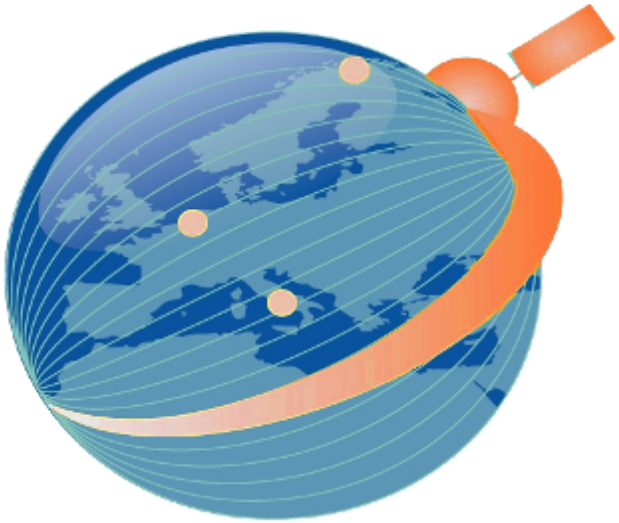

Towards a distributed Earth Science Data Infrastructure
ISGC 2011 & OGF 31

GENESI-DEC

INFRA-2010-1.2.3 : Virtual Research Communities
Duration : May 1, 2010 – April 30, 2012
Total EC funding : 2.15 M€

EUROPEAN COMMISSION
European Research Area

SEVENTH FRAMEWORK PROGRAMME

EC Grant Agreement no. 261623

Joost van Bemmelen, Luigi Fusco, Roberto Cossu, Eliana Li Santi
ESA
Presented by: Federico Ruggieri INFN

esa
ELSAG DATAMAT
A Finmeccanica Company
DLR
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iT innovation
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MINISTERO DELL'AMBIENTE
E DELLA TUTELA DEL TERRITORIO E DEL MARE

GENESI-DEC Overview

The achievements of the predecessor: **GENESI-DR**

Ground European Network for Earth Science Interoperations – Digital Repositories

an **Earth Science e-infrastructure**
connecting **Digital Repositories**
spread all over Europe

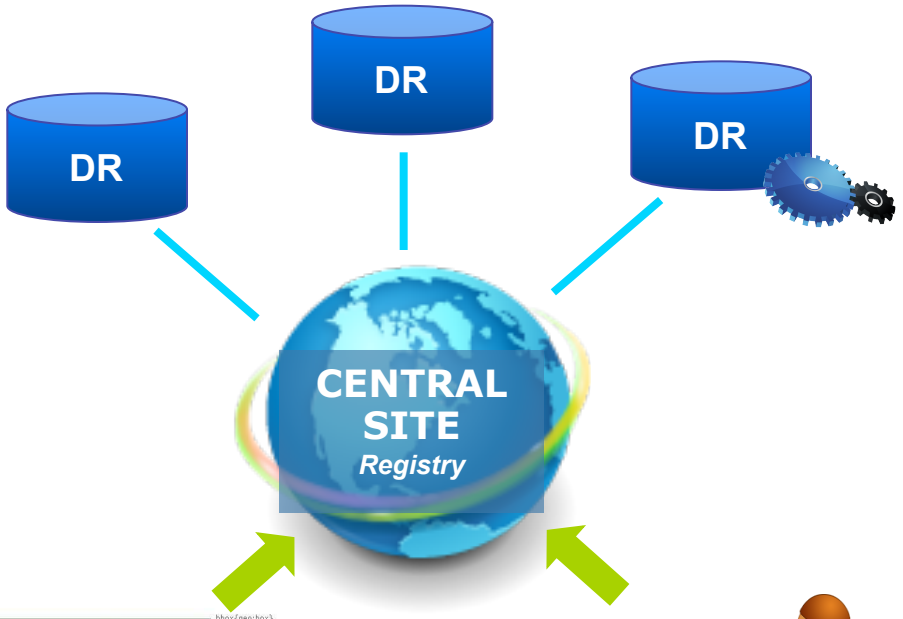
allowing:

- Easy and fast access to heterogeneous data (airborne, in situ, satellite) to authorized users (following provider's policies);
- Effective data and service discovery capabilities through the same interface in a transparent and homogeneous way;
- On demand processing capabilities;
- Easy integration of new Digital Repositories thanks to the standardization and scalability (the work done by GENESI-DR will be included by OpenGeospatialConsortium in the next release of *Catalogue Services for the Web* specs);
- Accessibility through user applications via the exposed programming interfaces.

Access to GENESI-DR

GENESI-DR data and services can be accessed by:

human users through the **GENESI-DR Web Portal**



external applications through an **OpenSearch–based interface**

The GENESI-DR Web Portal

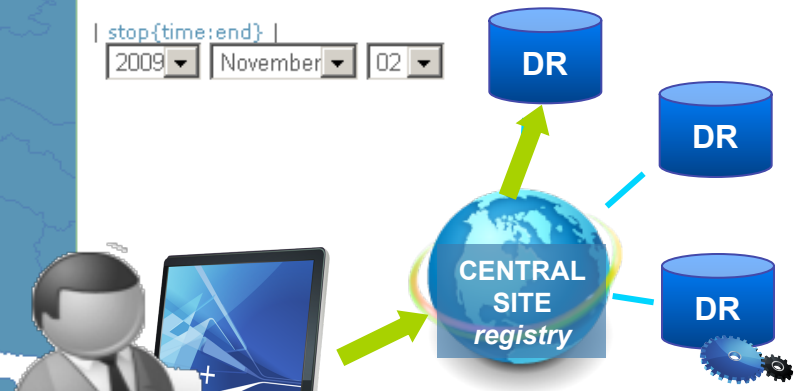
Users can discover data and services via the GENESI-DR Web portal searching on the base of:

bbox{geo:box}
3.7,37.32,21.63,49.04

…geographical area, temporal range..

| start{time:start} |
2009 November 02

| stop{time:end} |
2009 November 02



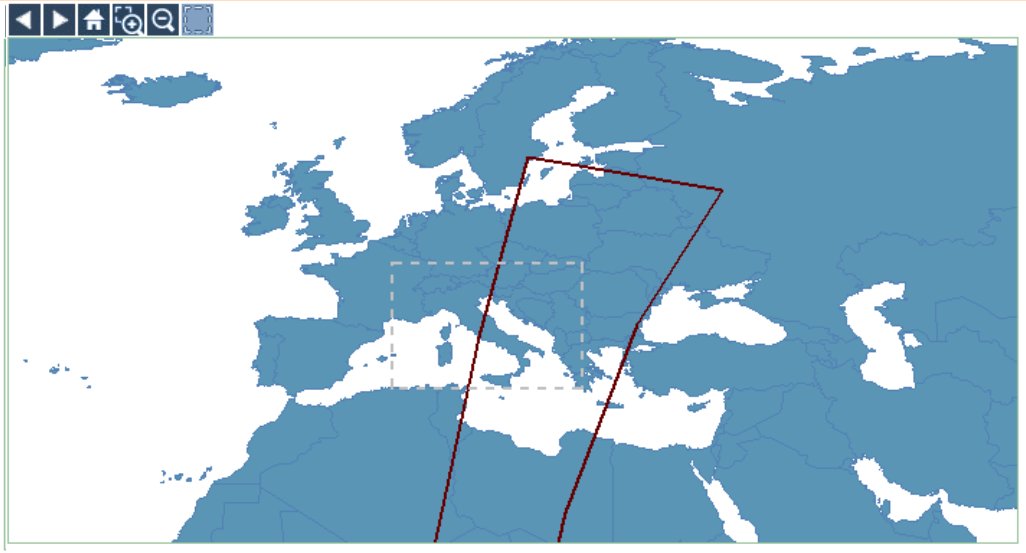
Free text search : q{searchTerms}

Processing Centre : All Acquisition Station : All

…free text string

…and other specific parameters as applicable

The GENESI-DR Web Portal



bbox{geo:box}
3.7,37.32,21.63,49.04

start{time:start}
2005 November 02

stop{time:end}
2009 November 02

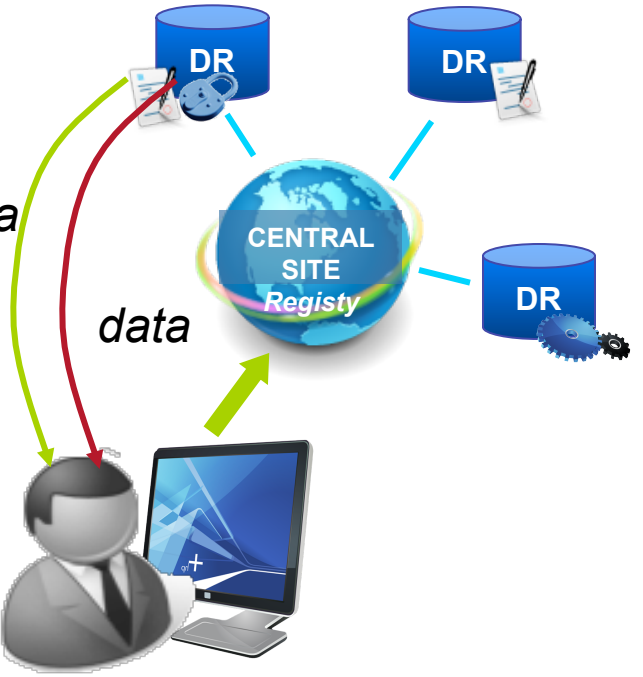
Free text search : q{searchTerms}

Processing Centre : All Acquisition Station : All

Query

ID	Dataset	Series	Start and End Time	Metadata
☐	MER_RR__1PNPDK20070910_094422_000023872061_00294_28905_8182.N1 quicklook gsiftp://	MER_RR__1P	2007-09-10T09:43:59.00 2007-09-10T10:24:14.00	dclite4g eop/hma
☐	MER_RR__1PQACR20051127_094014_000026312042_00480_19572_0000.N1 quicklook gsiftp://	MER_RR__1P	2005-11-27T09:40:14.00 2005-11-27T10:24:05.00	dclite4g eop/hma
☐	MER_RR__1PQACR20051128_090840_000026312042_00494_19586_0000.N1 quicklook gsiftp://	MER_RR__1P	2005-11-28T09:08:40.00 2005-11-28T09:52:31.00	dclite4g eop/hma
☐	MER_RR__1PQACR20051128_104916_000026312042_00495_19587_0000.N1 quicklook gsiftp://	MER_RR__1P	2005-11-28T10:49:16.00 2005-11-28T11:33:07.00	dclite4g eop/hma

DRs reply with all data and services matching the query

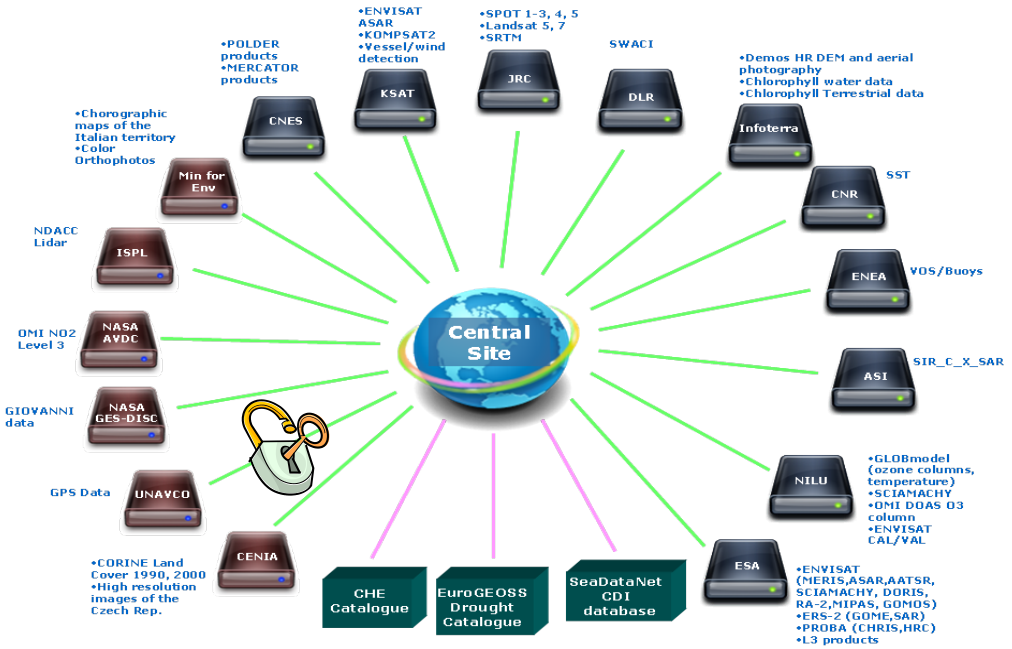


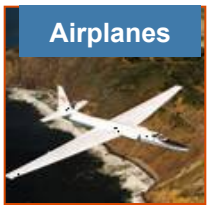
Direct and controlled access: Data are not copied to the central site and download/access is allowed only to authorized users

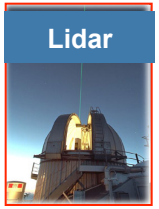
Individual DR data policies are considered and respected

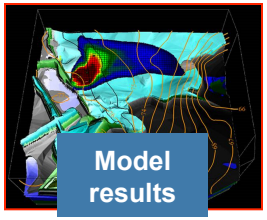
The current deployment topology

- More than 400 heterogeneous series
- Approximately 5,000,000 records!!!









Metadata Model and Search

- Metadata core properties based on the INSPIRE Implementing Rules for Metadata as minimal set following the criteria of their usefulness to data discovery and operational setting.

- Design for practical use as a Dublin Core Application profile.

- Open-Search was adopted and promoted in GENESI-DR as the minimal compliance level to develop discovery mechanisms in heterogeneous sites

- The geospatial extension allow to formulate geospatial requests e.g. point-plus-radius, a bounding box, or a polygon

  bbox={**geo:bbox**?}

- Together with the Time extension, OpenSearch can specify time start, finish, and slices for searching data.

  start={**time:start**?}&stop={**time:end**?}

- <**Url type**="text/html" **template**="http://example.com/xml/?q={searchTerms?}& start_date={time:start?}&stop_date={time:end?}&bbox={geo:box}"/>

Processing

GENESI-DR provides **on demand processing capabilities**: application/algorithms are run on **Grid** resources

| **Services Available** | | General Information |

Algal Bloom detection: An algal bloom is a rapid increase in the population of algae in an aquatic system. Algal blooms may occur in freshwater as well as marine environments. Typically, only one or a small number of phytoplankton species are involved, and some bloom the high density of pigmented cells. Algal blooms may also be he high cell concentrations reached during some blooms, the: looms composed of phytoplankters known to naturally produce biotoxins are called Harmful Algal Blooms, or HABs. The primary mission of MERIS is the measurement of sea colour in the oceans and in coastal areas. Knowledge of sea colour can be converted into a measurement of chlorophyll pigment concentration, suspended sediment concentration and of atmospheric aerosol loads over water.

Algal Bloom detection

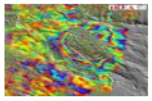
GlobModel Visualizat

Glob models visualisation

GOME and Lidar Ozone validation : This service processes ERS-2 GOME satellite data to derive estimates of Ozone in the atmosphere and validate such estimates by comparison with Ozone profiles measured by Lidar ground stations

Gome – Lidar comparison

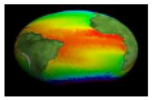
GOMEL1b->L1c: Process Gome Level 1b data to Gome Level 1c. Both data and processor are CASPAR preserved



INSAR SBAS IREA: InSAR involves combining two or more radar images of the same ground location in such a way that very precise measurements - down to a scale of a few millimetres - can be made of any ground motion taking place between image acquisitions. "Inte complete set of coloured bands, called "fringes", r h, which is 2.8 cm in the case of Envisat's ASAR. s of Italy's Istituto per il Rilevamento Elettromagnetico dell' Ambiente (IREA-CNR). The same algorithm can be used either for analysing long time-series to observe subsidence phenomena or to map rapid deformations e.g. after earthquakes.

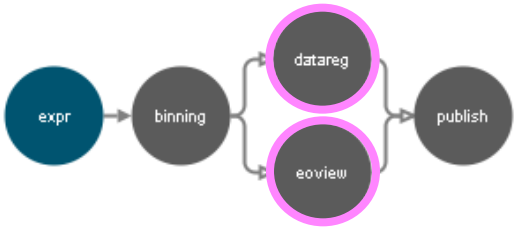
Interferometry processing

OCEAN_NEST: Ship detection based on NEST toolbox



Sea Surface Temperature: The sea-surface temperature (SST) is the temperature of the surface layer of sea or oceanic water. The between th variations and predicting the movement of oil spills. The Advanced Along-Track Scanning Radiometer (AATSR) aboard ESA's Envisat uses infrared wavelengths to acquire SST across a square kilometre of ocean to an accuracy of 0.2 °C.

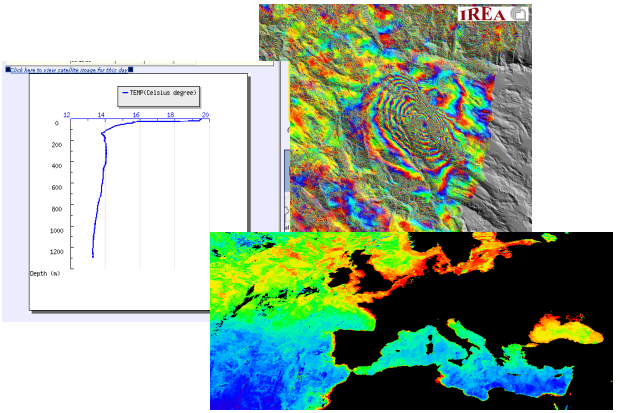
Sea Surface Temparture map generation



GENESI-DR splits the **processing steps** in several jobs.

These are **run in parallel** as possible in different **computing nodes** of the underlying **Grid infrastructure.**

Expert users are so enabled to produce the **final desired product.**



Value added of GENESI-DEC over GENESI-DR

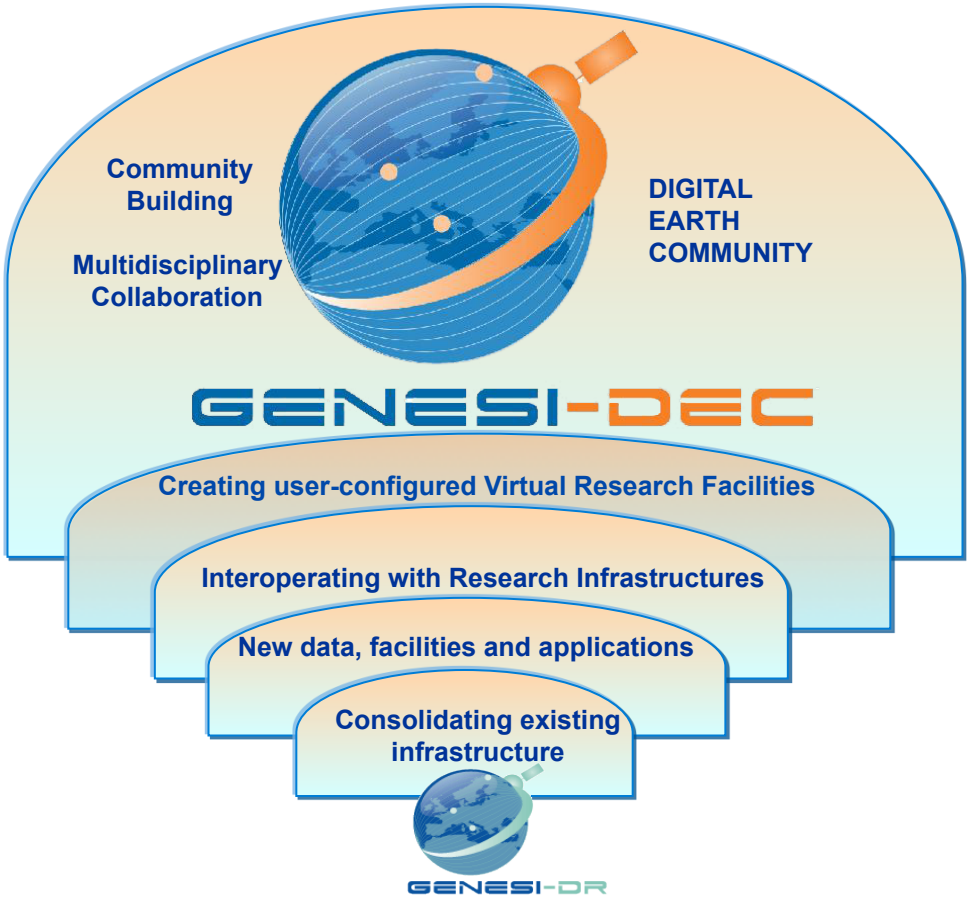
GENESI-DEC builds upon **GENESI-DR** , **consolidates it** , and evolves it in terms of

Data:

- **GENESI-DR** federates 16 DR hosting more than 166 dataset series;
- **GENESI-DEC:**
  - **new DRs**
  - **interoperation** with Research Infrastructures (addressing security model interoperability)

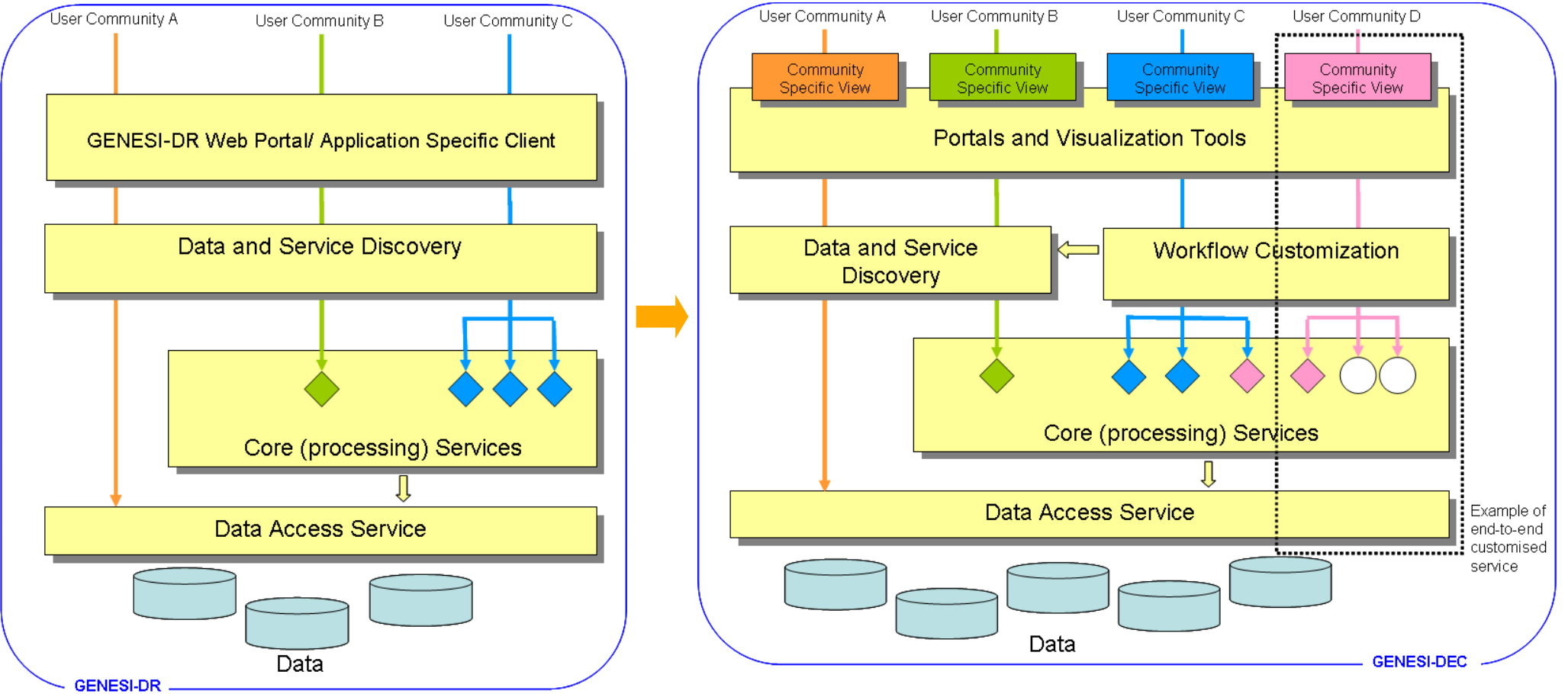
Communities and Virtual Research Facilities:

- **GENESI-DR:**
  - provides a limited set of services, community specific and with hard-coded workflow;
  - accessible through the GENESI-DR Web Portal or other application-specific clients
- **GENESI-DEC**
  - Will **engage** a wider user **community**
  - Will be accessible through **several portals** representative of the different communities
  - will provide a **larger set of services**;
  - will build user **customised** services on the base of their specific needs (also use of semantic composition);
  - Will provide **dedicated visualization tools** for the different communities.



All this will enable community building and will allow **multidisciplinary collaboration**.

Value added of GENESI-DEC over GENESI-DR

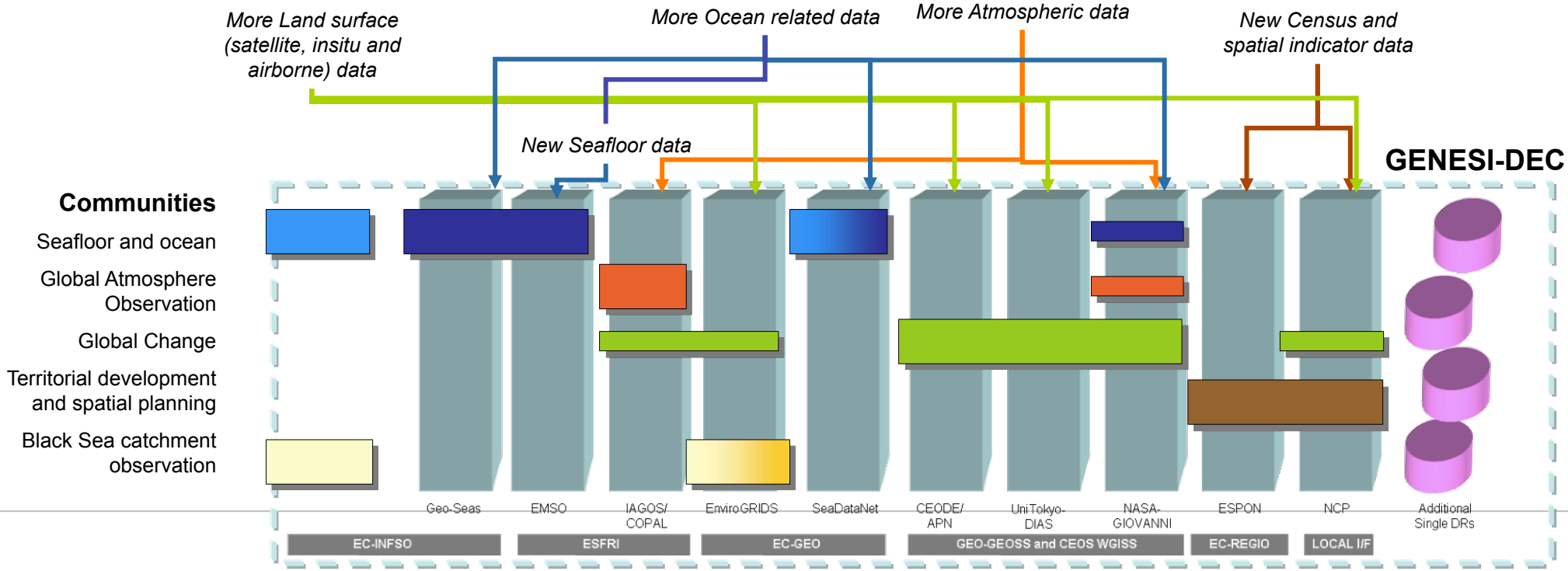


Generic (community-independent) service

Community-specific service

Adding data and addressing new communities

- GENESI-DEC:
  - Providers come from Europe, US, China, Japan (agreements already reached)
  - Not only "GENESI-fication" of single DRs but (complex) *interoperation with data infrastructures* (included ESFRI projects)
  - More (and new) *data (greater focus on non-satellite data)*
  - *More communities* (offered with data and a large set of *customizable services*)



Global Earth Observation System of Systems (GEOSS)

GENESI-DR/DEC :

- has an Active role in Task 09-02: alliance with NASA GES DISC and university of Tokyo
- Contribute to standardisation (OpenSearch with geospatial extension)
- Has been integrated and evaluated in the development area of the GEOPORTAL

GEOSS Interoperability for Weather, Ocean and Water

A proposal (currently in negotiations phase) to EC-FP7

Work programme topics addressed: ENV.2011.4.1.3-1 Inter-operable integration of shared Earth Observations in the Global Context

Type of funding scheme: Collaborative Project (Large-scale integrating project)
Requested funding: Up to 7 MEur

Partners: *ESA*, EC-JRC, CNR, Terradue, ECMWF, BfG, IOC-UNESCO, Bonn University, 52° North, KISTERS, metoffice, Meteo-France, KIT, INPE, Tokyo University

Scope

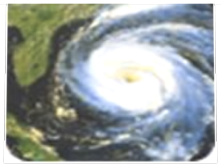
- **Further enable global access to EO data and resources through the GEOSS Common Infrastructure** (GCI) for GEOSS Earth Science users.
- Develop new tools, processes, procedures and protocols **to remove obstacles to the sharing of EO data at global level** and address data & product providers identified concerns.
- Develop operational capabilities of the GCI through applications in **three SBAs**:
  - **a. Weather**, with a focus on hazard and extreme meteorological events.
  - **b. Water**, with a focus on hydrological applications and run-off process.
  - **c. Ecosystem,** with a focus on GOOS and access to Ocean data via the GCI.

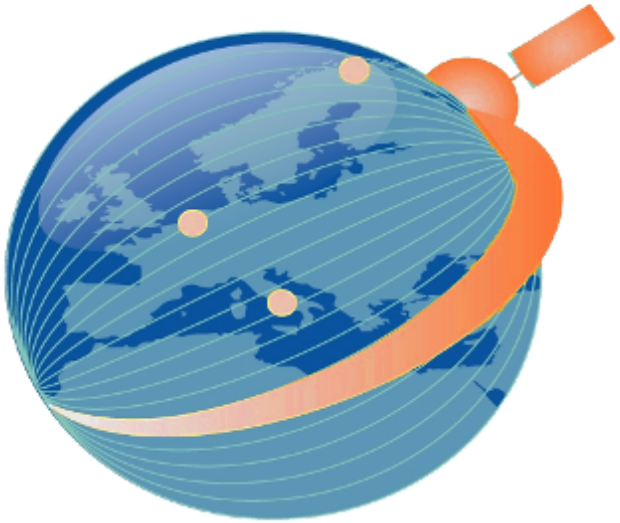
  Others will and can be considered as appropriate.
- Research includes **developing and testing adequate mechanisms to encourage reuse and re-dissemination of EO data** and products.

Advanced GCI evaluation and exploitation

Improvement of GEOSS Data CORE, new mechanisms for data discovery / access, Multi-disciplinary Mediation

Water SBA	Ocean SBA	Weather SBA	Other
requirements & developments	requirements & developments	requirements & developments	requirements





GENESI-DEC

Thank You!

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