Future prospects for satellite environmental information in support of Development Aid

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The European Commission's science and knowledge service

Joint Research Centre

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European Commission

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- DEVCO contribution to EO
- JRC/EUMETSAT/ESA support
- Thematics + data of interest
- How to access and process the data?

Key contribution of DEVCO to EO information

…continuity and complementarity…

…from project to programme…

GMES AND AFRICA

Intra ACP CS

11M€ 21M€ 37M€ (2001-2016)

(2017-2020) 28M€

(2019-2024) 85M€

African Union-HRST

African Space Policy and Strategy

Pan-African

11+**2** Regional Consortia

Environmental monitoring services
- Water
- Natural Resources
- Marine

African Union-DREA

African Integrated Strategy on Meteorology

African, Caribbean and Pacific

5+**2** Regional WMO certified centers

Climate services
- Water
- Agriculture and food security,
- Disaster risk reduction
- Health
- Energy

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…supported by EO organisations in Europe…

→JRC

→EUMETSAT

→ESA

JRC contribution to GMES & Africa

AA with DEVCO for 3 main activities

Institutional and scientific support to the project

- Participate to the Steering+Technical committees

Adaptation and maintenance of eStation 2.0

- JRC ensures **continued functioning of the eStations software**
- JRC integrates the processing of **Sentinel3 data**.
- JRC facilitates the access from the Stations to **EO data generated on different platforms**, including **cloud-computing** solutions, through the **EUMETCast** channel or the **internet** or **local disk**.
- JRC implements **new processing chains, ad-hoc functionalities** for facilitating the **data analysis**, **data export** of the generated products towards other analysis tools (ecosystem approach).

Capacity building

- On the Job Training of the 13 consortia teams in JRC, Italie
- 12 IT training in Africa
- 10 Thematic sessions in Africa

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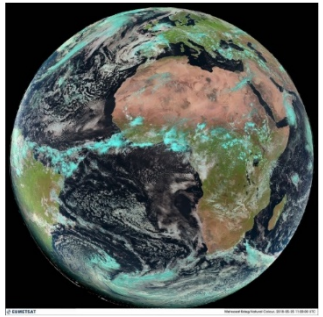
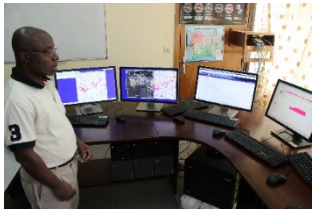
EUMETSAT contribution to GMES&Africa

- Funded by EUMETSAT, part of our operational activities
- Formalized through a MoU and Implementing arrangements with African Union Commission

- Contribution areas:
  - Access to data:
    - Provision of satellite data (EUM, COP, 3rd party)
    - Different access mechanism: EUMETCast-Africa (not internet), web-based access (CODA), soon cloud-computing (Wekeo)
    - Support to procurement of user equipments (reception station, terminal) – cooperation with JRC e-station
  - Education and training: training modules, support for training plan, training of experts, support to courses
  - Support to marine and land services: share of expertise/experiences in use of sat data in the G&A applications





ESA Contribution to GMES & Africa

- African & European Research & Development partnership for GMES & Africa
  - Start of **EO4Africa** initiative: **EO A**frican **F**ramework for **R**esearch, **I**nnovation, **C**ommunities and **A**pplications
- Technical expertise to support African users to access Copernicus data
  - Implementation of the **Copernicus Data Access** Cooperation Agreement
- **Cloud computing** approach as innovative solution for EO exploitation
  - Bringing the algorithms to the data (e.g. DIAS)
  - Thematic Exploitation Platforms (TEPs) for cloud cooperation
- **Capacity development** – African MOOC, webinars, training courses
- **Partnership** with GMES & Africa
  - Exchange of letters with AUC, DG-Devco and DG-Grow
  - ESA participation to GMES & Africa Policy Coordination Advisory Committee

The main targeted applications

GMES & Africa applications

Intra-ACP CS Themas

	Agric Food Security	Disaster RR	Water Management	Health	Energy Infrastructure
Water Balance Monitoring			**X**		
Water Level for Fluvial Navigability and Hydrology Cycle Monitoring and Assessment			**X**		
Riverine Floods Monitoring and Assessment		**X**			
Major African Lakes Biophysical Parameters Monitoring			X		
Wetlands Monitoring and Assessment			X		
Consolidation of Knowledge on Large Trans-boundary Aquifers			X		
Water Abstraction Surveillance, Monitoring and Assessment in Irrigated Areas	**X**		**X**		
Open Geographical Regional Reference Vector Database (~1:1M scale) and agro-ecological zonings					
Land Degradation Monitoring and Assessment		X			
Natural Habitats Monitoring and Assessment					
Tropical Forest Surveillance, Monitoring and Assessment					**X**
Surveillance, Monitoring and Assessment of Environmental Impacts of Mining activities					**X**
Agriculture Seasonal Monitoring, Early Warning and Assessment	**X**				
Pasture Seasonal Monitoring, Early Warning and Assessment	**X**				
Wildfires Seasonal Monitoring, Early Warning and Assessment		**X**			
Monitoring and forecasting of physical and biological oceanography variables				X	
Fishing Zones Monitoring and Protection	**X**				
Aquaculture Site Monitoring and Protection	**X**				
Coastal Vulnerability		X			
Coastal Ecosystems Mapping, Monitoring and Assessment					
Ship Traffic Monitoring		X			
Oil Spills Monitoring and Warning		**X**			
3 days Marine Weather Forecast		X			

The main source of EO information

Current sources @continent

	Res.	TS	15'	30'	1h	3h	6h	1d	3d	5d	8d	Dek	Mth	Season
RAINFALL														
FEWSNET RFE	8km	###						X				X	X	X
TAMSAT RFE	5km	###										X	X	X
CHIRPS2.0 RFE	8km	###								X		X	X	X
ARCv2 _ NOAA NCEP	10km	###						X				X	X	X
MSG MPE	3km	###	X	X	X	X		X						
CAM-OPI from NOAA NCEP	2.5°	###												
TEMPERATURE														
CAM_OPI TEMPERATURE ESTIMAT	2.5°	###											X	X
Landsaf LST - MSG	5km	###		X				X				X	X	
Landsaf LST - METOP	1km	###		X				X				X	X	
VEGETATION														
SPOT VGT + PROBA V	1km	###						X				X	X	X
METOP AVHRR	1km	###										X	X	X
MSG	5km	###						X				X	X	X
MODIS	250m	###										X	X	X
FIRE														
MSG ABBA (CSIR)		###	X				X	X				X	X	X
MODIS	500m	###												
BURNT AREA														
MODIS	1km	###						X					X	X
Landsat BA	30m	###												
EVAPOTRANSPIRATION														
MSG - LSASAF	5km	###											X	X
ECMWF	25km	###											X	X
WATER BALANCE														
FEWSNET WRSI	1km	###											X	
METOP ASCAT (COPERNICUS)	25km	###											X	
WATER BODY														
LANDSAT WATER BODY	30m	###									X			
MARINE														
MODIS SST	4km	###						X					X	
PML SST	1km	###							X					
UCT SST	1km	###						X						
MODIS CHLA	4km	###						X					X	
PML CHLA	1km	###							X					
UCT CHLA	1km	###						X						
MODIS KD490	4km	###						X					X	
PML KD490	1km	###							X					
UCT KD490	1km	###						X						
MODIS PP (new)	4km	###						X					X	
MODIS PAR	4km	###						X					X	
AVISO WAVE HEIGHT	1°													
AVISO WIND SPEED	1°													
AVISO SEA SURFACE HEIGHT	1°													
AVISO WAVE HEIGHT	1°													
IFREMER WIND FIELD	1/12°							X						
MYOCEAN SURFACE CURRENTS	1/12°							X						

New sources @national/regional

→High resolution

SEN2/Landsat…

- At large extent (national to regional)
- Crop mask, forest map, PA monitoring, Coastal zone mapping

SEN1

- Wetland monitoring
- Oil spill

→Low resolution

SEN3

- for marine Chl A/SST

Copernicus The European Earth Observation Programme

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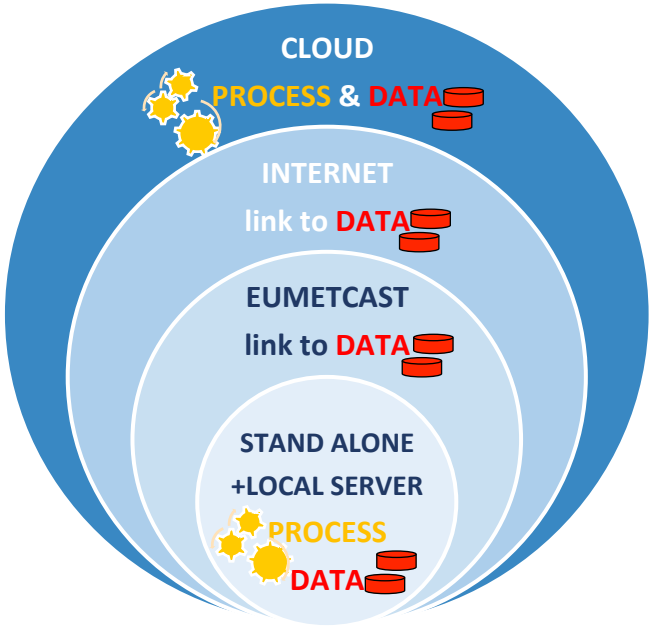
How to access and process the data?



Need an ecosystem approach adapted to the users

→ with different access to the data:
stand alone/eumetcast/internet/cloud

→ with different volume of data to process
- Stand alone
  low resolution + high frequency
  high resolution+low frequency
- Cloud
  high resolution+high frequency

How to process the Low Resolution data?

→ Example in GMES & Africa: the **eStation** ecosystem

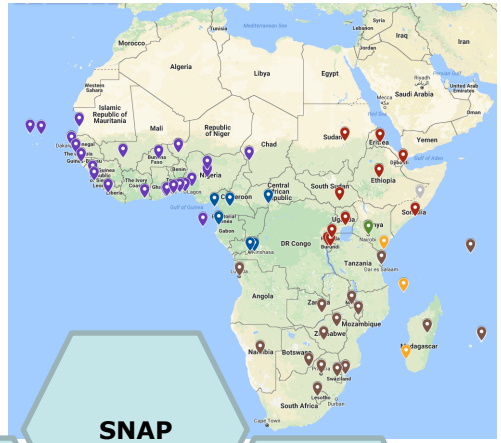
Different data connection (stand alone, eumetcast, internet)

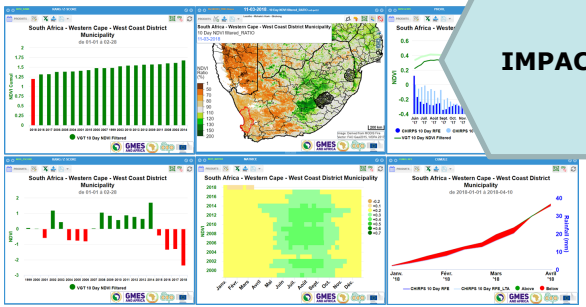
Different platform (linux, windows)

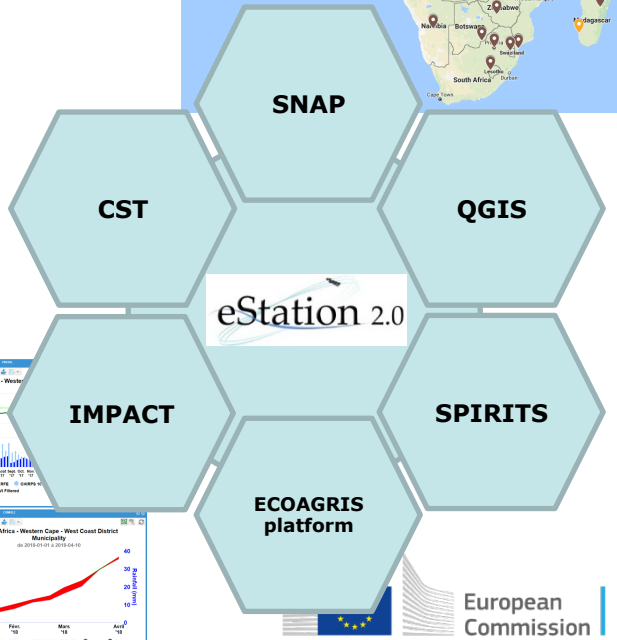
Different module from reception/processing/analysis

Different plugin and compatible data format

- SNAP for SEN3 composite
- CST for yield estimate
- QGIS land degradation plugin
- SARAH (Agrometeo model)
- SPIRITS for crop monitoring
- ECOAGRIS platform
- IMPACT







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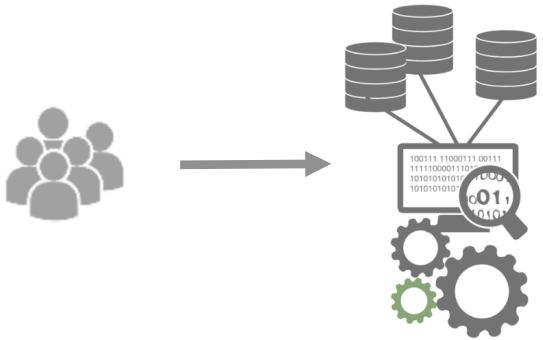
How to exploit the High Resolution data?

1. Make available cloud computing platforms to the intermediate/final User (e.g. DIAS, TEPs, JEO-DPP, GEE…)

?IT knowledge ?reliable cloud ?internet connection



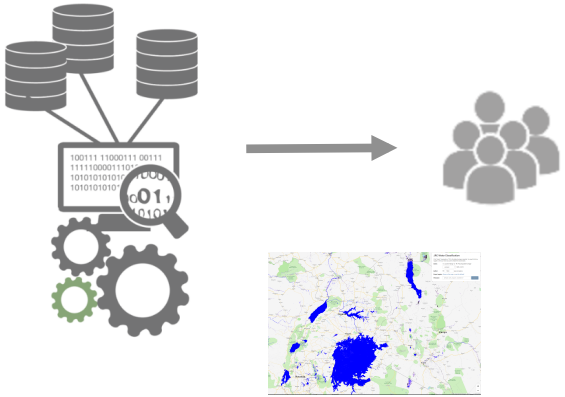
2. Download images for limited areas and exploitation of dedicated ‘ad-hoc’ tools (SNAP, IMPACT, …)

? Local storage ?Local processing capacity ? internet connection

How to exploit the High Resolution data?

3. Process the products in the cloud and distribute it through various channels (ex: GEE + Landsat Water detection + eStation EUMETCAST, Internet)

?ownership ?master the process?reliable cloud ? connection



None of the above approaches seems optimal/mature enough for the needs of GMES&Africa consortia in the design of their monitoring services ..

Thank you

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JRC's Mission

Vision

"To play a central role in creating, managing and making sense of the collective scientific knowledge for better EU policy."

Mission

"As the science and knowledge service of the Commission our mission is to support EU policies with independent evidence throughout the whole policy cycle."

JRC sites

Headquarters in Brussels and research facilities located in **5 Member States:**

- Belgium (Geel)
- Germany (Karlsruhe)
- Italy (Ispra)
- The Netherlands (Petten)
- Spain (Seville)

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JRC Role: facts & figures

€ 386 million Budget annually,
plus **€ 62** million earned income

6 locations in 5 Member States: Italy, Belgium, Germany, The Netherlands, Spain

Independent of private,
commercial or national interests

Policy neutral:
has no policy agenda of its own

42 large scale research facilities,
more than **110** online databases

30% of activities in policy preparation,
70% in implementation

125 instances of support
to the EU policy-maker annually

More than **100** economic,
bio-physical and nuclear models

1500 core research staff, out
of around 3 000 total staff

83% of core research staff
with PhD's

Over 1,400
scientific publications per year

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The JRC in GMES & Africa