ESA Report to CEOS WGCV

European Space Agency
Agence spatiale européenne

the Living Planet

Past Reports

- WGCV-26
  - ESA Campaigns
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- WGCV-27
  - GMES Space Component Sentinel-1, -2 and -3
- WGCV- 28
  - Sensor Performance, Product and Algorithm
  - Activities in the context of Product and Processes harmonisation

- Kopernicus

  – ESA-EC GMES architecture for data access services - GSCDA

  – To provide a generic overview about the GMES Space component and about the Data Access related initiative on-going at ESA

What is Kopernicus ?

www.gmes.info

What is GMES?

GMES is a European initiative which will provide us with the tools to improve our environment and will help us keeping our planet safe and healthy. More...

How did GMES start?

GMES is the results of years of research in the fields of science and technology associated with the observation and the understanding of the processes and phenomena of the terrestrial environment. More...

To whom is GMES addressed?

GMES is the European solution to respond to the needs of citizens in Europe to access reliable information on the status of their environment. It will mainly support decision-making by both institutional and private actors. More...

What uses can be made of GMES services?

GMES will support the implementation of public policies at European or national level that deal with, for example, agriculture, environment, fisheries, or regional development, external relations, security. More...

What services will be provided by GMES?

The services provided by GMES can be classified in three major categories: mapping, support for emergency management and forecasting. More...

What is the context of GMES?

GMES is the European participation in the worldwide monitoring and management of our planet Earth and the European contribution to the Group on Earth Observation (GEO). More...

The GMES Service Projects

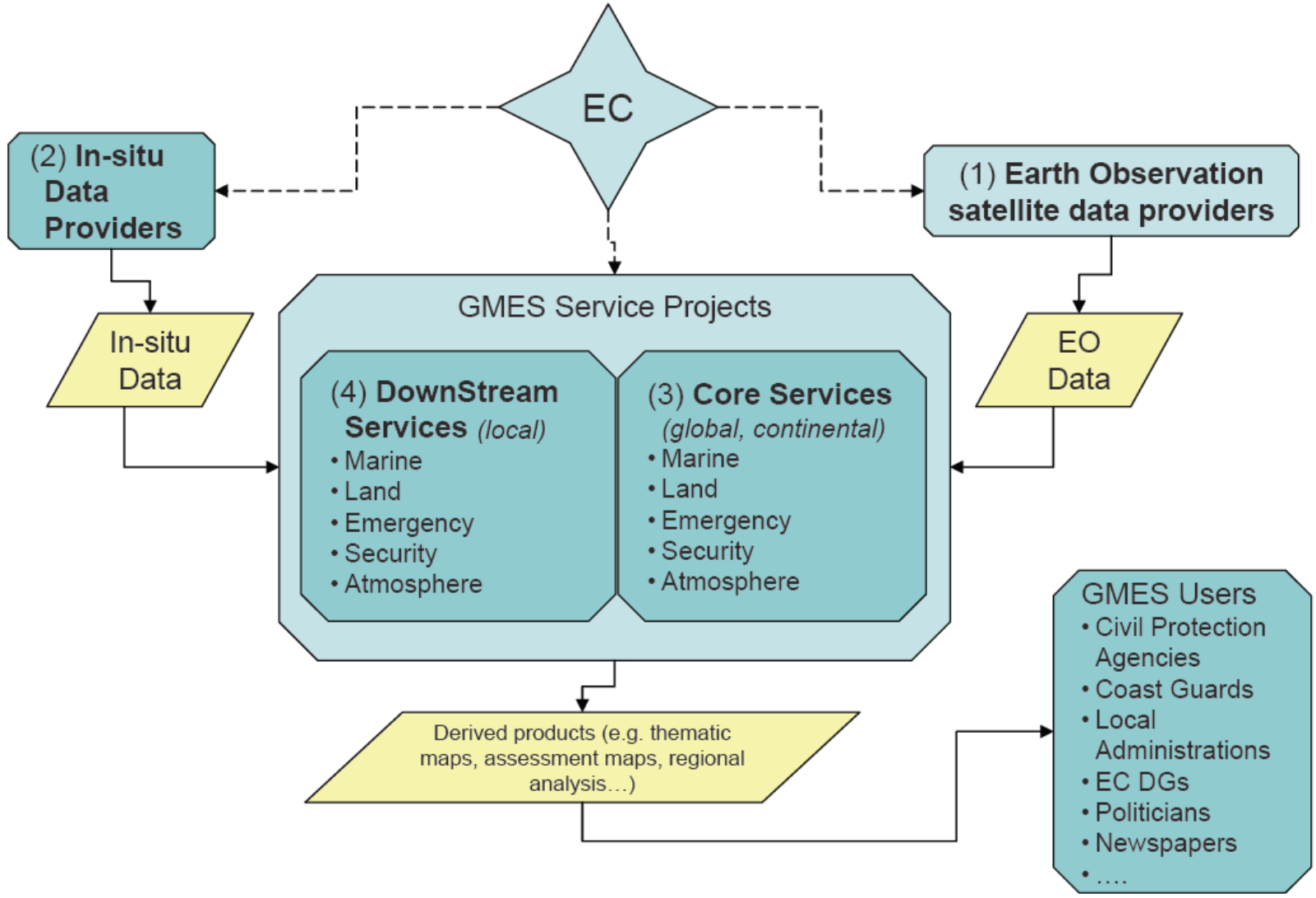
- Three GMES Fast Track Services (FTS), and two additional GMES pilot services (Security and Atmospheric) have been identified by the European Commission (EC) for early operational implementation in 2008-2010 and additional GMES services are expected to become operational beyond 2010.

- The scope of the GMES Core Services is summarised hereafter:
  - The Marine Core Service (MCS), to make available and deliver a set of services for forecasting, monitoring and reporting on the ocean state
  - The Land Core Services (LCS), to provide timely, continuous and independent observations about the use of land resources and the changes of the land environment.
  - The Emergency Response Core Services (ERCS) to support at global level all stages of intervention cycle from early warning, to crises management and recovery in response to natural, environmental, technological and man-made emergencies (e.g. droughts, floods, storms, earthquakes, tsunami, volcano eruptions, landslides fires, nuclear plant accidents, etc).
  - The Security Core Service (SEC) to support security agencies and institutions with monitoring for crises management and recovery in response to technological and man-made emergencies (e.g. nuclear plant accidents, etc).
  - The Atmospheric Core Service, to support at global level atmospheric related analysis and monitoring

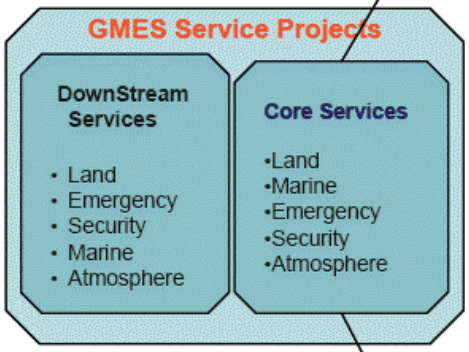
- The GMES Space Component Data Access (GSCDA) project has been initiated by ESA for providing EO data to the Fast Track and to the two Pilot Services.

- Within this project, a Data Access Portfolio (DAP) Management function (GSCDA-P) is in charge of capturing the data and services requirements from the GSPs.

Overview of GMES



The GMES Service Project



Land Core Service

to provide timely, continuous and independent observations about the use of land resources and the changes of the land environment.

- Forest Monitoring
- Land use / land cover state & changes
- Land cover mapping for water & soil management
- Environmental information for public health
- Urban Land-use mapping

Marine Core Service

to make available and deliver a set of services for forecasting, monitoring and reporting on the ocean state

- Sea ice & iceberg monitoring
- Vessel tracking and fisheries monitoring
- Oil pollution monitoring
- Sea Surface Temperature monitoring
- Ocean colour
- Altimetry

Emergency Core Service

support at global level all stages of intervention cycle from early warning, to crises management and recovery in response to natural, environmental, technological and man-made emergencies (e.g. droughts, floods, storms, earthquakes, tsunami, volcano eruptions, landslides fires, nuclear plant accidents, etc).

- Active seismic zone and volcano observatory
- Regional landslide risk monitoring
- Rapid Flood mapping & damage assessment
- Regional Forest Fire Area Mapping & stats
- Urban subsidence risk assessment

Security Core Service

support at global level all stages of intervention cycle from early warning, to crises management and recovery in response to technological and man-made emergencies (e.g. nuclear plant accidents, refugees, etc).

- Nuclear Plants monitoring
- Refugees monitoring…

Atmospheric Core Service

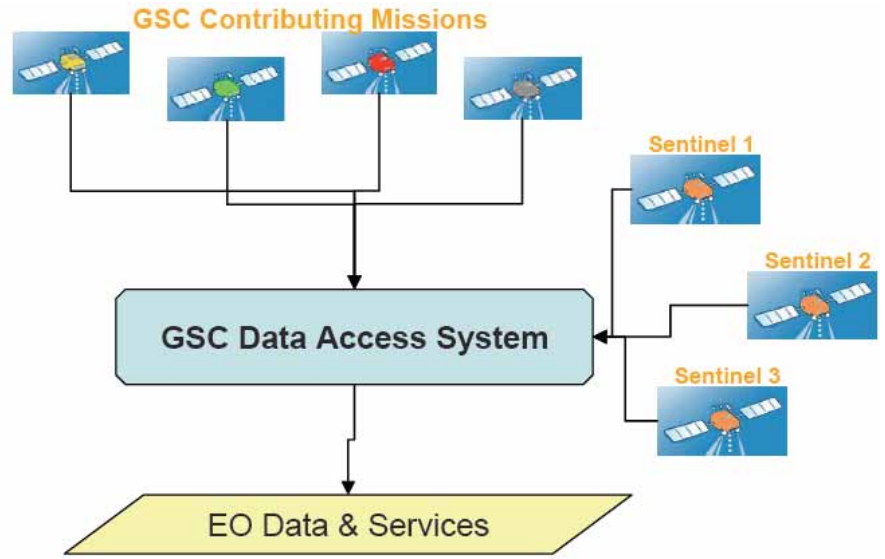
support at global level to monitoring of the atmosphere

- Pollutant
- Ozone hole monitoring

The GMES Space Component

- **The GMES Space Component (GSC) includes the Sentinels satellites and the access to ESA and European EO missions**

- The EO missions contributing to the GSC having similar characteristics (e.g. radar, optical HR, atmospheric…) are referred to as “Sentinel-type” group for Convenience
  - S1-type: SAR
  - S2-type: optical high and very high resolution
  - S3-type: altimetry, optical/IR medium and low resolution
  - S4/S5 type: interferometers for atmospheric chemistry

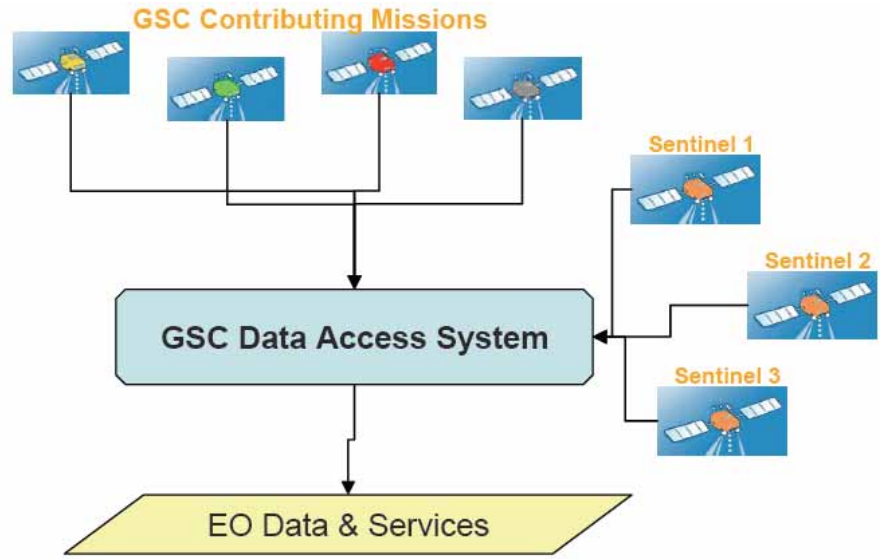


The GMES Space Component

- **The GMES Space Component (GSC) includes the Sentinels satellites and the access to ESA and European EO missions**

- *ESA is responsible for the development of the Sentinels satellites and of coordinating the data provision to the GMES Services*

- The GSC **Data Access (GSCDA) Project** is the ESA starting step for GMES set-up. It covers the GSC pre-Sentinels ("pre-operational") phase (i.e. 2008-2010) and is based on existing missions (ESA + European)



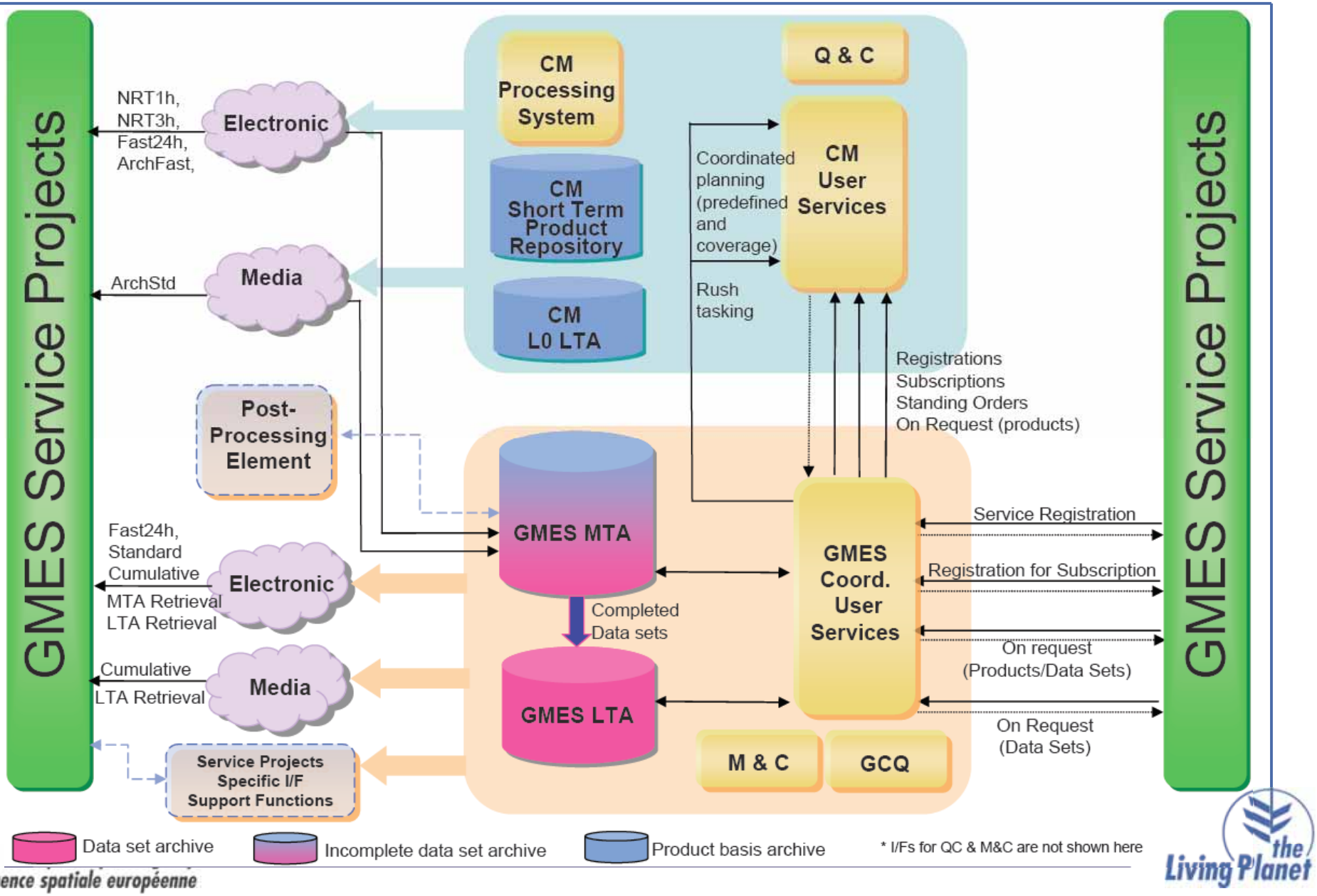
Main GSE Service Drivers

- Large data volumes involved (e.g. for the three Sentinels, about 2-3 TB/day)
- Stringent timeliness requirements (e.g. NRT1h, NRT3h)
- Heterogeneous environment (several EO missions and sensors are contributing to the same data-sets)
- Operational constraints (high reliability, availability, maintainability,…)

GSC DA implementation approach

- Evolution from mission/sensor product concept to data-set concept
- Harmonized access for users achieved through an enhanced coordination layer on top of existing infrastructures (“data access coordinated functions”)
  - No impact on source products
  - No impact on GCM core infrastructure
- Enhanced system operability achieved through interoperable catalogues/ordering/programming (see HMA interfaces standardization)
- GSC dedicated archiving for long-term data sets availability

Baseline High-Level Architectural concept



GSCDA-S Architectural Concept

- ## GSCDA-S Architectural elements

- ***GMES Contributing Missions*** *(GSC CM):* this is the core G/S of the GSCDA-S, located at each Contributing Mission. It includes an *acquisition/processing system, a long term archive* (for L0 data), *a short-term data repository (L1 and higher), a dissemination function, a User Service,* and also a *Quality, Monitoring and Control function.*

- ***GSC Coordinated User Services*** *(GSC CUS)*: this is the system front-end to the GMES Service Projects. It interacts with the User Services of the various GCMs for ensuring user support and for coordinating mission planning. It includes a Customer Service, a GMES Coordinated Catalogue and a coordinated mission planning capability.

- ***GSC Coordinated Archive*** *(GCA)*, the store for (almost) all data acquired and distributed by the GSCDA.

- ***GSC Post Processing Element*** *(GSC PPE):* it is a facility providing post-processing capabilities when necessary (e.g. for ortho-rectification)

- ***GSC Coordinated Quality Control*** *(GSC CQC):* in charge of organising harmonized publication and definition of data quality for GSC data, relying on CM quality standards.

- ***GSC Monitoring & Control*** *(GSC M&C):* in charge of ensuring the overall control and monitoring of the system.

GMES data-sets handling classes: Examples

DAP DataSets Description	Systematic access to S3-group ocean colour	C-band SAR systematically over ice regions Europe/Artic	reference maps over crisis-prone areas worldwide	emergency planning	1-3 European coverages in 3 years with windows of countries
Archiving	• L0: LTA @ CM • L1/L2: LTA @ CM	• L0: LTA @ CM • L1: MTA / LTA @ GMES	• L0: LTA @ CM • L1: MTA/ LTA @ GMES	• L0: LTA @ CM • L1: MTA / LTA @ GMES	• L0: LTA @ CM • L1: MTA / LTA @ GMES
Data Availability Timeliness (from acquisition to distribution)	NRT3h	NRT1h	Not Applicable	NRT1h	Standard / Cumulative
Data Availability Timeliness (retrieval from archive)		• GCA (after dissemination)	• Arch6h • GCA (after dissemination)	• GCA (after dissemination)	• GCA (after dissemination)
Data Delivery	On-line from CM to SP (or multicast)	On-line from CM to SP (or multicast)	On-line	On-line from CM to SP (or multicast)	Media, On-line
Products and Data Set Catalogue	• GMES Global Data Set Catalogue	• CM catalogue for view of planned predefined acquisitions. • GMES catalogue after dissemination.	• CM Catalogues for past selection before processing & dissemination. • GMES catalogue after dissemination.	• CM catalogue for selection of potential acquisitions (if available at CM). • GMES catalogue after dissemination.	• GMES Catalogue
Data Access Mechanisms	Subscription	Subscription	On-request	On-request	Subscription
Coordinated Mission Planning	Fixed	Pre-defined planning	Pre-defined planning	Rush tasking	Coordinated Coverage Planning
Processing	• Processing • Re-processing (from CM to SP)	• Processing • Re-processing (from CM to MTA)	• Processing • Re-processing (from CM to MTA)	• Processing • Re-processing (from CM to MTA)	• Processing • Post-processing • Re-processing (from CM to MTA)
Monitoring and Control	• Q&C from CM • Coordinated QC • System M & C	• Q&C from CM • Coordinated QC • System M & C	• Q&C from CM • Coordinated QC • System M & C	• Q&C from CM • Coordinated QC • System M & C	• Q&C from CM • Coordinated QC • System M & C