

**THE MULTI-SENSOR EVOLUTION ANALYSIS (MEA) SYSTEM
AS A CLIMATE DATA EXPLOITATION PLATFORM**

Simone Mantovani
Managing Director
mantovani@meeo.it



Summary

- Overview of particularly successful services
- The users' needs
- The solution
- Lessons learnt



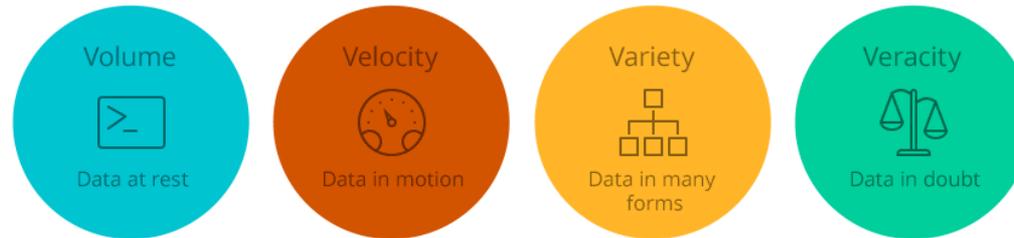
Current services

- [MEA platform](#), EO products exploitation in Atmosphere/Land&Ocean domains
- [Climate Data Service](#), to support Climate/Atmosphere communities
- [InSAR Italy](#), open data portal to disseminate maps of the ground deformation
- [EOCHA Data portal](#), to support Climate-Health experts in Africa
- Climate KIC projects
 - URBMOBI to support air quality monitoring over urban areas
 - WAT-ENER_CAST climate data platform, integration and visualization
- UNODC installation, to support illicit crop detection





The Big Data era is running



Is the data exploitation (availability, collection and preparation) effective?

Each product has its own:

- data distribution format
- distribution platform (one producer per product)

Some of the users

- use only one dataset per time
- use multi-temporal datasets

Datasets to be managed are huge (GB→TB→PB→EB→ZB→YB)

Discovery, data access and data access processing services are crucial



Access and access processing services



The Open Geospatial Consortium [Web Coverage Service](#) Interface Standard (WCS) **defines Web-based retrieval of coverages** – that is, digital geospatial information representing space/time-varying phenomena. [...]

- WCS Core functionalities
 - **GetCapabilities**: returns an XML with summary description of data collections
 - **DescribeCoverage**: lists more information about specific coverage offerings
 - **GetCoverage**: allows for the retrieval of coverages in a specified output format to the client



[WCPS](#) is a protocol-independent language for the **extraction, processing, and analysis of multi-dimensional gridded coverages** representing sensor, image, or statistics data. Services implementing this language provide access to original or derived sets of geospatial coverage information, in forms that are useful for client-side rendering, input into scientific models, and other client applications.



Access and access processing services

```

http://<endpoint>/wcs2?
service=WCS&Request=GetCoverage
&version=2.0.0
&CoverageID=<ID>
&SubsetX=x(x1, x2)
&SubsetY=y(y1, x2)
&SubsetT=t(t1, t2)
&format=image/png
  
```

WCS

```

for c in (MOD_OPTDEPLOMEAN_4326_1)
return
encode ( {
  red: (char)( c > 0.1 ) * 255 + (char)( c >=
0.07 and c <= 0.1 ) * 255 ;
  green: (char)( c < 0.07 and c > 0 ) * 255
+ (char)( c >= 0.07 and c <= 0.1 ) * 255 ;
  blue: (char)( c * 0 )
}
[t(150248)]
,"png")
  
```

WCPS

[1] Campalani et al., [Temporal analysis of atmospheric data using open standards](#). In 4th Symposium on Geospatial Databases and Location Based Services. ISPRS Ann. Photogramm. Remote Sens. Spatial Inf. Sci., II-4, 21-27, doi:10.5194/isprsannals-II-4-21-2014, 2014.



Access and access processing services

These services offer suitable standard interfaces for “educated” users

... but are they user-friendly and flexible as the most diffused geospatial analysis tools are?



Make users' life easier: the web portal

mea multi-sensor evolution analysis EarthServer Welcome Guest

Aerosol Species: desert dust (red), biomass burning (green), sea salt (blue), sulphates (white).

What is MEA?

The Multi-sensor Evolution Analysis (MEA) is an Earth Observation and geospatial data analysis tool empowered with OGC standard interfaces

- MEA CONCEPT
- DATA AVAILABILITY
- TOOLS
- MEDIA CONTENT

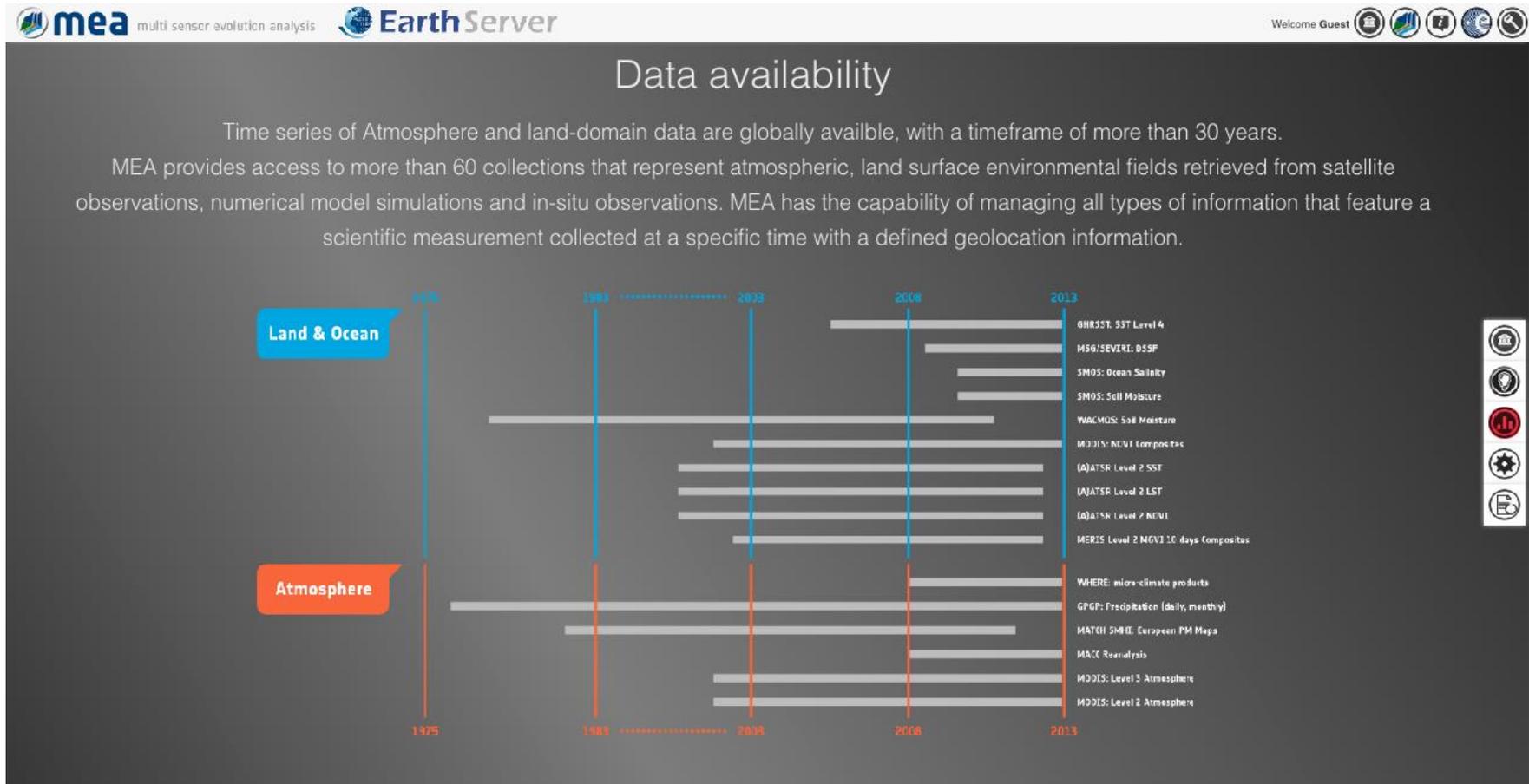


Make users' life easier: the **one-stop-shop**

- **+130TB of heterogeneous datasets**
 - EO products (from Level 1 to Level 4)
 - Forecast / re-analysis products (ECMWF, SHMI, ENEA, ZAMG, NMA, ...)
 - Others (GPCP, CHIRPS, ...)
- **Near Real Time services running to keep up-to-date the data availability**
- **Distributed across several Data Storage servers in different infrastructures: ESA, MEEO, cloud environments**

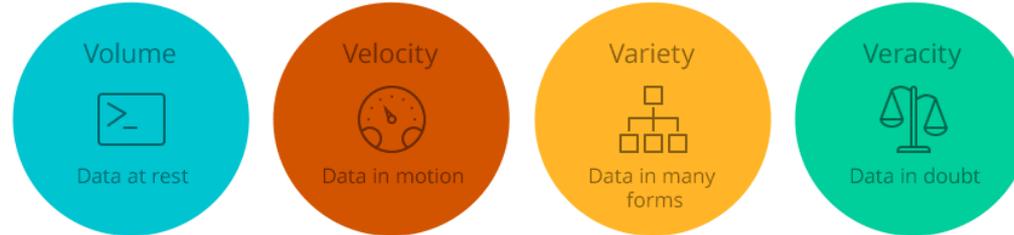


Make users' life easier: the one-stop-shop





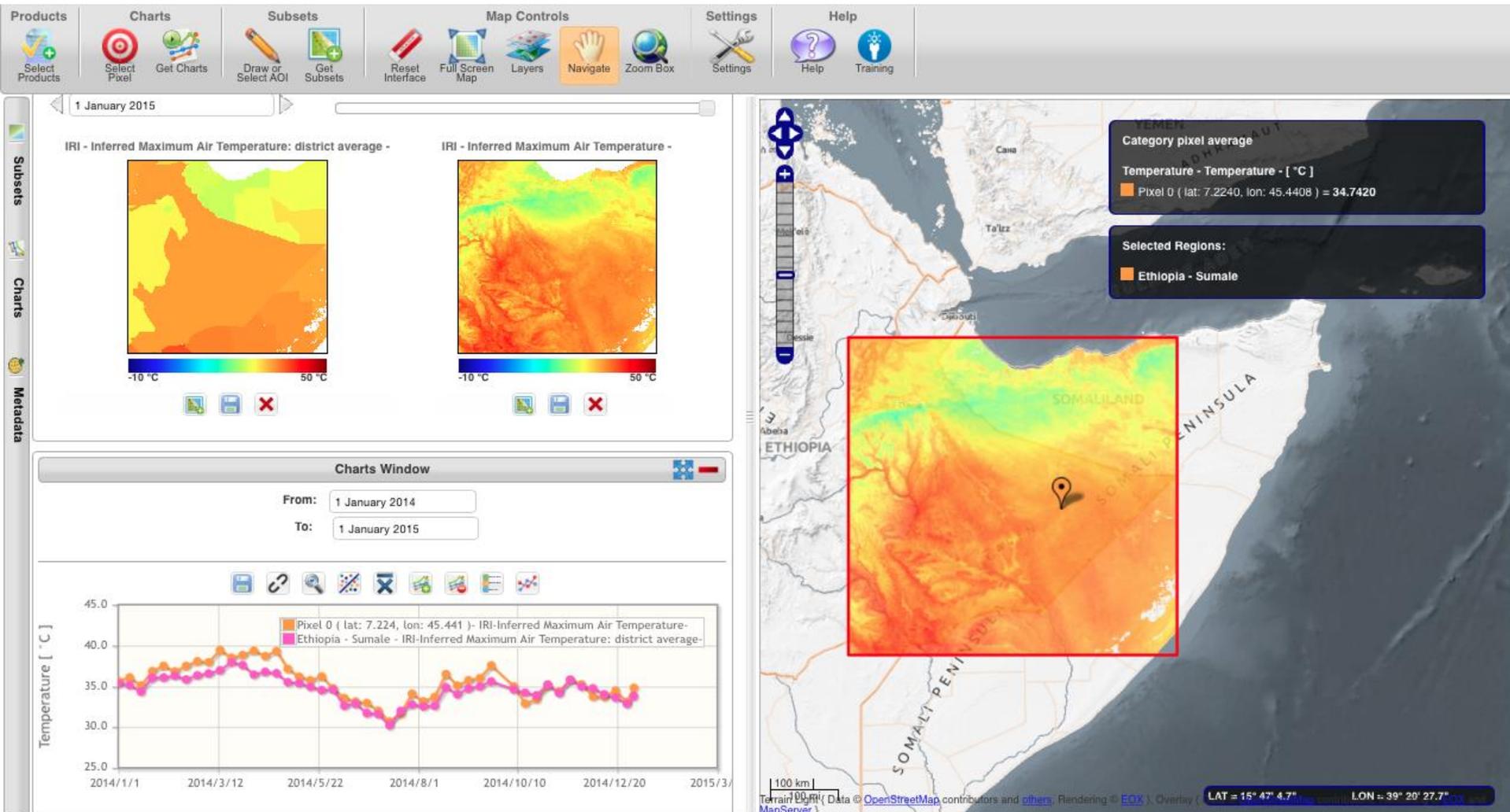
Make users' life easier: **customized services**



- Access processing
 - Download (full / subset)
 - Re-projection in the target / common grid
 - Format conversion
- On-the-fly Data Analytics
 - Real time data access and visualization
 - Heterogeneous data comparison
 - On-the-fly data analysis (e.g. extraction of statistical parameters)



Make users' life easier: customized services





Administrator and staff users

Should the portal offer also suitable tools to support the application administrators?



Make users' life easier: administrators' panels

mea multi sensor evolution analysis Welcome smantovani       

Users Groups **Products** Features Settings

precipitation

Category	Sensor	Product	Version	Resolution	Start Date	End Date
  <input type="checkbox"/>  Precipitation [mm]	CPCNOAA	CMORPH	eocha	0.25 degrees	16 November 2013	28 February 2015
  <input type="checkbox"/>  Precipitation [mm]	TAMSAT	RFE:DAY	eocha	0.0375 degrees	11 January 1983	28 February 2015
  <input type="checkbox"/>  Precipitation [mm]	TAMSAT	RFE:SEASONAL	eocha	0.0375 degrees	01 May 1983	01 February 2015
  <input type="checkbox"/>  Precipitation [mm]	TAMSAT	RFE:MONTHLY	eocha	0.0375 degrees	01 February 1983	01 February 2015
  <input type="checkbox"/>  Precipitation [mm]	TAMSAT	RFE:DECADE	eocha	0.0375 degrees	11 January 1983	21 February 2015
  <input type="checkbox"/>  Precipitation [mm]	CPCNOAA	AFRICARFE	eocha	0.1 degrees	01 January 2001	28 February 2015
  <input type="checkbox"/>  Precipitation [mm]	CPCNOAA	GCMORPH	eocha	0.25 degrees	16 November 2013	28 February 2015
  <input type="checkbox"/>  Precipitation [mm]	CPCNOAA	CMORPHWEEKLY	eocha	0.25 degrees	16 November 2013	28 February 2015
  <input type="checkbox"/>  Precipitation [mm]	CPCNOAA	CMORPH25	eocha	0.25 degrees	05 November 2013	28 February 2015
  <input type="checkbox"/>  Precipitation [mm]	CPCNOAA	GLBDLYPREC	eocha	0.5 degrees	01 April 2012	27 February 2015
  <input type="checkbox"/>  Precipitation [mm]	CPCNOAA	AFRICAARC	eocha	0.1 degrees	01 January 1983	28 February 2015



Make users' life easier: administrators' panels

mea multi sensor evolution analysis

Welcome **smantovani**

Products

Edit Product

Sensor: GPCP
 Product: PRECIP
 Version: eocho
 Collection Name: GPCP_PRECIP_
 Description *: Global Precipitation Climatology Project (GPCP)
 Metadata Link:
 Min Value >=: 0
 Max Value <=: 255
 Null Value ==: -999
 Start Date: 1 October 1996
 End Date *: 31 October 2014
 Temporal Resolution: Irregular (format=image | 1
 Priority: 1
 Colortable: rainbow_white.py - rainbow + white
 Product Type: Precipitation - Float32 [mm]
 Projection and Resolution: Equirectangular (EPSG: 4326) - 1 degrees
 Host: meeo-dar-05:80 (v9.0)

(*) Optional parameter

Start Date	End Date
16 November 2013	28 February 2015
11 January 1983	28 February 2015
01 May 1983	01 February 2015
01 February 1983	01 February 2015
11 January 1983	21 February 2015
01 January 2001	28 February 2015
16 November 2013	28 February 2015
16 November 2013	28 February 2015
05 November 2013	28 February 2015
01 April 2012	27 February 2015
01 January 1983	28 February 2015



Make users' life easier: administrators' panels

Edit Group Rights for GPCP - PRECIP

Filter Groups

Group	Read
Everyone	<input checked="" type="checkbox"/>
Registered	<input type="checkbox"/>

Showing 1 to 2 of 2 entries

Available Groups:

Filter Available Groups:

- COSMO-SkyMed
- EarthServer Group
- ENEA Group
- INGV Group

product ownership: damiano

Filter Potential Owners:

- administrator - administrator@nomail.com
- aryavarta - pd.aryavarta@gmail.com
- ascremin - scremin@sistema.at
- bankoge - qebhard.banko@umweltbundesamt.at

Save Cancel

Date	End Date
ember	28 February 2015
uary 1983	28 February 2015
y 1983	01 February 2015
bruary 1983	01 February 2015
uary 1983	21 February 2015
uary 2001	28 February 2015
ember	28 February 2015
ember	28 February 2015
ember	28 February 2015
Precipitation [mm]	CPCNOAA GLOBLYPREC eocha 0.5 degrees 01 April 2012 27 February 2015
Precipitation [mm]	CPCNOAA AFRICAARC eocha 0.1 degrees 01 January 1983 28 February 2015



Make users' life easier: the MEA System

MEA is composed by **three main modules** based on **open-source** technologies



GUI (Graphic User Interface)

The Graphic User Interface (GUI) provides the Data Analytics tools to:

- access / explore / subset the data and metadata
- download the data and metadata

WxS



DS (data storage module)

It is composed by

- file system structure that hosts the data
- postgresql / array database that hosts the data

FTP / WCS-T



LDR (data loader module)

It includes a set of tools and scripts to load geospatial data in to the Data Storage



Make users' life easier: the MEA System

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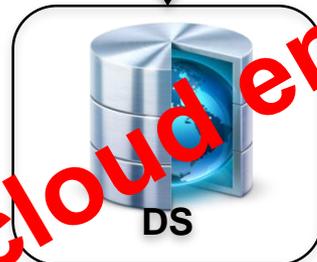


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Lessons learnt (1/2)

- Users' requirements are the lymph for the service(s) design
- Cross-disciplinary is the key point for a successful implementation of services and applications
 - Infrastructure / environment set-up
 - Implementation of robust performing tools
 - Service(s) deployment
 - Service(s) operation



Lessons learnt (2/2)

- The service becomes a success story when the users start promoting its usage within their communities.
- Have a look at the video “Climate-health experts at work” (~20’ long) to know more about the EOCHA Data Portal



“...so I totally endorse this system and I think that **once people** in the medical community those you do research as well in to the effect of the climate and climate change on disease **are aware of this system that it will become a one stop shop for those people who need that data for their existing models and to develop new models in the future.**”



Via Saragat, 9

I-44122 Ferrara, Italy

Tel.: +39 0532 1861501

Fax: +39 0532 1861637

info@meeo.it

<http://www.meeo.it>



Währingerstraße 61

A-1090 Wien, Austria

Tel.: +43 (0)1 2367289 7403

Fax: +43 (0)1 2533033 7427

info@sistema.at

<http://www.sistema.at>