



Global Land Component

Land Monitoring

Dr. Astrid – Christina Koch
Copernicus
European Commission

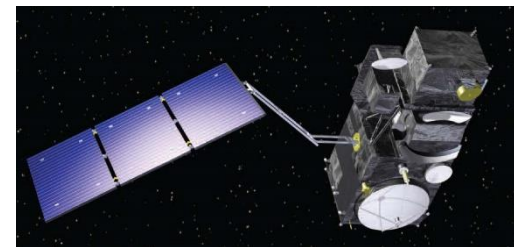


Land
Monitoring

Global Land Component

Global Land Objectives :

1. Production of Biophysical Variables
2. Hot-Spot Monitoring (land cover change)
3. Sentinel-2 Global Mosaics





Land
Monitoring

Building on European expertise

50+ industry partners
250+ experts





Land
Monitoring

BIOPHYSICAL PRODUCTS



19 products available at **1km** every ten days with world coverage

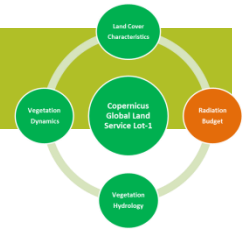
8 products available at **300m** every ten days with world coverage

1 product (Land cover) at **100m** (currently Africa)

- ✓ Validated
- ✓ Documented
- ✓ External review
- ✓ Free
- ✓ Continuity ensured

Theme	Variable	Spatial Resolution	
		Moderate	100m
Vegetation	Land Cover	In production	
From coarse to medium resolution			
Theme	Variable	Spatial Resolution	
		Coarse >=1km	Medium 300m
Vegetation	Fraction of photosynthetically active radiation absorbed by the vegetation	In production	In production
	Fraction of green vegetation cover	In production	In production
	Leaf Area index	In production	In production
	Normalized Difference Vegetation Index	In production	In production
	Vegetation Condition Index	In production	
	Vegetation Productivity Index	In production	
	Dry Matter Productivity	In production	In production
	Burnt Area	In production	In production
	Soil Water Index	In production	
	Surface Soil Moisture	In development	
Energy	Land Surface Temperature	In production	
	Top Of Canopy Reflectance	In production	
	Surface Albedo	In production	
	Downward Short- and Longwave Fluxes at the surface	In development	
Water	Water Bodies	In production	In production
	Lake Surface Water Temperature	In production	
	Lake Water Quality	In production	
Cryosphere	Lake Ice Extent	In production	
	Snow Cover Extent	In production	
	Snow Water Equivalent	In production	
Non-gridded products			
Theme	Variable	Rivers and Lakes	
Water	Water Level	In production	

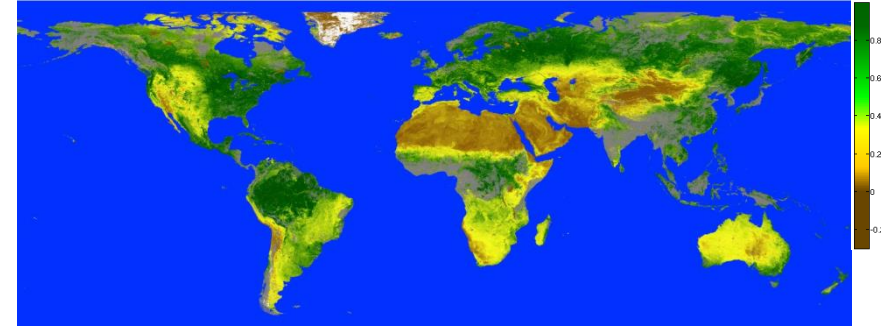
Vegetation Dynamic



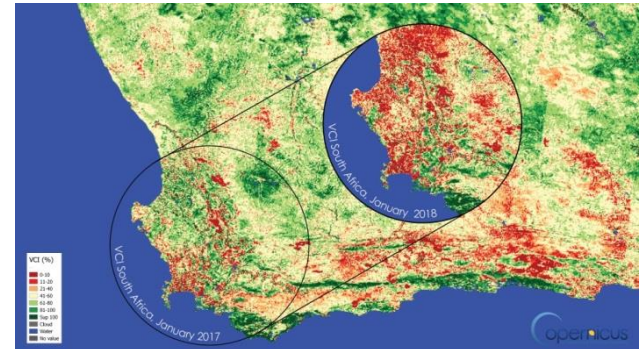
Product: NDVI , VCI/VPI

Status: Operational

- Description:
 - Normalized Difference Vegetation Index is an indicator of greenness of the biomes
 - Vegetation Condition Index and Vegetation Productivity Index assess the vegetation by referencing the current value to long-term statistics
- Product Specifications:
 - Sensor SPOT-VGT, PROBA-V, (Sentinel-3)
 - Collection 1km V2 1999-NRT
 - Method max_NDVI 10 days
 - Collection 300m V1 2014-NRT
 - Method max_NDVI 10 days
 - **In preparation: 1km V3, 300m V2**
 - **Method ANT (angular normalization) 10 days**
- Accuracy:
 - 0.05: not possible to assess



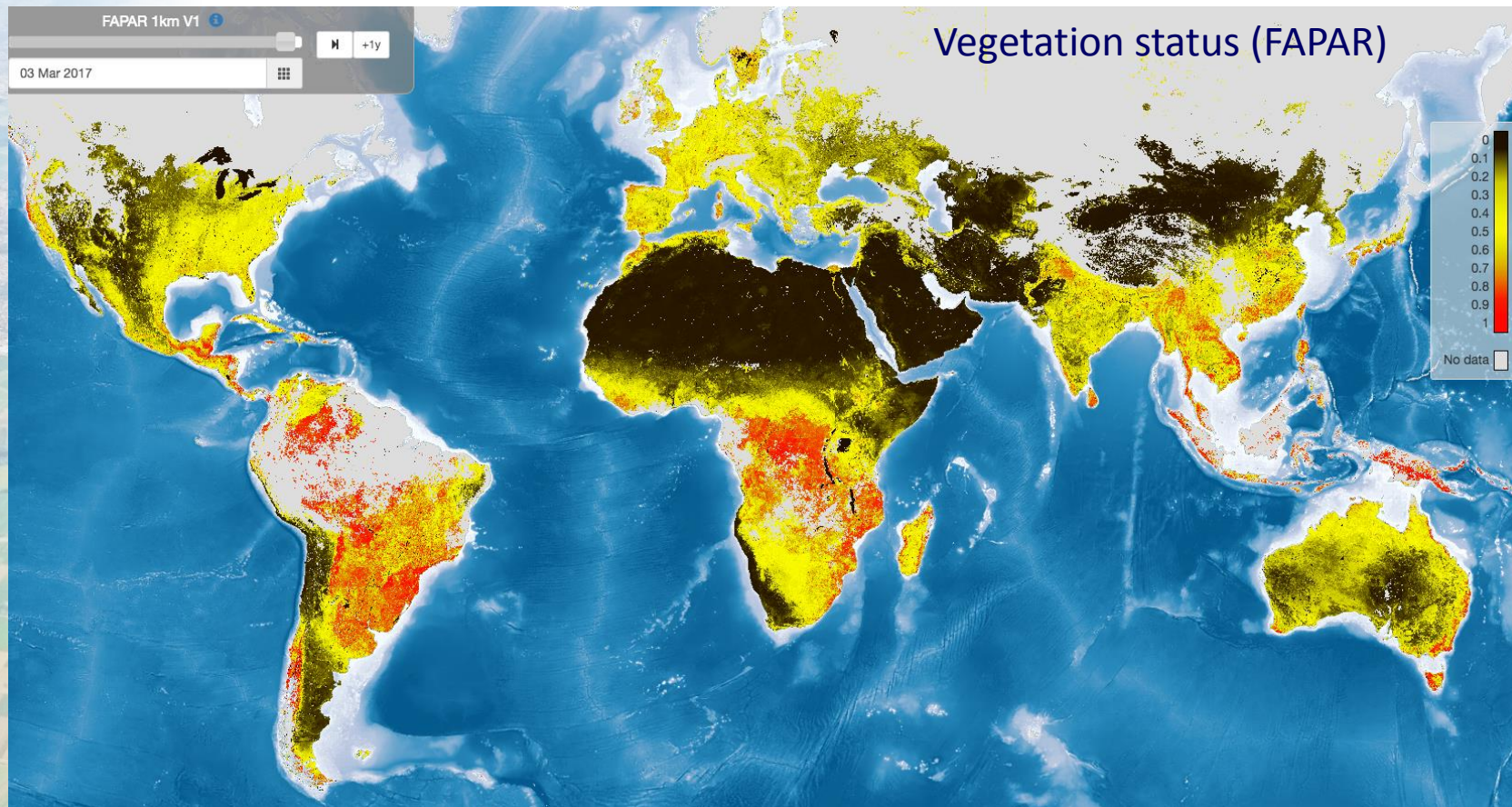
Example drought Kaapstad Jan 2018



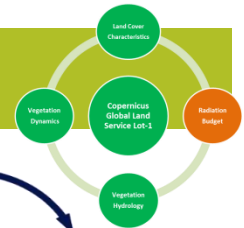


Land
Monitoring

BIOPHYSICAL PRODUCTS

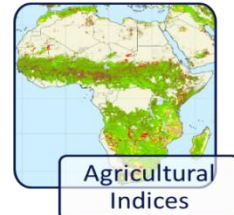
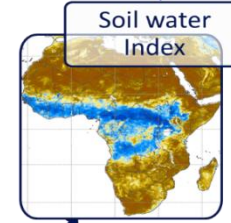
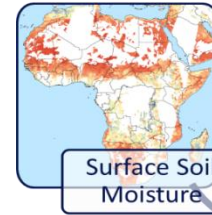
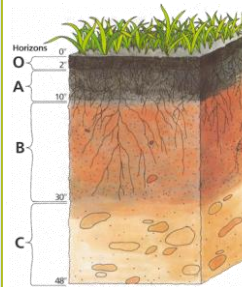


Vegetation Hydrology

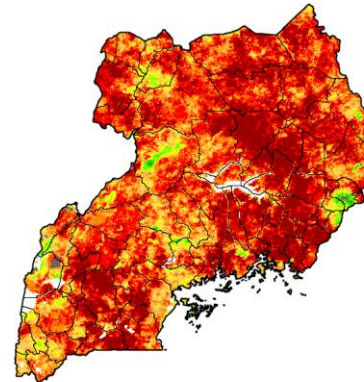


Product: Soil Water Index Status: Operational

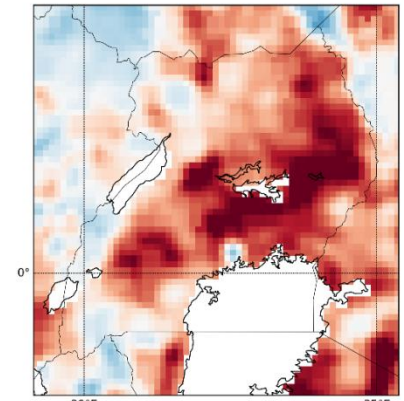
- Description:
 - Soil Water Index quantifies the moisture condition at various depths in the soil, driven by precipitation and via process of infiltration
- Product Specifications:
 - Sensor Metop-ASCAT, (Sentinel-1)
 - Collection 0.1° V3 (2007-NRT)
 - SWI: using two-layer balance model, provides surface state flag
 - SWI10: average over 10 days for each 8 depths
 - *In preparation:*
 - *Collection 1km daily SSM and SWI through merging with Sentinel-1*
- Accuracy:
 - $0.08 \text{ m}^3/\text{m}^3$
[GCOS $0.04 \text{ m}^3/\text{m}^3$]



Uganda



Vegetation Health Index (VHI)
January 2017
METOP-AVHRR
WGS84, Geographic Lat/Lon

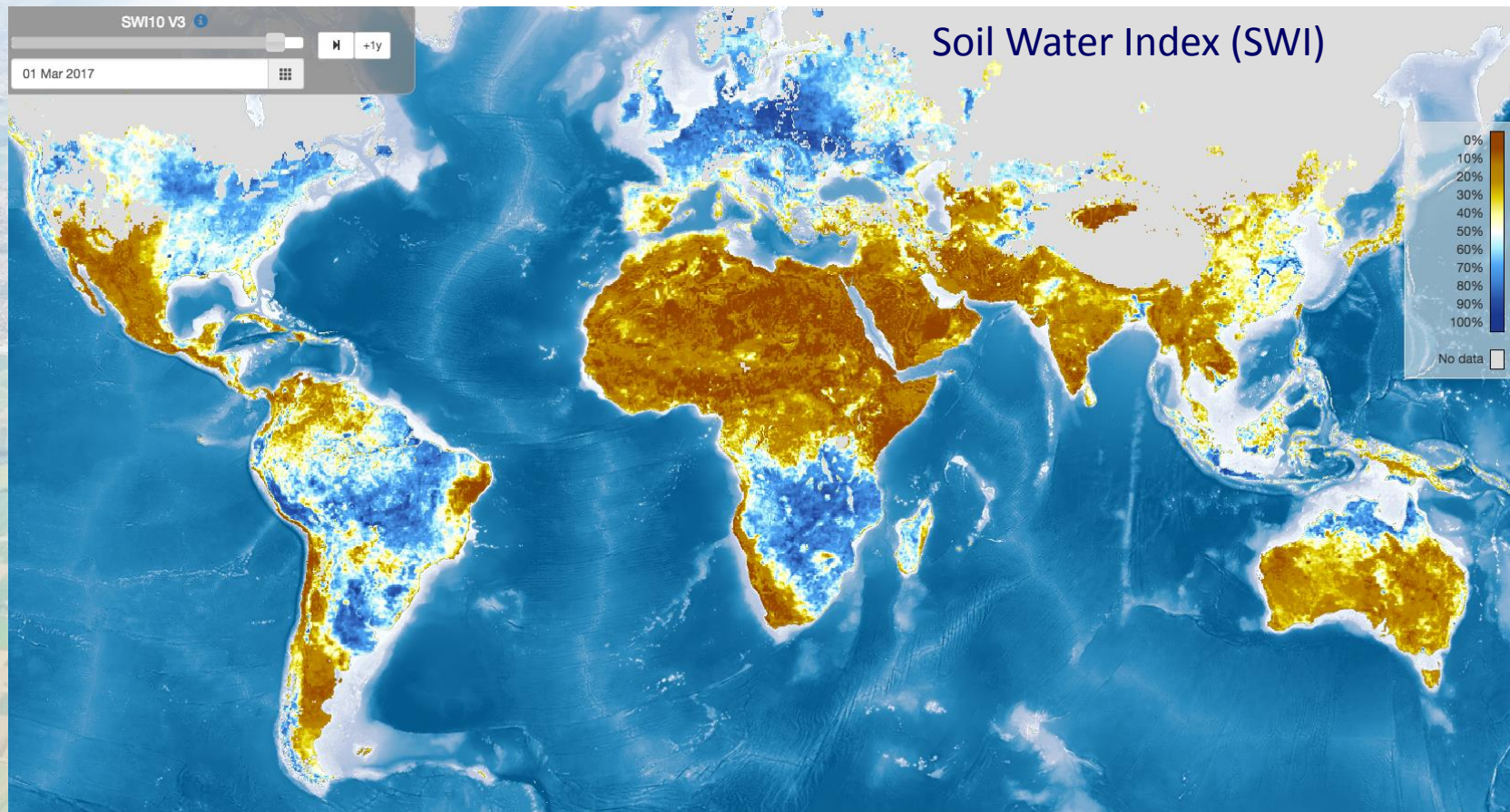


Uganda SWI10 T=5 Anomaly (%) December 2016 - mean(2007 to 2015)

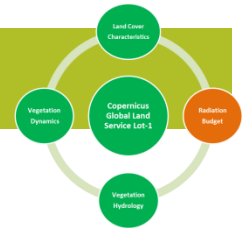


Land
Monitoring

BIOPHYSICAL PRODUCTS



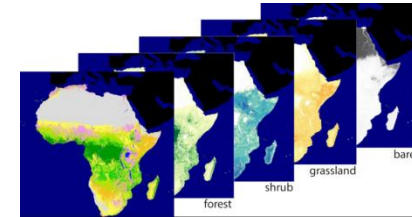
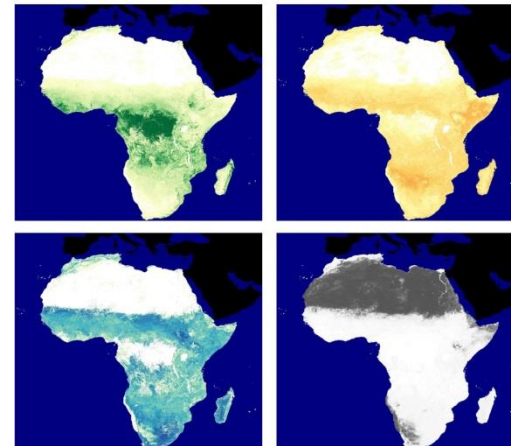
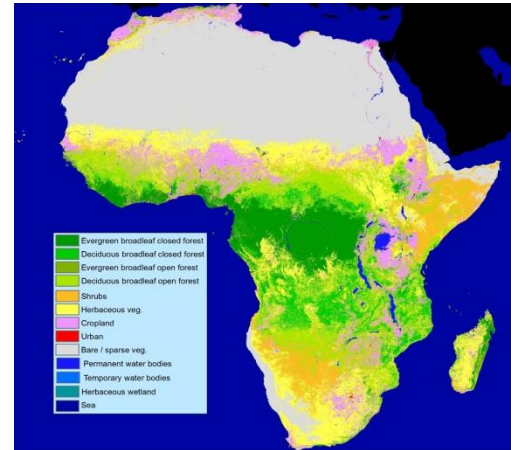
Land Cover Characteristics



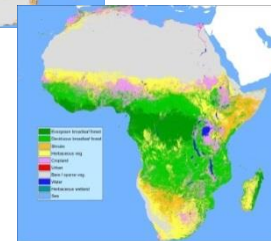
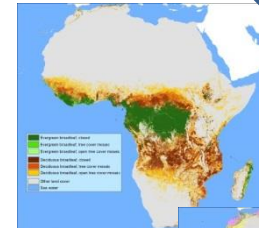
Product: Land Cover 100m

Status: Operational

- Description:
 - Map land cover types and their changes, with proportional estimates for continuous field layers
- Product Specifications:
 - Sensor PROBA-V, (Sentinel-2)
 - Collection 100m V1
 - Africa continent 2015, 18 discrete classes, 4 continuous layers
 - 11000 Training samples at 10m
 - Random Forest classifier, decision tree integrating external layers
 - *In preparation: Collection 100m V2*
 - *Global coverage -> 80K training samples*
 - *Improved accuracies, UTM zone projection*
 - *Changes over Africa (2015-2017)*
 - *Regional 20m maps*



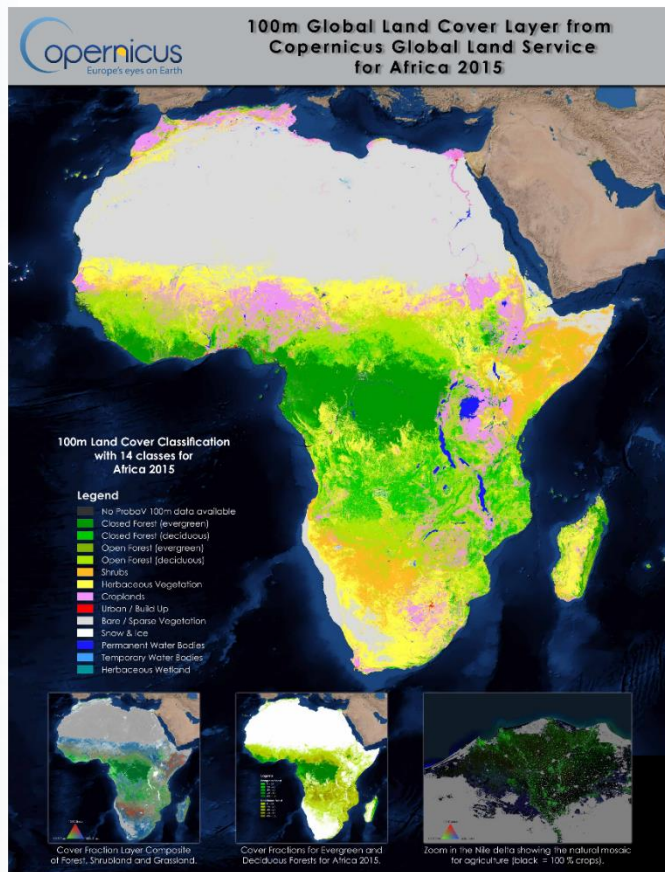
customize





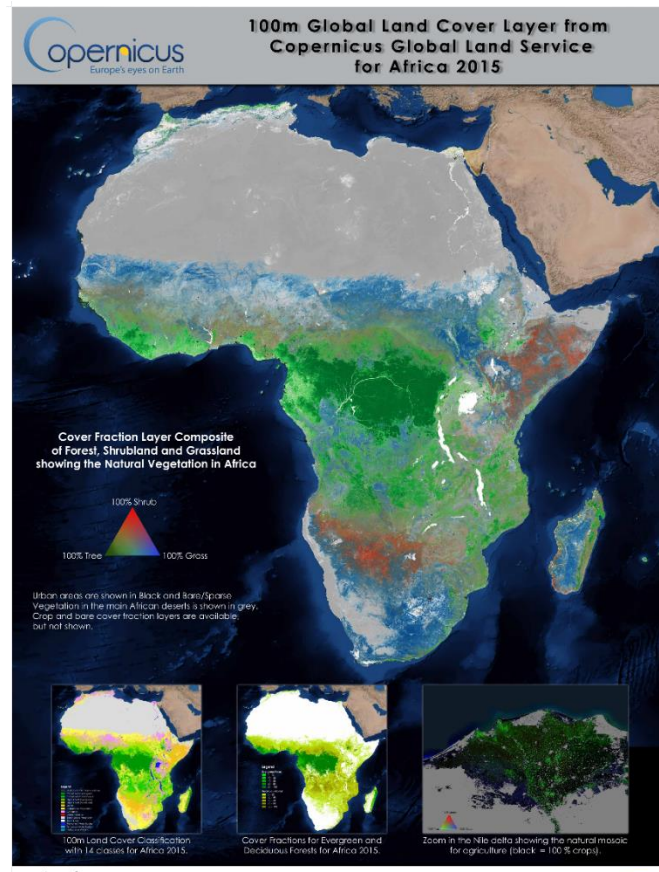
Land
Monitoring

BIOPHYSICAL PRODUCTS



This map was created by VITO Remote Sensing (Belgium), ESA (Austria) and Wageningen University (the Netherlands) under assignment of the European Commission DG Joint Research Center (Italy) and in co-operation with DLR (Germany). The data used is PROBA-V 100 m for the reference year 2015. The bathymetry is derived from the Blue Marble next generation.

© Copernicus Service Information 2017



This map was created by VITO Remote Sensing (Belgium), ESA (Austria) and Wageningen University (the Netherlands) under assignment of the European Commission DG Joint Research Center (Italy) and in co-operation with DLR (Germany). The data used is PROBA-V 100 m for the reference year 2015. The bathymetry is derived from the Blue Marble next generation.

© Copernicus Service Information 2017

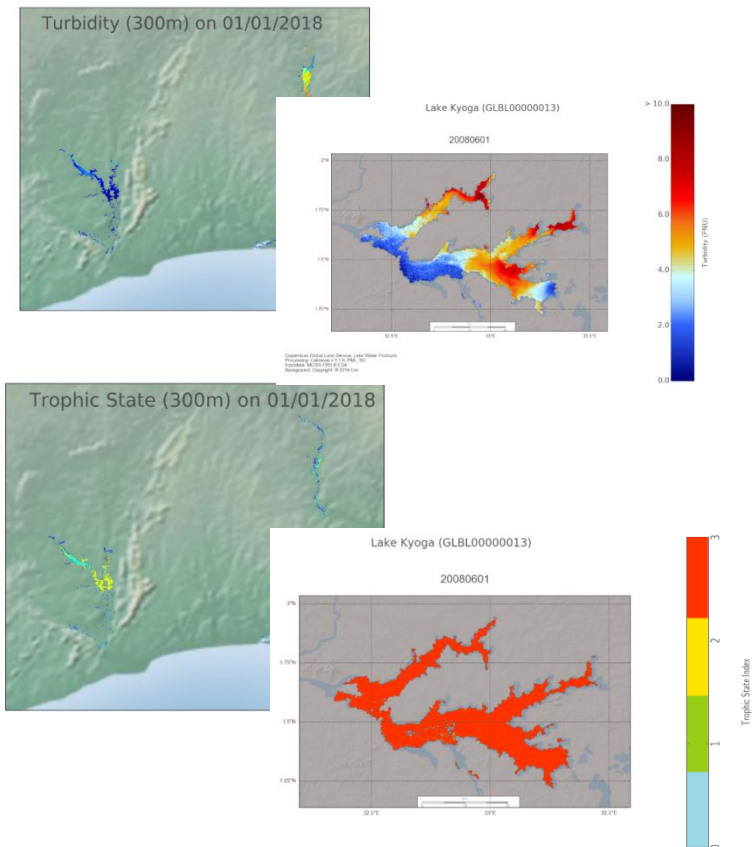


Lake Water Quality

Product: Lake Water Quality

Status: Demonstration

- Description:
 - Surface Reflectance : Top-level variable from which are deduced turbidity and trophic state
 - Lake turbidity : Water Framework Directive indicator of ecological status
 - Trophic state : trophic classification predicted from dynamics in the biomass of aquatic vegetation (Chla).
- Product Specifications:
 - Domain: Global (~1000 selected lakes)
 - Projection: Lat-Long/WGS84
 - Pixel size: 1km & 300m
 - Sensor: MERIS (archive), S3-OLCI (NRT)
 - Time resolution: 10 days



Lakes and reservoirs Water Level

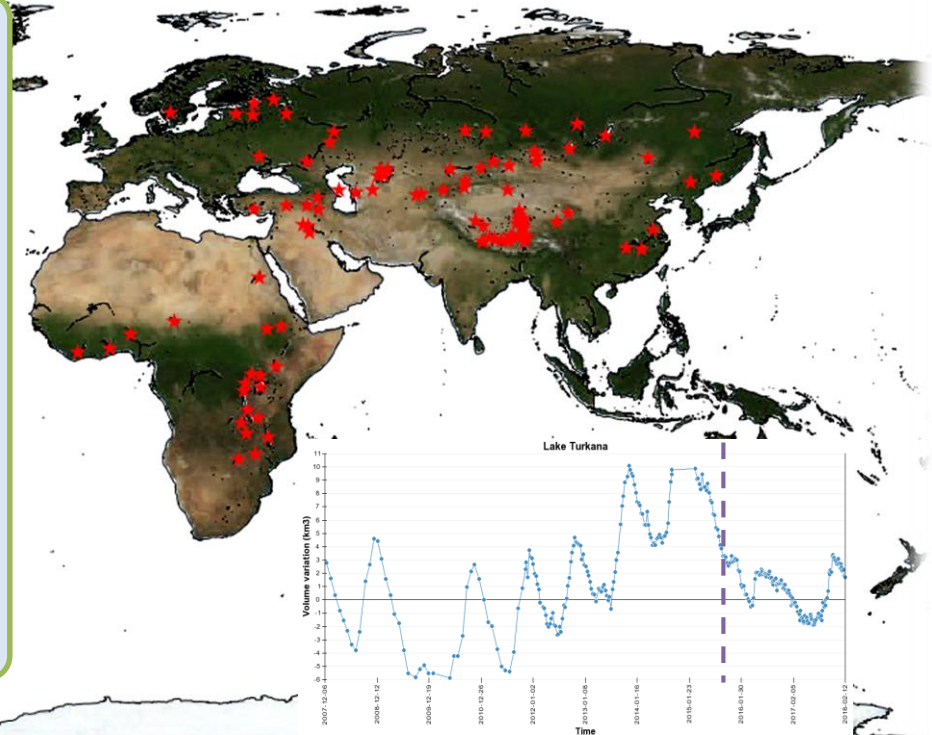
Product: Lakes and Reservoirs Water level

Status:

- V1 (Jason-3 only) pre-operational,
- V2 (Jason-3 + Sentinel-3a) demonstration

Product Specifications:

- Parameter: water height w.r.t geoid (m)
- Domain: Global (limited to a set of lakes)
- Sensor: Jason-3, Sentinel-3a
- Time resolution: 1-to-28 days
- Latency: 2-days after decade
- Accuracy: 5 to 15cm

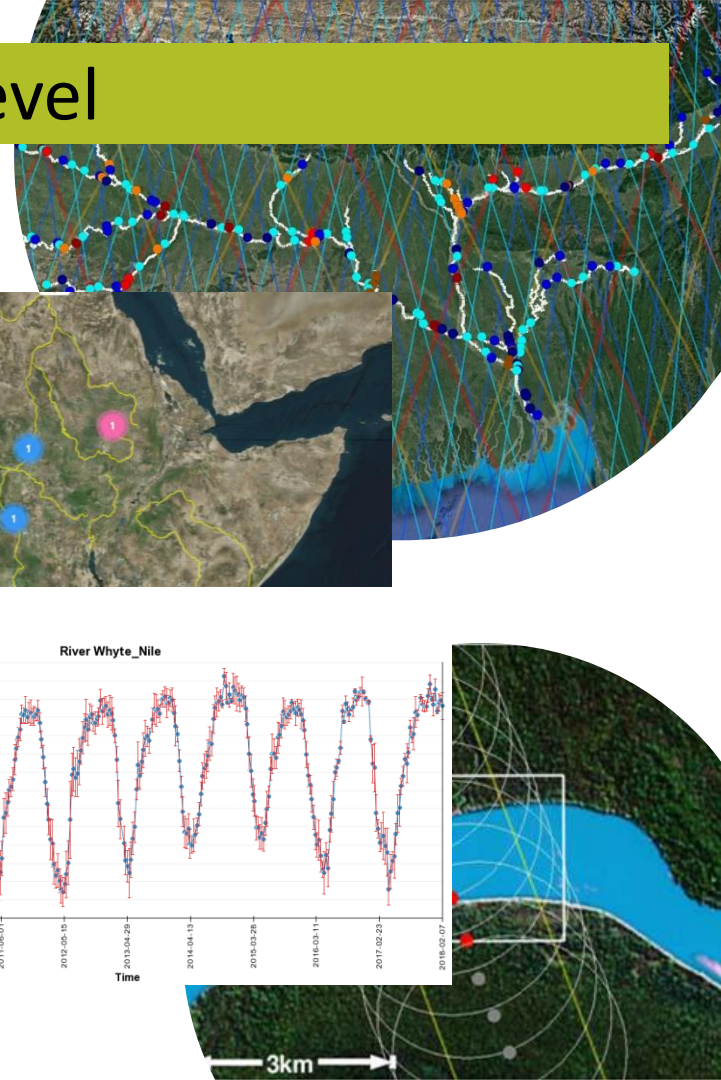
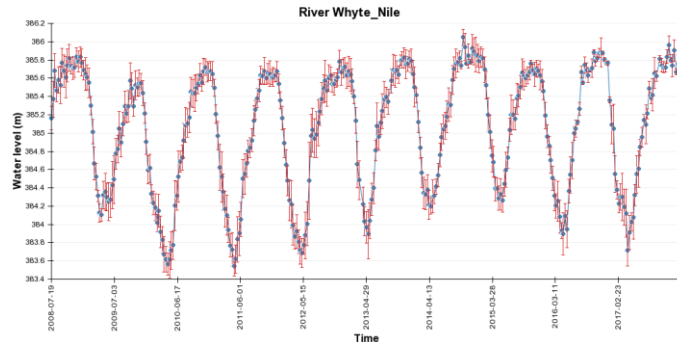


River Water Level

Product: River Water level

Status: Pre-operational

- Description: Water height w.r.t geoid where altimeters cross rivers
- Product Specifications:
 - Parameter: water height w.r.t geoid (m)
 - Domain: Global
 - Sensor: Jason-3, Sentinel-3a,
 - Time resolution: 10 or 28 days
 - Latency: 2 days after decade
 - Accuracy: 10 to 50cm



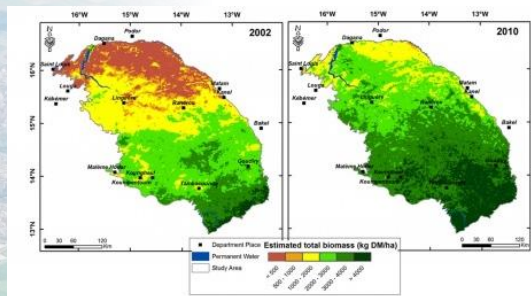


Land
Monitoring

Vegetation & Energy - Spotlight on users

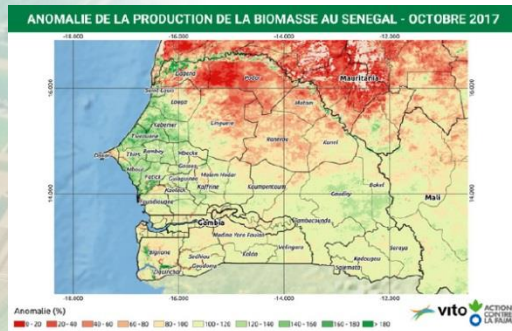
CSE (Senegal) & CREAM (Spain)

Uses FAPAR for fodder biomass monitoring in Sahelian rangelands



ACF NGO (Senegal)

Uses DMP anomalies for pasture monitoring



<http://sigساهel.info>

ICPAC (Kenya)

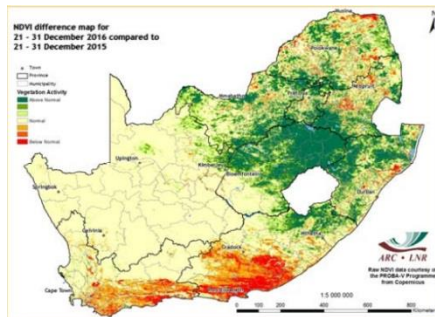
Uses NDVI to monitor protected area's in IGAD



<http://icpac.mesa.net>

ARC-LRN (S-Africa)

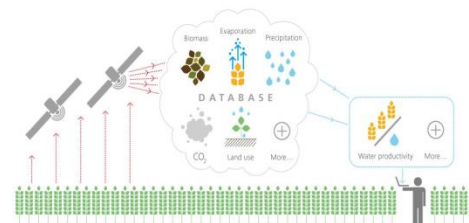
Uses NDVI for drought monitoring



<http://mesasadc.org>

FAO / eLeaf (Italy / NL)

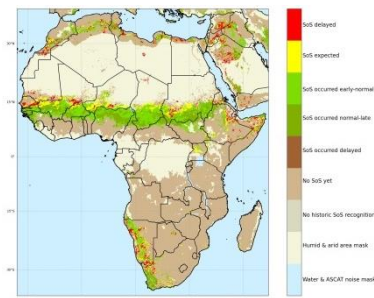
Uses LC100 for water productivity management (WaPOR)



<http://fao.org/in-action/remote-sensing-for-water-productivity/en/>

GeoVille GmbH (Austria)

Derives Start of Wet Season indicators from SWI



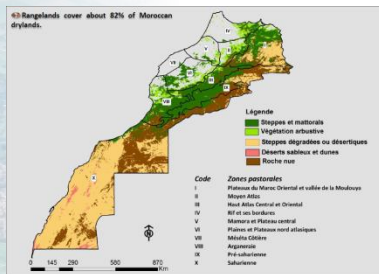


Land
Monitoring

Vegetation & Energy - Spotlight on users

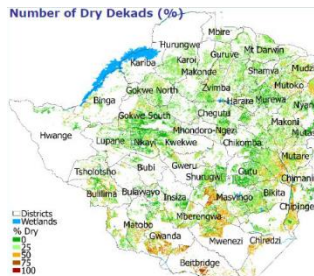
INRA (Marocco)

Uses LAI, fAPAR, NDVI to evaluate monitoring of rangelands



BDMS (Botswana)

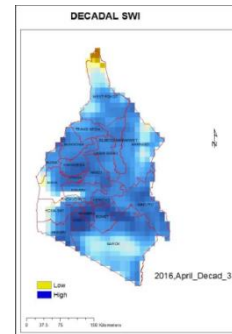
Uses VCI (dry dekads) to predict maize yield in Zimbabwe



<http://hq.mesasadc.org:8080/EMMA/emma>

DSRS (Kenya)

Uses SWI for Agricultural monitoring



I find the Global Land Service products, based on PROBA-V, really useful for developing environmental indicators for decision makers in Namibia. We look forward to the Service going the extra mile and introducing online processing facilities.

Peter Erb, National Director, SASSCAL, Namibia

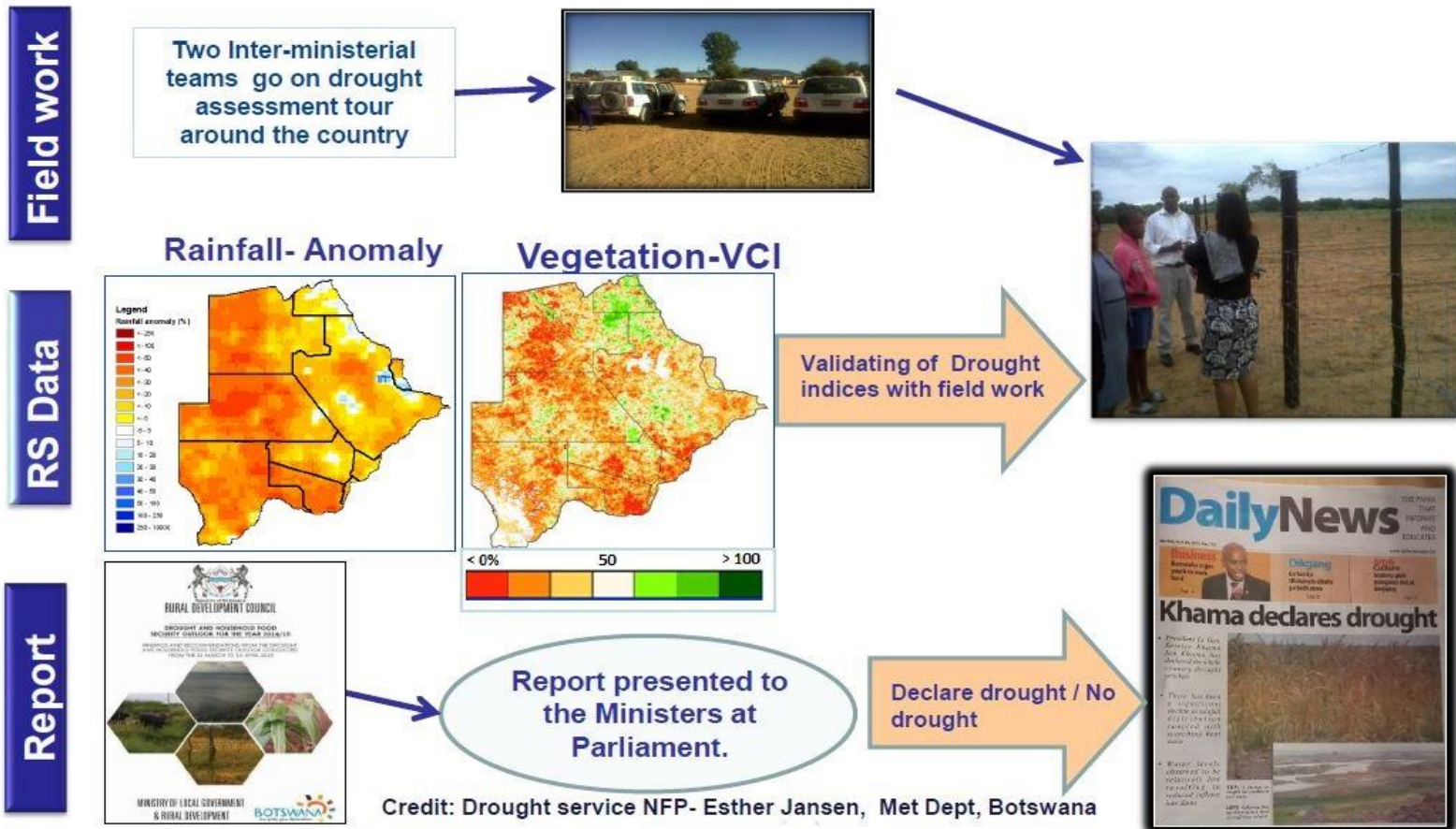
SASSCAL centres are supported by the Federal Ministry of Education & Research, Germany

We regularly use Global Land's products for evaluating trends and deviations in growing seasons across multiple years. Often combined with Sentinel data for crop classification, monitoring crop phenology, and flooding. For instance in the context of the ESA-funded TIGER project for water resource management in Africa.

C. van der Sande, NEO B.V. (private company), the Netherlands



Usage examples: Botswana Drought Assessment

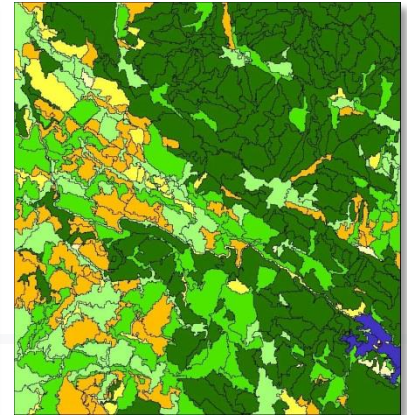




Land
Monitoring

Hot Spot Monitoring (HSM) - Objectives

- ★ To produce Land Cover and Land Cover Change maps (LC/LCC) and related indicators over specific Areas of Interest (AOI) using high resolution satellite data (from 1m to 30m)
- ★ To answer to ad-hoc requests within the domain of the sustainable management of natural resources
- ★ To complement the near real time global monitoring service at low resolution
- ★ To support EU funded projects or related policies with priority in biodiversity conservation and rural / social development sectors

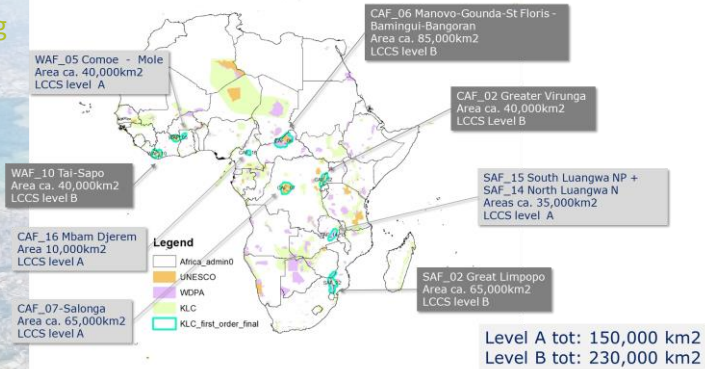




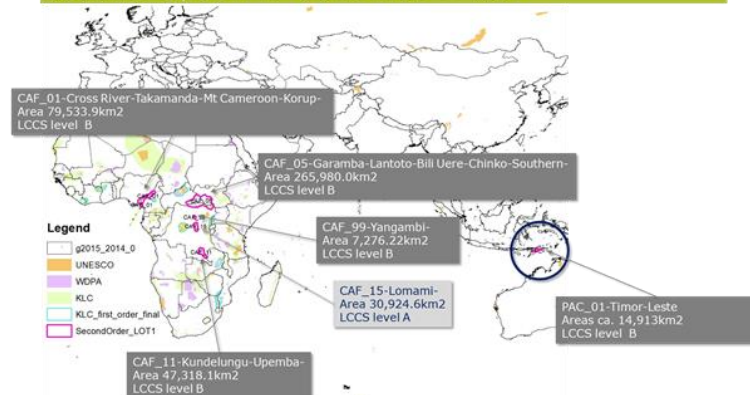
Land
Monitoring

HOT SPOT MONITORING

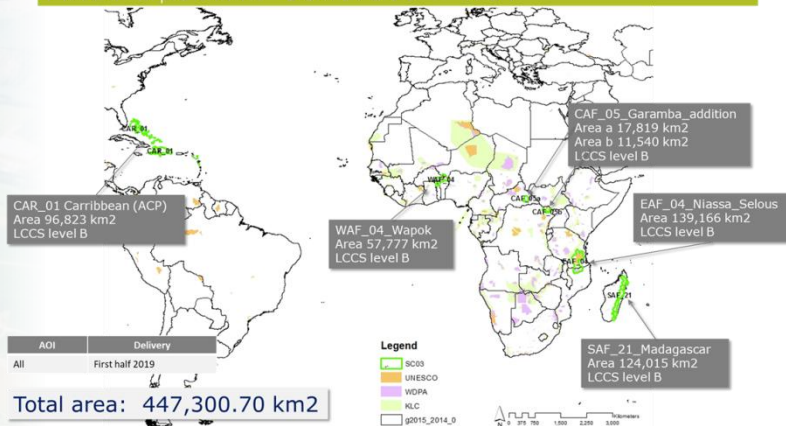
First Specific Contract – AOI



Second Specific Contract – AOI



Third Specific Contract – AOI





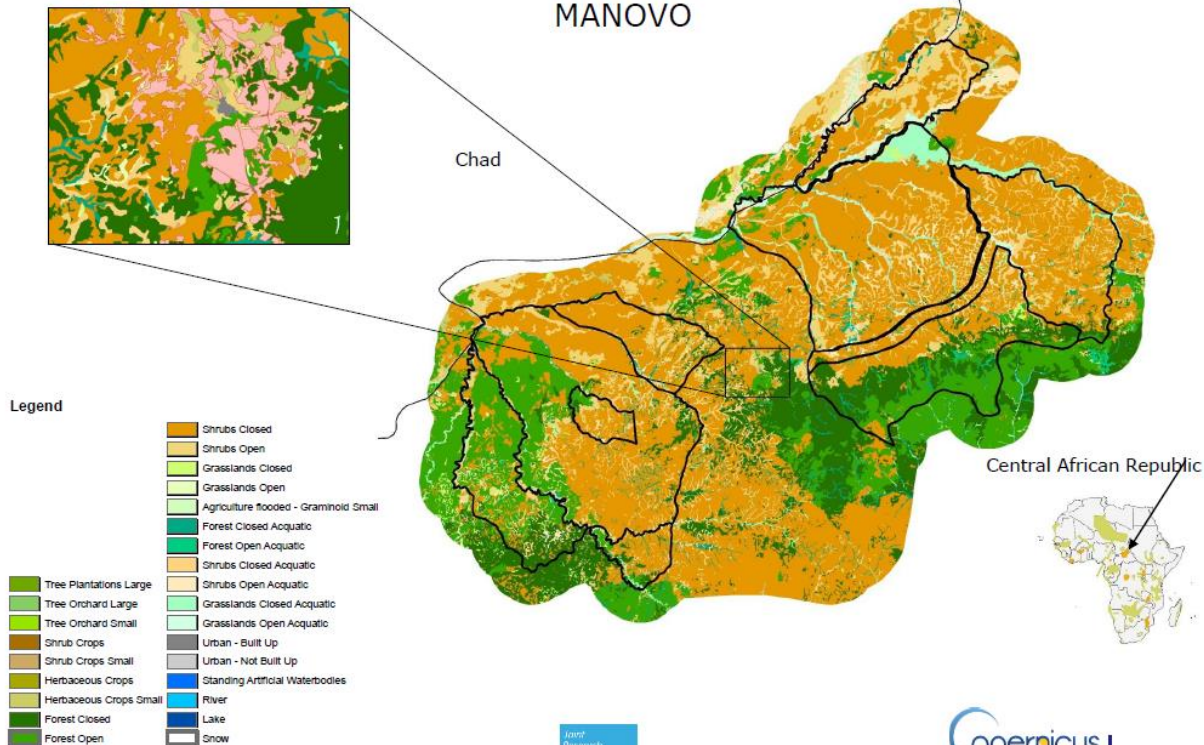
Land
Monitoring

Hot Spot Monitoring - Example



MANOVO

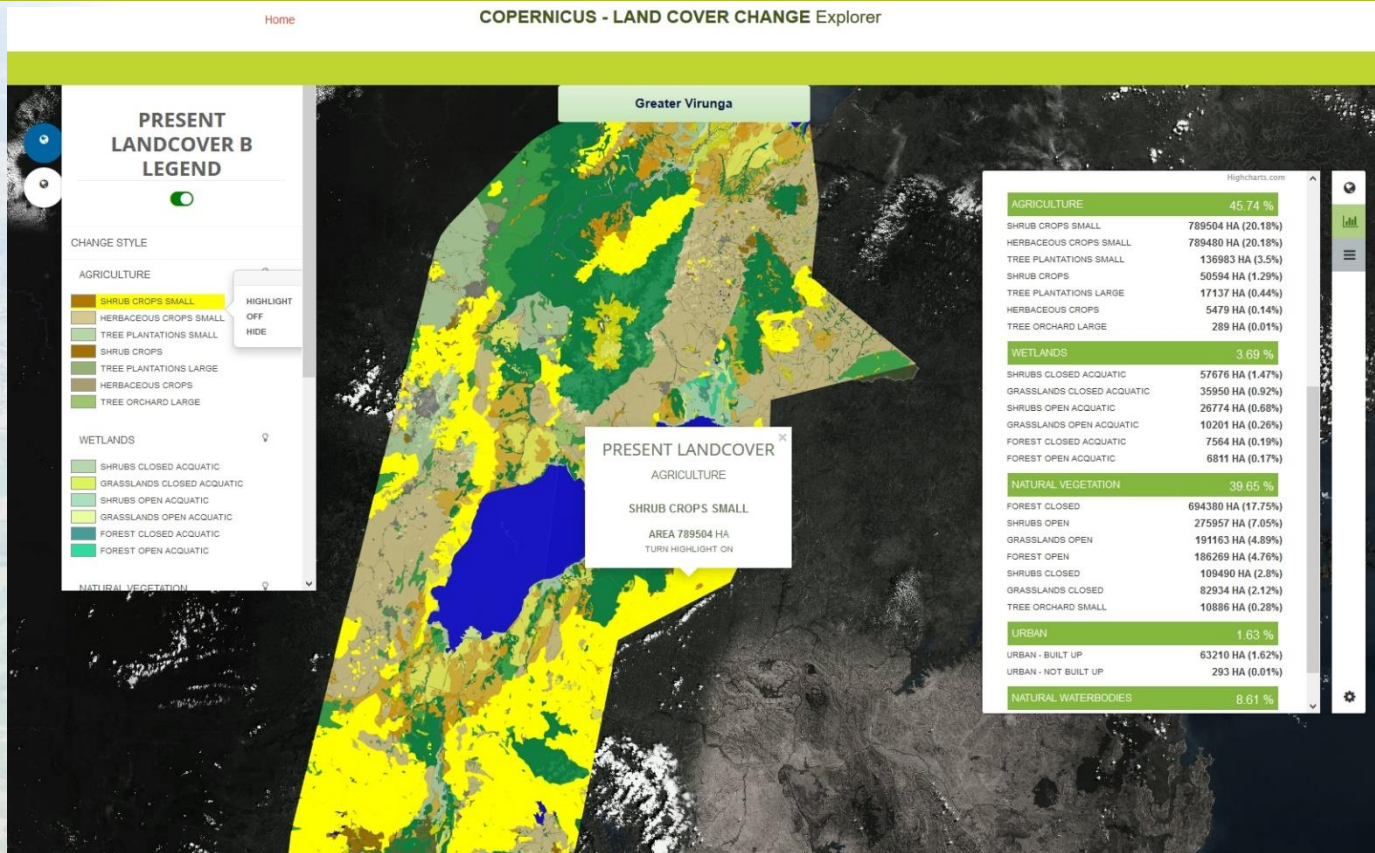
Preliminary Results





Land
Monitoring

HOT SPOT MONITORING - WEB tool





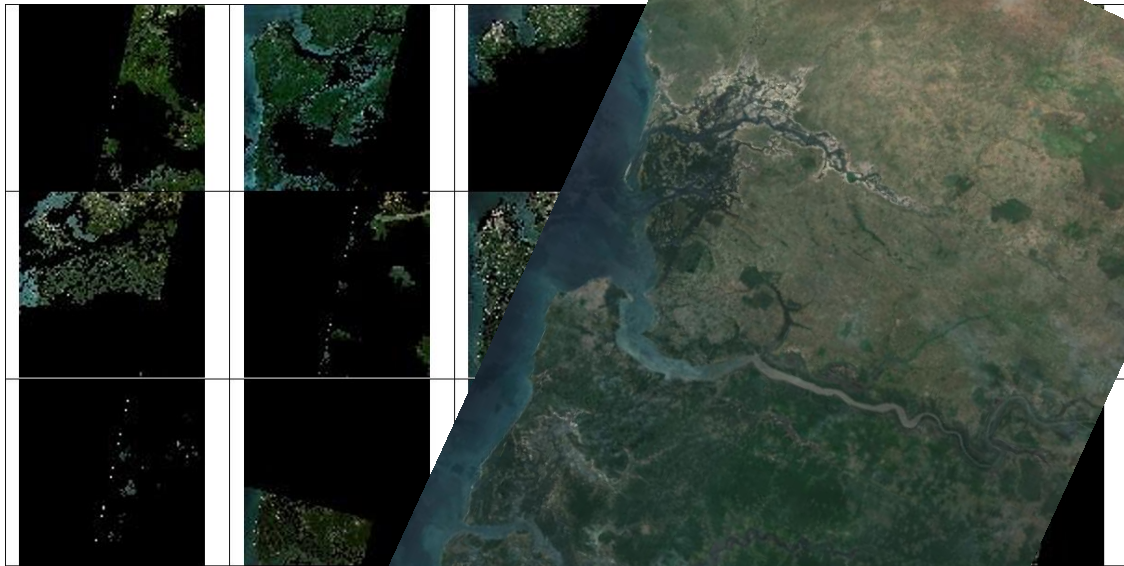
Land
Monitoring

Sentinel-2 Global mosaic

Preparation of Analysis Ready Data

Cloud free composites

Geographic & Temporal composites



Sentinel 2B (source: ESA)

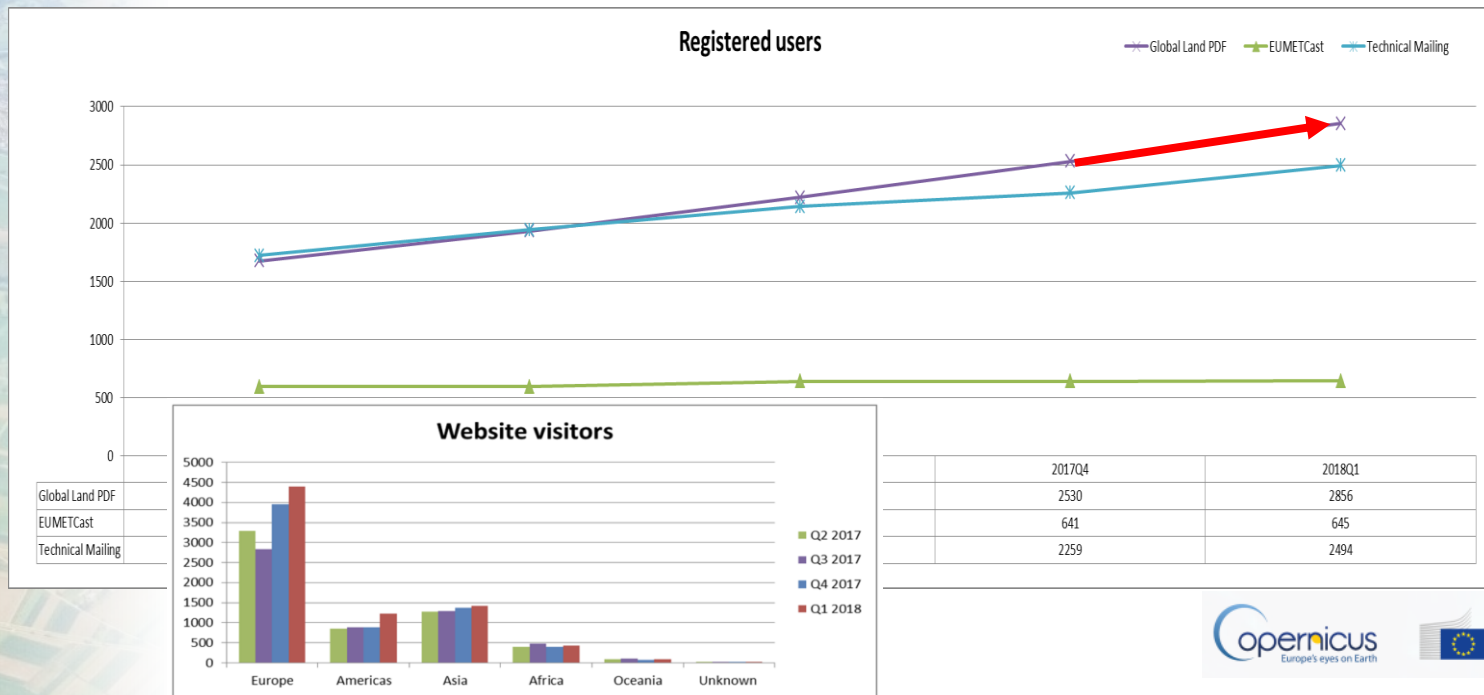


Land
Monitoring

GLOBAL LAND COMPONENT



3500+ registered users*



* Only
biophysical
products

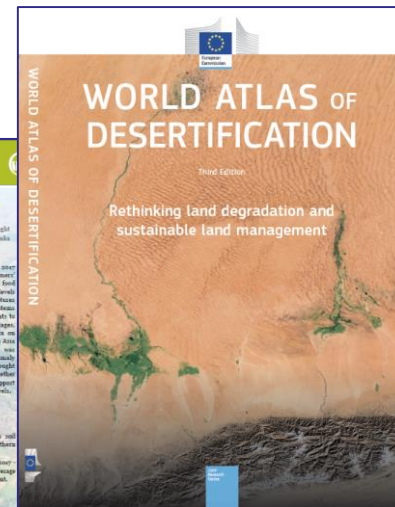
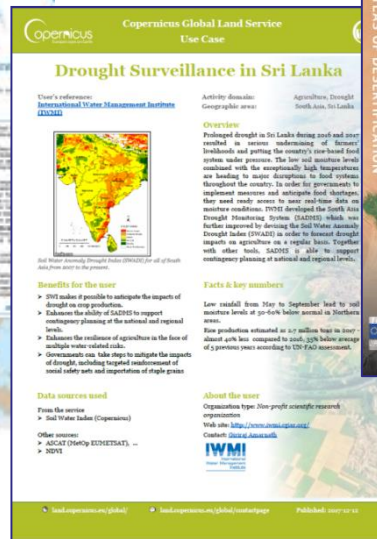
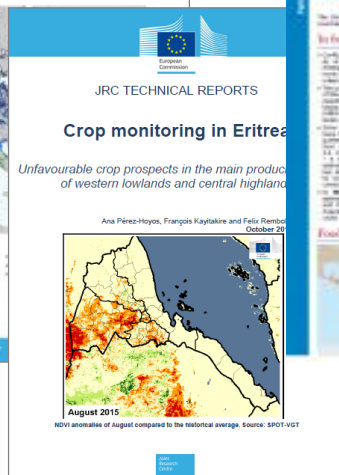
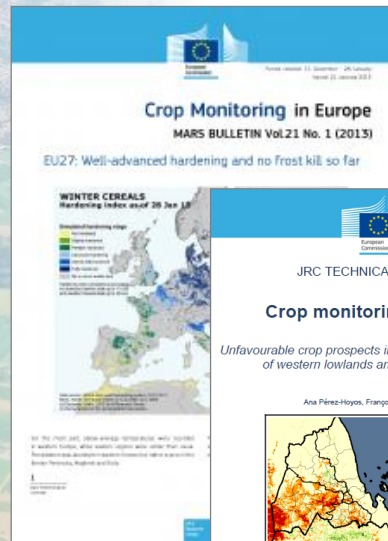


Land
Monitoring

GLOBAL LAND COMPONENT

Products used in Bulletins distributed to wide audiences

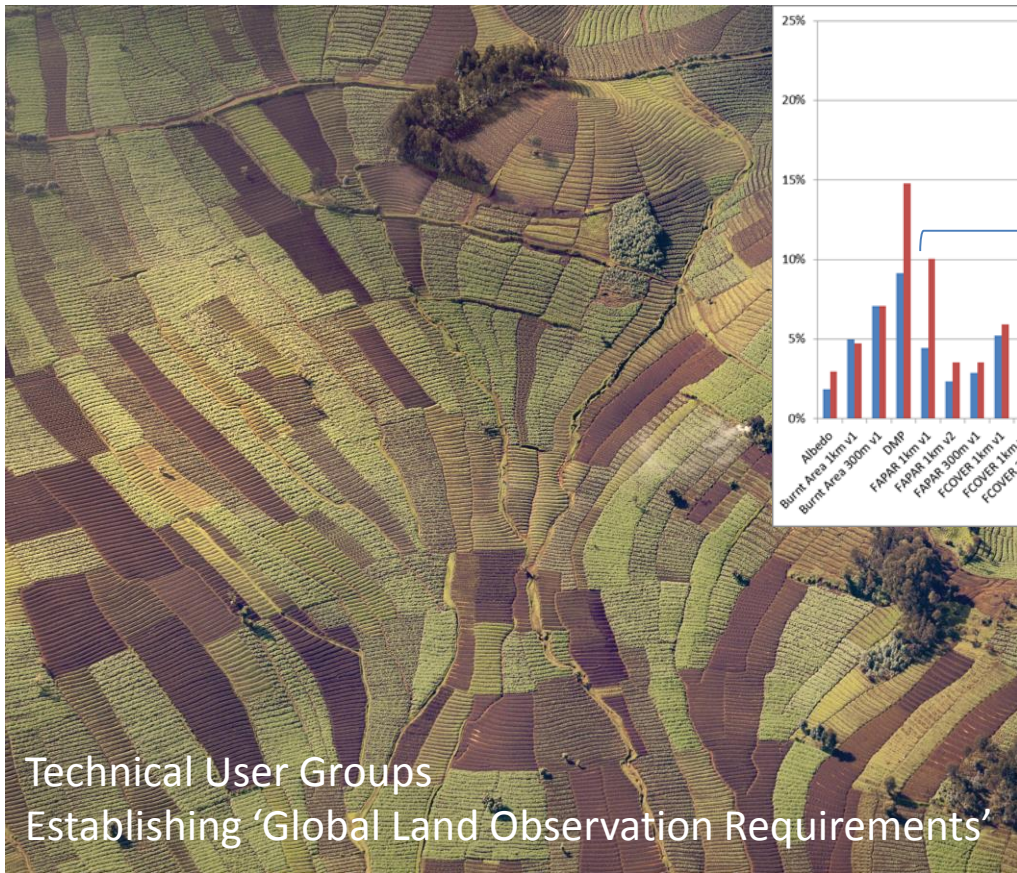
JRC-MARS Crop monitoring : 2000+ audience / FAO and WFP bulletins / regional and national



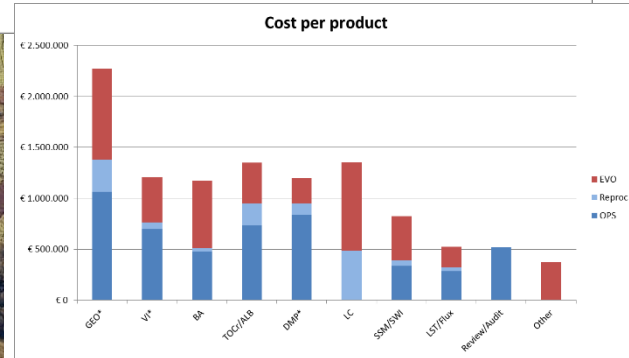
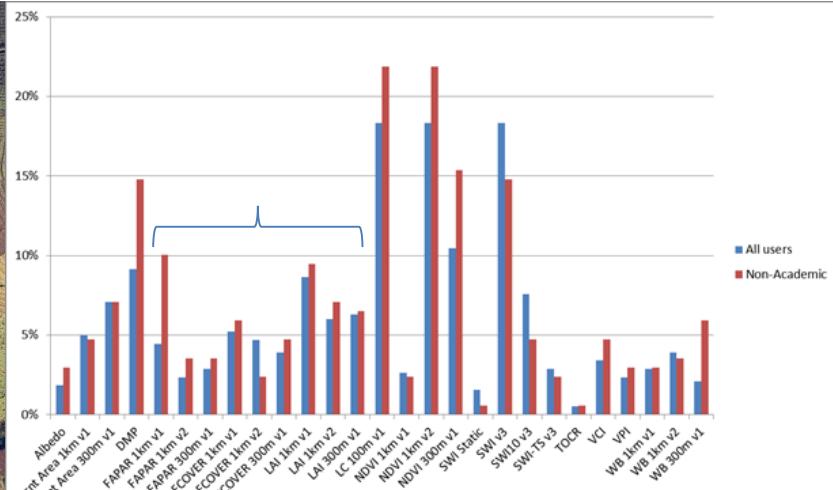


Land
Monitoring

GLOBAL LAND COMPONENT



Technical User Groups
Establishing 'Global Land Observation Requirements'





Land
Monitoring

GLOBAL LAND COMPONENT - evolution

Moving to: High resolution land products and on-the-fly processed products





Land
Monitoring

GLOBAL LAND COMPONENT - evolution

Base support for addressing Sustainable Development Goals



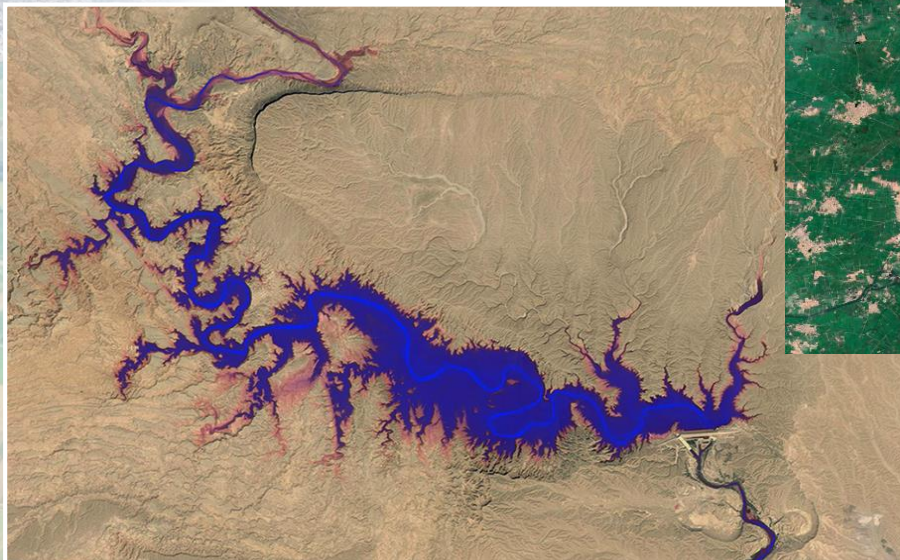


Land
Monitoring

GLOBAL LAND COMPONENT - evolution

Supporting specific user communities

Observatories on
forest/water/urban/agriculture





Land
Monitoring

GLOBAL LAND COMPONENT

Thank you!



<https://land.copernicus.eu/global/>