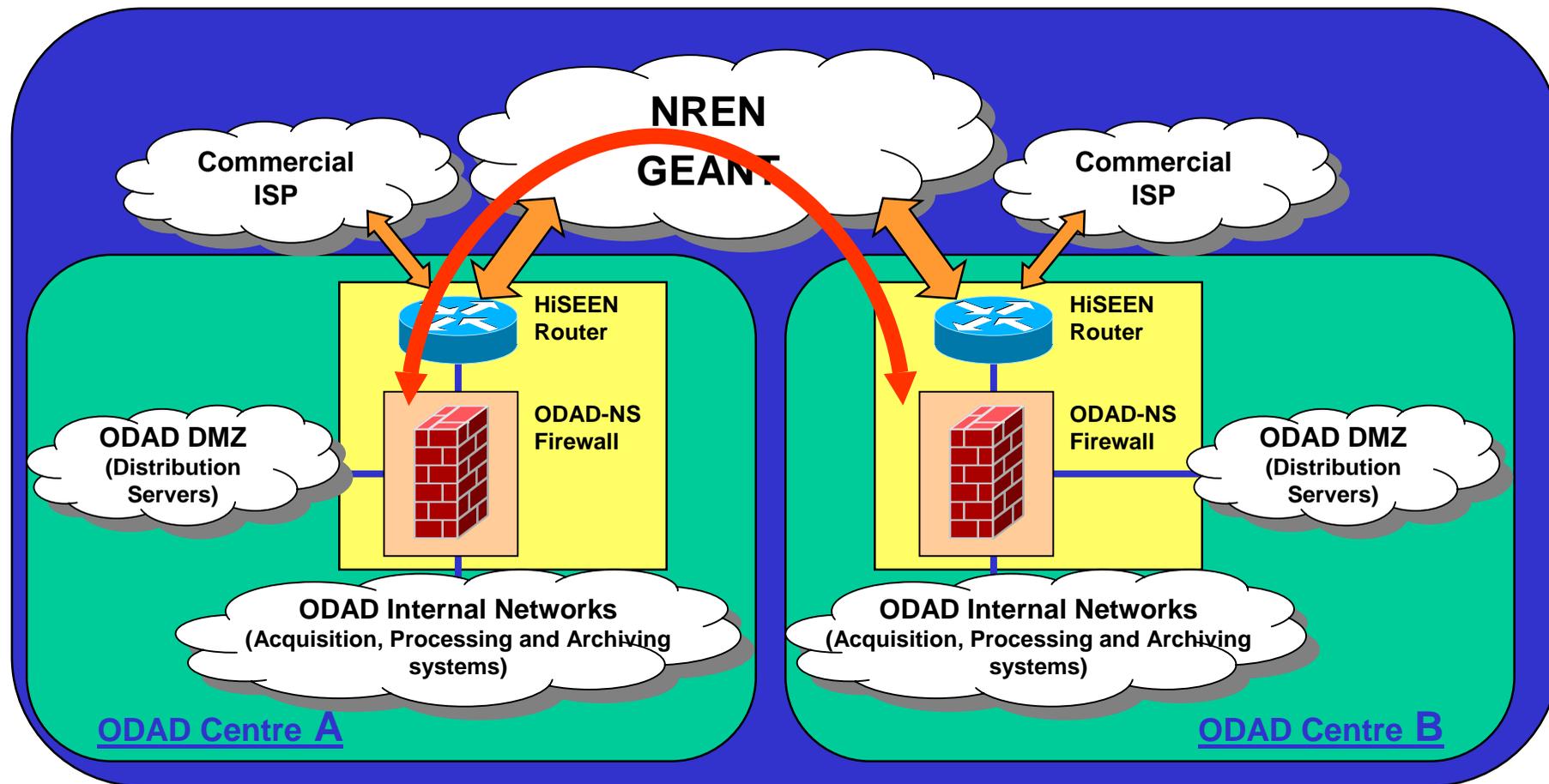
- Data volumes (next 10 years)
 - X10 for EO constellations for Global Environmental Monitoring (GMES)
 - X50 for high resolution satellites
- Multicast over ground links
- Migration of Monitoring and Control traffic
- New Centres
 - Canada
 - Japan
 - Belgium
 - Italy
 - UK

High-speed Network solution

High-Speed ESA Earth Observation Network



Country	Site	NREN	Access Circuit	Bandwidth	Activation
Italy	Frascati	GARR		64	Oct-03
	Matera			25	Dec-04
Sweden	Kiruna Salmijarvi	SUNET	x	34	Oct-03
	Kiruna Esrange				
Germany	Oberpfaffenhofen	DFN		34	Jan-04
	Neustrelitz			34	Nov-04
UK	Farnborough	UKERNA		34	Jun-04
Norway	Svalbard	UNINETT	x	34	May-04
	Tromsoe				
Spain	Maspalomas	RedIRIS	x	20	Dec-04
France	Toulouse	Renater	x	20	May-05



- **NRENs/GEANT Services**
 - Earth Observation data transfer between ODAD Centres
 - High-speed access of scientific users to Earth Observation data
- **Commercial Internet Providers Services**
 - Access of non-scientific users to Earth Observation data
- **Security Services**
 - Centre protection with firewall
 - Protection of data transferred between Centres with VPN (IPSEC)
- **Monitoring Services**
 - Network performance monitoring with PROBES and SNMP

- **Centralized Operations**
 - Monitoring of the ODAD-NS infrastructure from a central site
 - Detection and handling of network anomalies
 - Interfacing with Network Providers
 - Management of configuration changes and maintenance activities
- **Local support to Centralized Operations**
 - the execution of maintenance tasks requiring on-site presence

- **ESA is starting to use NREN and GEANT to support:**
 - the Earth Observation data distribution to the scientific users
 - The data circulation between the EO centres
- **Network has started to be operationally since January 2005 with no anomaly recorded and high performance monitored**
- **Full operational use is planned for Q3 2005**

Thank you

