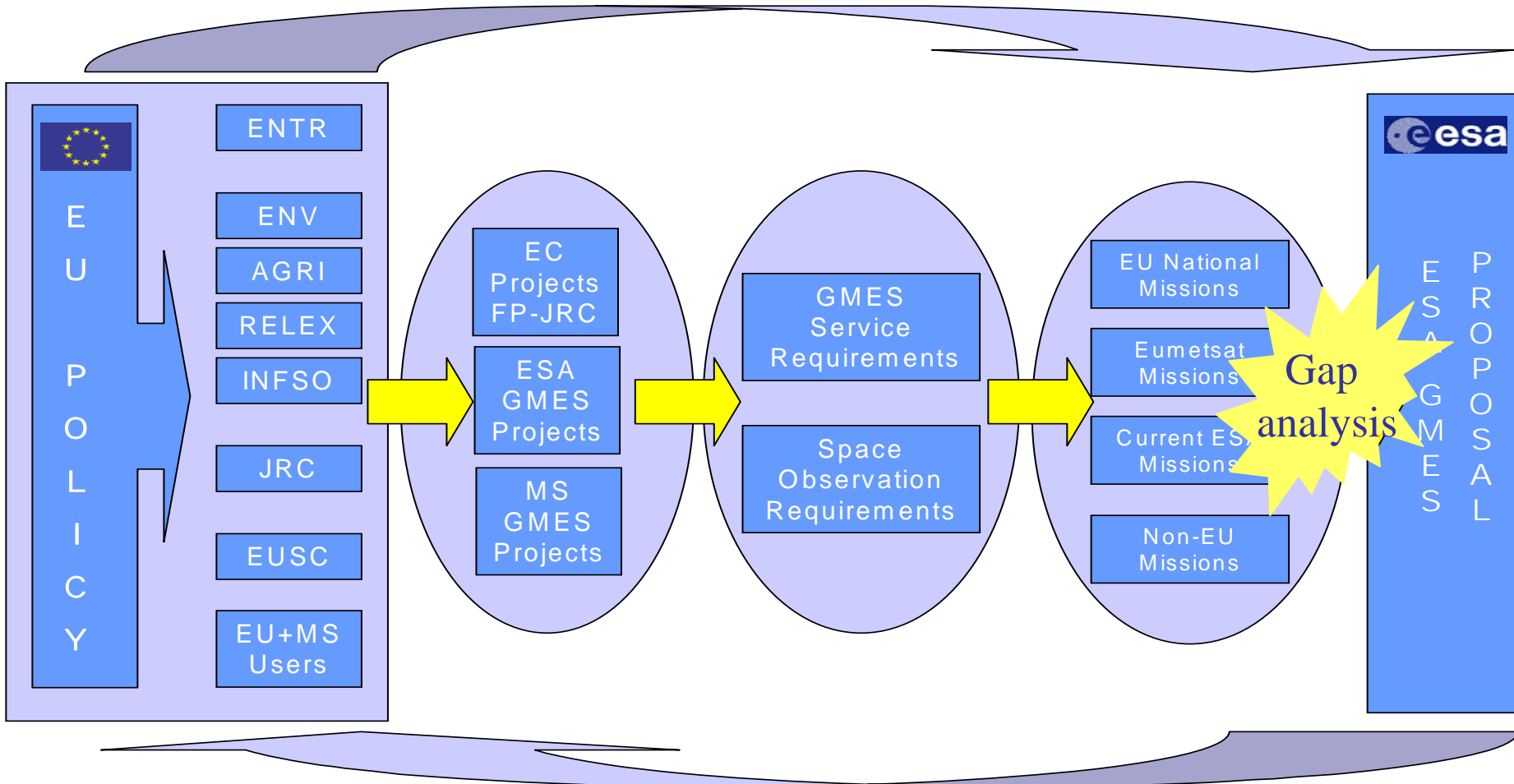


GSE Co-location Meeting
6-8 March 2007, Frascati

GMES Space Component

Josef Aschbacher

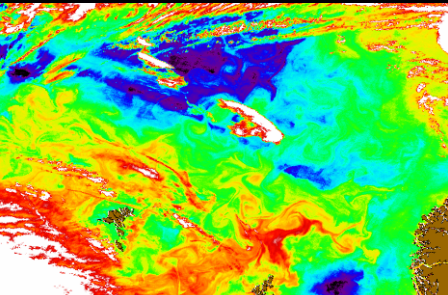
Head, GMES Space Office, ESA



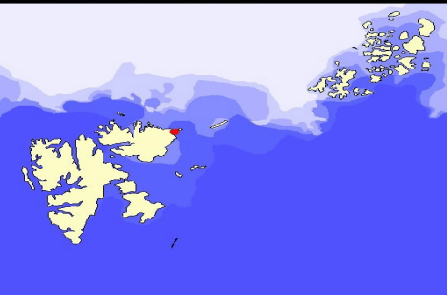
POLICIES → USERS → SERVICES → REQUIREMENTS → GAP ANALYSIS → SOLUTIONS



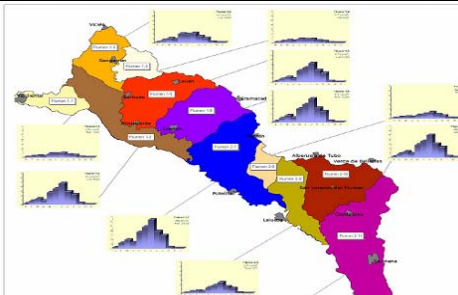
10 ESA GMES Services ... in Pre-operational Phase



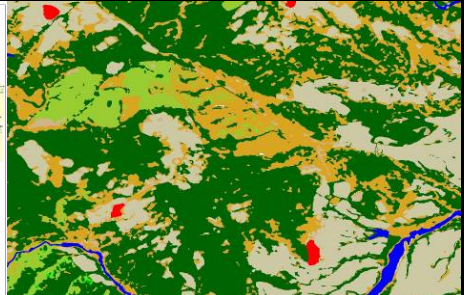
MarCoast



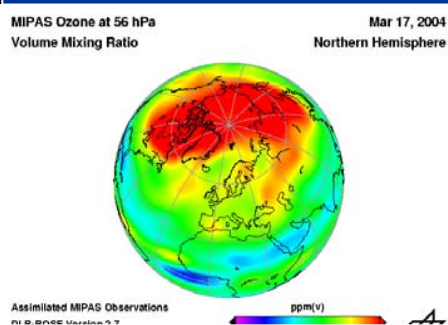
PolarView



GSE Land



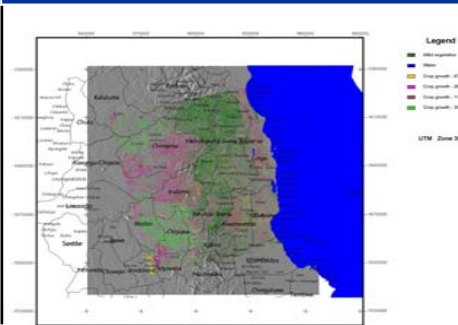
Forest Monitoring



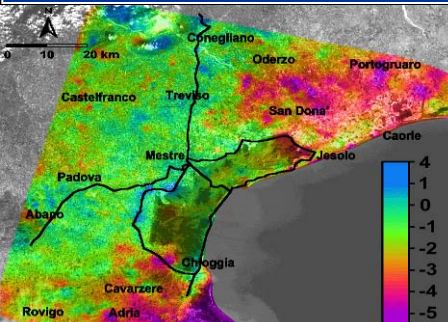
PROMOTE



RISK-EOS



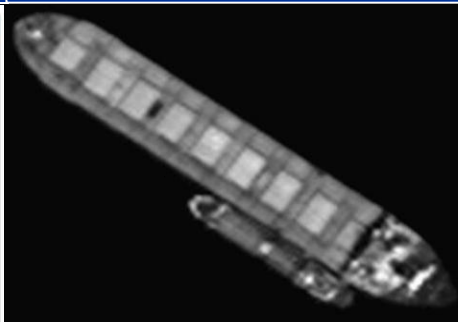
GMFS



TERRAFIRMA



RESPOND



MARISS

•100 M €
by ESA MSs

•Period
2003-2008 (2009)

•300+ User
organisations

•EC has invested
another 100 M €

Sent-1 10-30 m SAR for interferometry, ocean, ice, land applications

✓ 0.5-10 m SAR for detailed land mapping

Sent-2 10-30 m multispectral instruments for land mapping

✓ 0.5-10 m optical instrument for detailed land mapping

✓ 100-1000 m wide-swath thermal infrared instruments for sea surface and land temperature measurements

Sent-3 100-1000 m wide-swath multi-spectral instruments for ocean colour and global land monitoring

✓ radar altimeters for ocean current measurements at high inclination orbit

✓ radar altimeters for ocean current measurements at low inclination orbit

✓ radar scatterometers for sea surface wind speed and direction

Sent-4-5 atmospheric chemistry instruments for trace gas composition, pollution and climate change monitoring (low and geo orbit)

✓ 100-500 m infrared instruments for fire monitoring



NATIONAL & EUROPEAN MISSIONS

... are integral part of GMES

National and European missions

- were designed to satisfy primarily national (or EUM) objectives;
- ESA developed Sentinels are complementary;
- ESA was asked to develop a comprehensive plan ('architecture') to coordinate access to these missions for GMES

Candidate missions

- Spot, Rapid Eye, Pleiades, TerraSAR-X, Cosmo Skymed, Jason, DMC-UK, TopSat, BIRD, Altika, Radarsat, SeoSat, EnMap, MSG, MetOp, PROBA, ERS, ENVISAT
- Some satellites carry more than one instrument

GMES Sentinels – Overview

	SENT-1	SENT-2	SENT-3		
Spacecraft					
Altitude (km)	~ 700	786	815		
Equator cross. (LT)	06:00	10:30	10:00-10:30		
Mass (kg)	2 100	1 000	1 300		
Power consumption (W)	6 000	800	1 100		
Lifetime (years) design/consumables	7 / 12	7 / 12	7 / 12		
Core Payload	SAR	MSI	OLCI	SLST	RA
Instrument type	C-SAR, dual-pol.	Push-broom MSI	MERIS-type	AATSR-type	SRAL +MWR
No. of channels/bands	1	10 VNIR + 3 SWIR	8 / 15	6-9	1/2
Resolution (m)	5x20 (IWS) 25x100 (EWS) 5 x 5 (SM) 5x5 (WM)	10 (4 ch.) 20 (6 ch.) 60 (3 ch.)	300	500	10-100 km
Repeat cycle (days, at equator) / per sat	12	10	< 4 (1.3 with SLST, 2 sat)	~2	27
Swath (km)	240/400/80/20 (IWS/EWS/SM/WM)	290	1 270	1 675	
Fire-IR planned	Option	Option	Option		
Launch (estimate)	Q2 2011	Q2 2012	Q2 2012		
Launcher (baseline)	Soyuz	Vega	Vega		
Fast-Track Serviced	<u>M</u> , E, L	<u>L</u> , E	L, <u>M</u>		
No. of sat's for 15 yrs operation (incl. spare)	4-5	4-5	4-5		
Data rate (Mbps)	500	450	310		
No. of ground stations	4	4	2-3		

Cost estimates

- Development costs (build-up of first generation Sentinels, ground segment, data access): approx. 2.3 bn Euro

Financing – ESA (2005-2013)

- 257 M Segment 1 Phase 1 (2005)
- 430 M Segment 1 Phase 2 (2007)
- 463 M Segment 2 (2008)

Financing – EC (2007-2013)

- 700-780 M FP7 Space Workprogramme (2007-2013)
- In addition, **operational** funds (e.g. outside R&D framework) are required to sustain operational aspects

How to use EC funds to co-fund GMES space component ?

- Good news: FP7 is approved, indication of funding level is given

Issues to resolve

- Verify exact funding levels
- Match FP7 rules with ESA procurement rules
- Disparate ESA and EU participants (incl. Israel)
- Different (or no) geo-return rules
- Back-loaded EC profile
- IPR and ownership
- Sliced approval process of FP7 funds (bi-annual)

	2007	2008	2009	2010	2011	2012	2013	TOTAL
for data access	48		0	50		0	32	130
for space component	0	0	85	120	125	160	160	650
TOTAL	48	0	85	170	125	160	192	780

Note: EC internal tax and cross-cutting activities to be deducted from above figures

1. First grant for data access (48 M) to be signed before end 2007, covers 3 years → **in preparation**
2. Funds for other space component activities available in 2009/2010 → **preparations to start in early 2008**

EC contribution late in the process, needs to be considered in procurement planning

Resolving the (non) geo-return issue

- This could become a stumbling block if not properly resolved
 - Use of EC funds has to be spread across all EU MSs; cannot favour specific country/industry
- Guidelines need to be agreed (Galileo model?)

Resolving the slicing issue

- Uncertainties due to sliced approval process need to be minimised

Resolving the (single-interface) procurement issue

- Spacecraft projects require tight, single customer-contractor interface → EC funds need to be able to be spent in conjunction with ESA funds, without breaking up single management approach

A pragmatic financial engineering approach

- For example, identification of (EC) payment milestones which are part of a global procurement

One set of procurement rules & procedures

- Ideally, ESA procedures should be used which have been optimised over 25 years for space infrastructure procurement
- Could be through a one-time certification of ESA rules & procedures by EC – with introduction of amendments to assure coherence with FP7 rules

1. Confirm details of **EC/ESA funding scheme**
2. Subscription of **Phase 2** of GSC programme (430 M€), mid 2007
3. Confirm EO mission contributions from ESA/EU Member States to GSC programme – establishment of **GSC Partnership**
4. Confirm content of **Segment 2**
5. Preparation for decision at **2008 Ministerial Council**