



PECORA22

Opening the Aperture to Innovation: Expanding Our Collective Understanding of a Changing Earth

Digital Earth Africa

Empowering a billion people with earth observation

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Digital Earth Africa
University of Washington

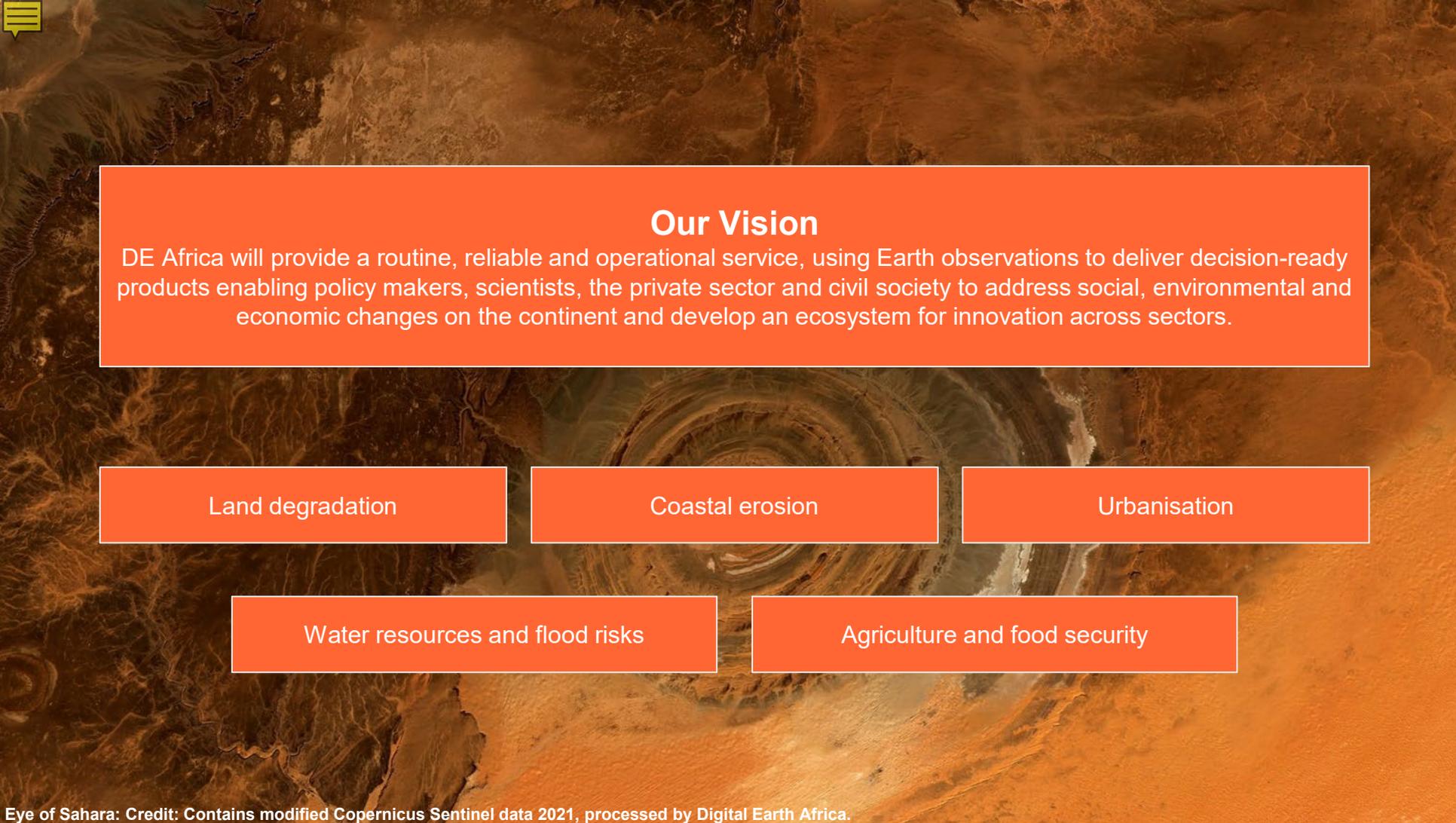
Meghan.halabisky@digitalearthafrica.org

Celebrating



YEARS
Landsat
1972-2022



A satellite-style map of the Sahara Desert, showing the intricate patterns of sand dunes and dry riverbeds. The colors range from light tan to dark brown, highlighting the rugged terrain. In the top-left corner, there is a small yellow icon of a speech bubble with three horizontal lines inside.

Our Vision

DE Africa will provide a routine, reliable and operational service, using Earth observations to deliver decision-ready products enabling policy makers, scientists, the private sector and civil society to address social, environmental and economic changes on the continent and develop an ecosystem for innovation across sectors.

Land degradation

Coastal erosion

Urbanisation

Water resources and flood risks

Agriculture and food security



Open and Free Data

- Interoperability
- Privacy and Integrity



Operational Service

- Continental-scale
- Sustainable
- Domain expertise



Accountability and transparency

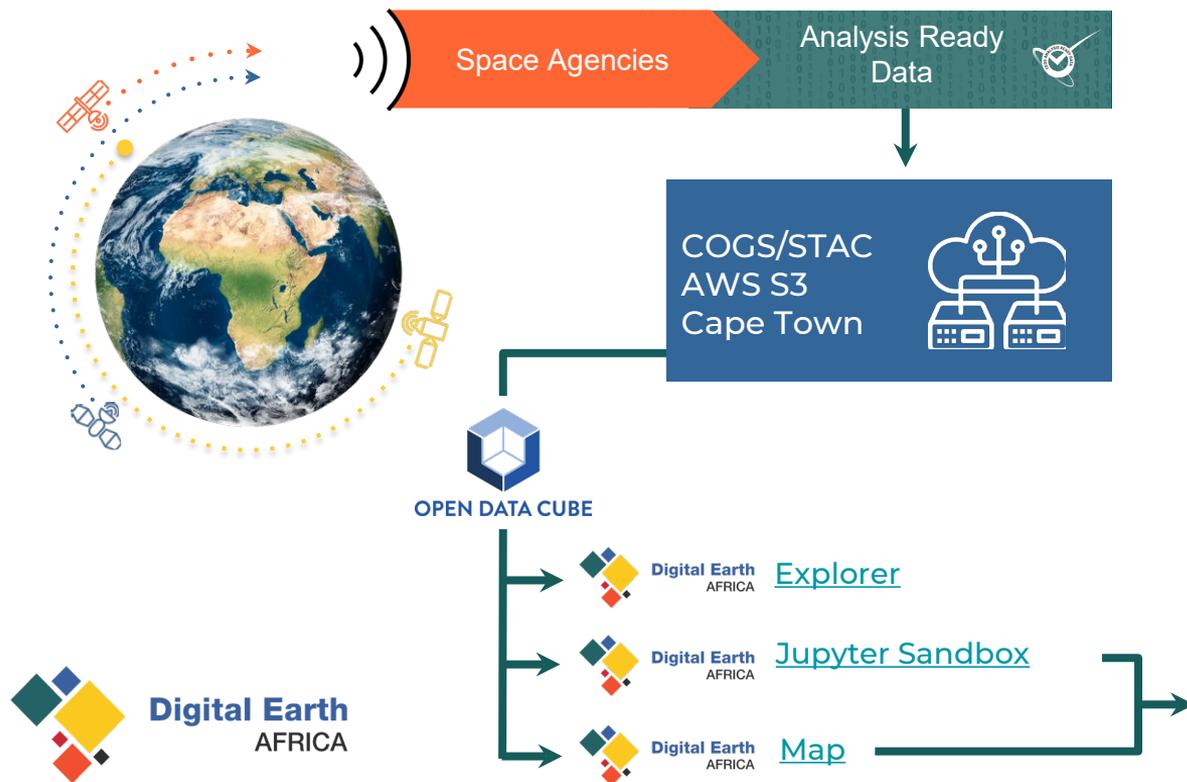
- Responsive to African priorities
- Agile, nimble and actions oriented



Diversity and inclusion

- Multi-sector perspectives
- Span data communities
- Foster collaboration

Satellite data available through Digital Earth Africa



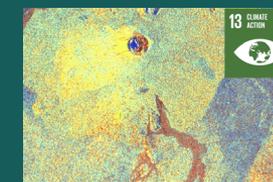
Studying the Tanzanian Coastline with GeoMAD, 2019, RGB



Monitoring crops in Egypt 2001-2020, Landsat, RGB



Monitoring Mount Nyiragongo, 2018 Sentinel-2 RGB and 2021 Sentinel-1



Measuring water extent on rangelands in Etosha National Park, Namibia 1992-2021, Landsat, False Colour



Supported by Strong Governance & Thriving Partnerships

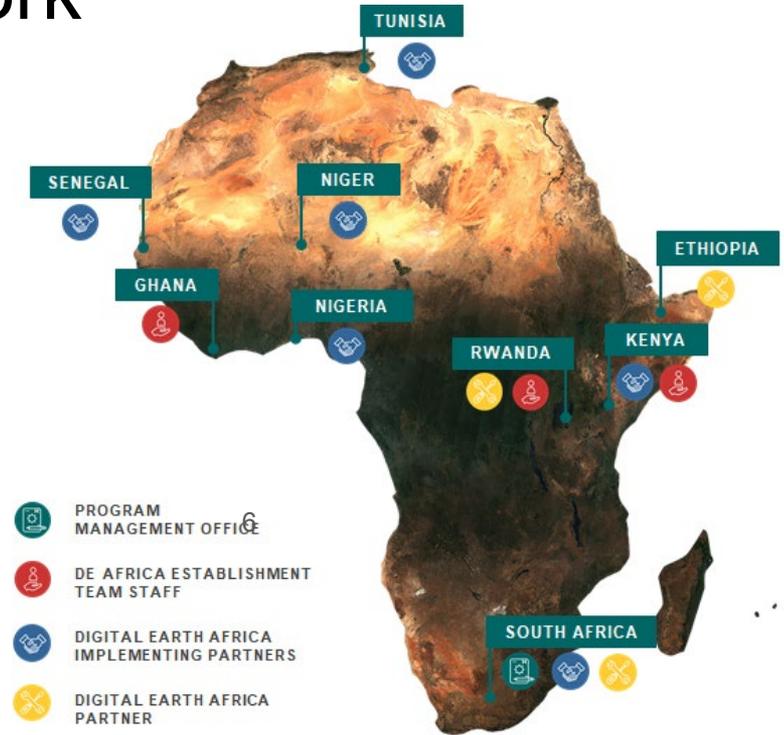


Program Delivery Framework

PMO - lead, manage, oversee, ensure delivery

Platform host - maintain operation of the platform, develop new capabilities and support science team as guided by PMO

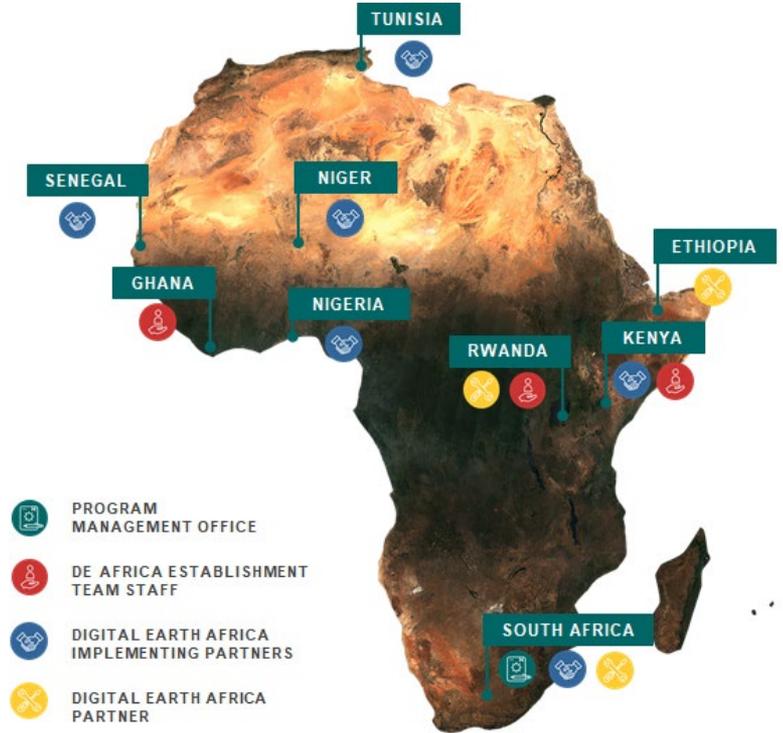
IPs - drive activities related to specific work plan, support program wide activities (PDTT, CD, comms)



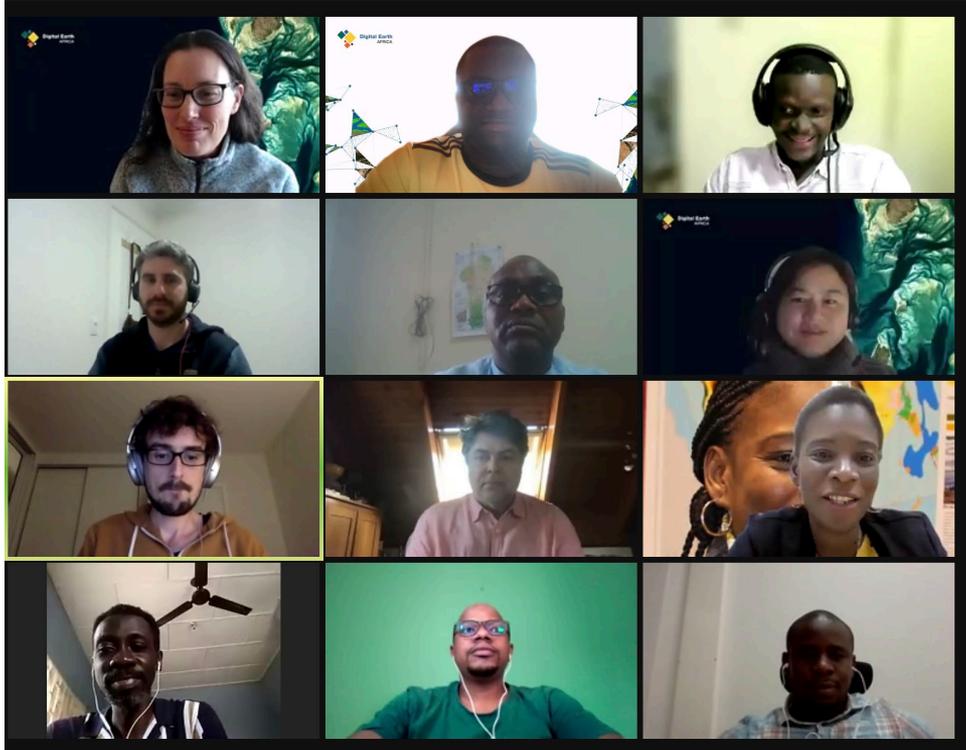
New Program Management Office in Africa



Managing Director – Dr. Thembi Xaba



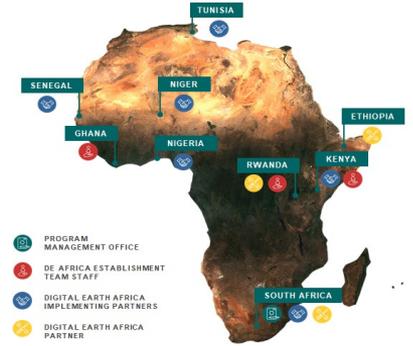
The Product Development Task Team



**REGIONAL CENTRE FOR
MAPPING OF RESOURCES
FOR DEVELOPMENT**

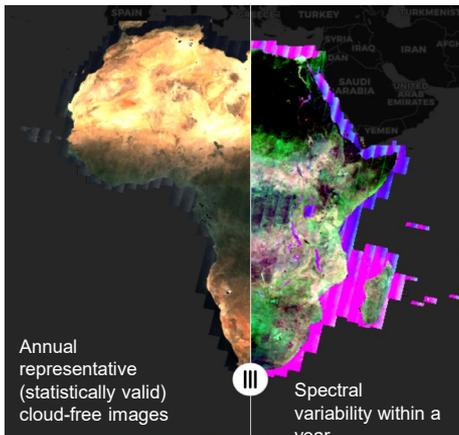


Centre de Suivi Ecologique

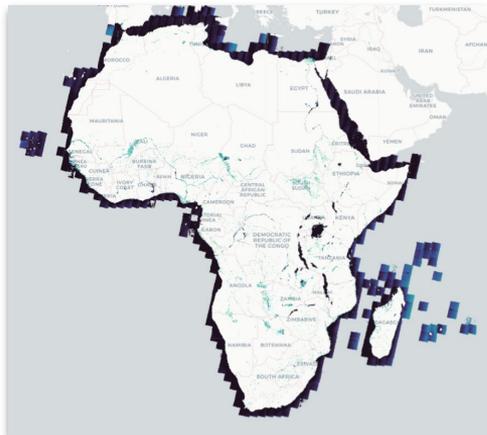


*« Ensemble pour une
gestion durable des ressources naturelles
et de l'environnement »*

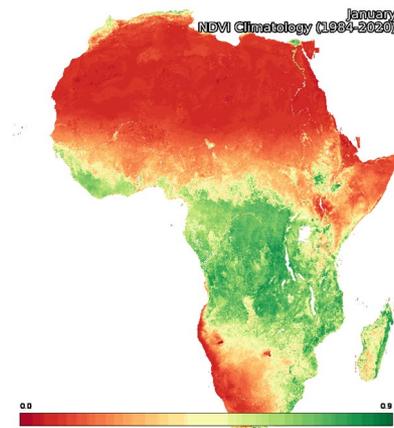
- Operational Continental Services



Annual/Semi-annual GeoMAD

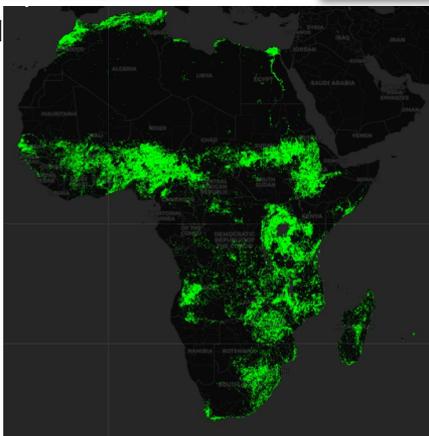


Water Observations from Space

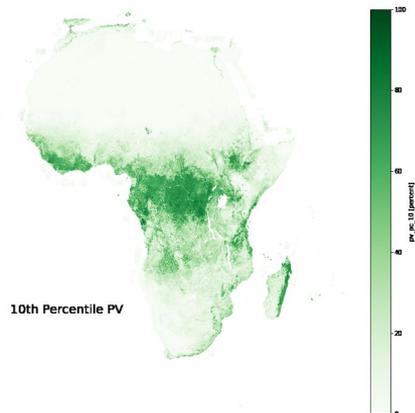


Monthly NDVI Climatology and Anomaly

Cropland Extent Map (2019)



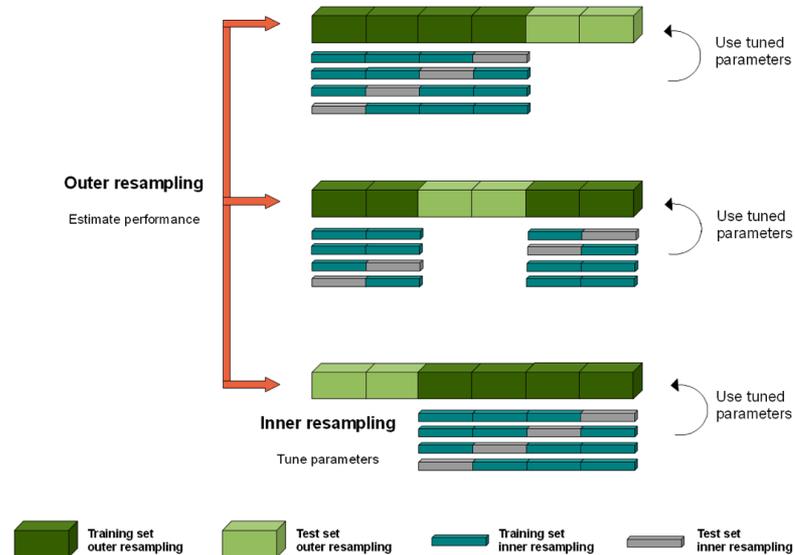
Fractional Cover



- + open source tools
- + user training

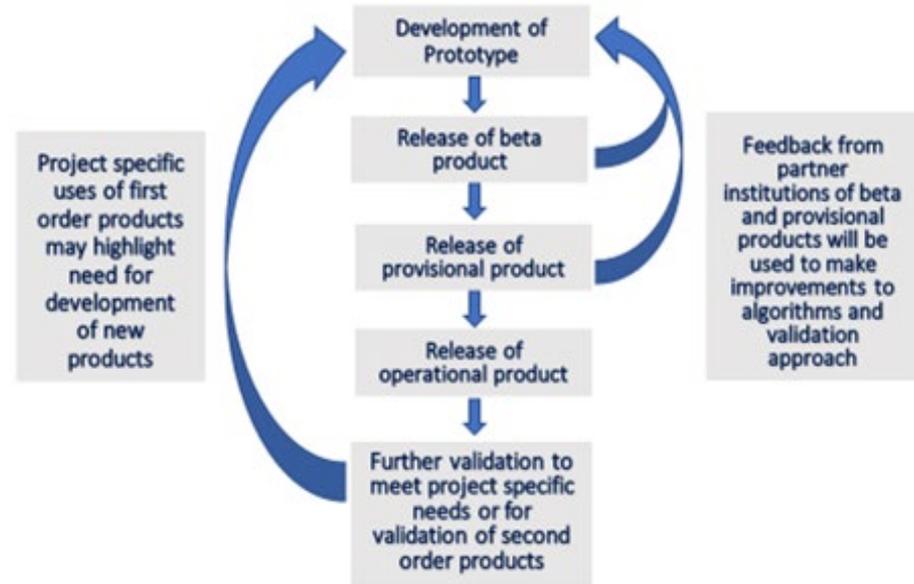
- Transferable workflows

ex. Crop type Mapping using machine learning

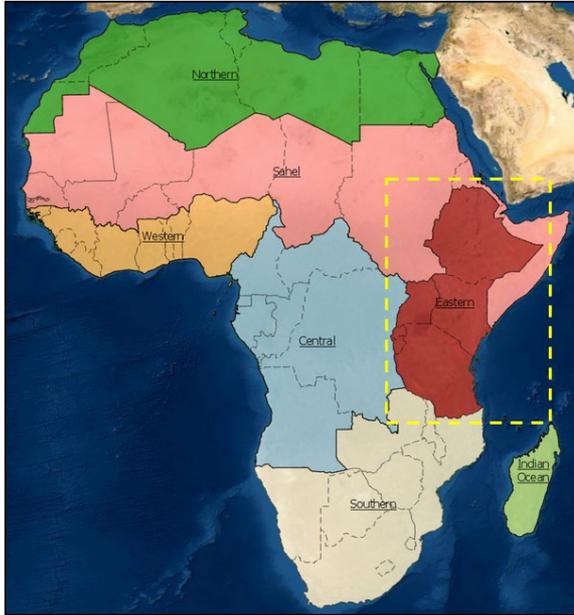


Field data sampling has been designed for central province, Zambia.

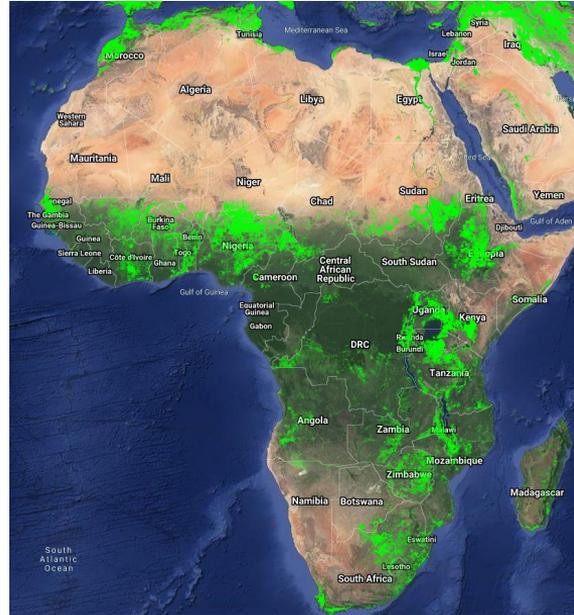
Cropland extent map - Co-developed with our implementing partners - PDTT



Collection of reference data



Sample data points were stratified by AgroEcological Zones



Within each AEZ, samples stratified by a pre-existing, crop mask (GFSAD2015).

▼ Cropland Reference Data Acquisition - Western Reg...

Navigate Through: All analyzed plots

1050 Go to plot

External Tools

Re-Zoom Geodash

Download Plot KML

Imagery Options

Bing Basemaps

Survey Questions

Unanswered Color Black White

1

Is the sample area entirely: crop, non-crop, mixed, ...

crop mixed

non-crop unsure

Flag Plot Clear All

Save Quit

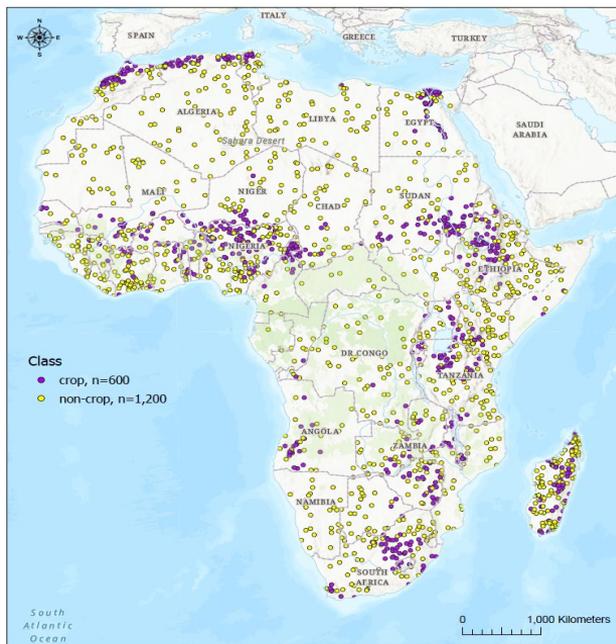
Samples uploaded to Collect Earth (NASA SERVIR). Labelled as either crop, non-crop, mixed, or unsure. <https://collect.earth/>

Continental cropland reference data

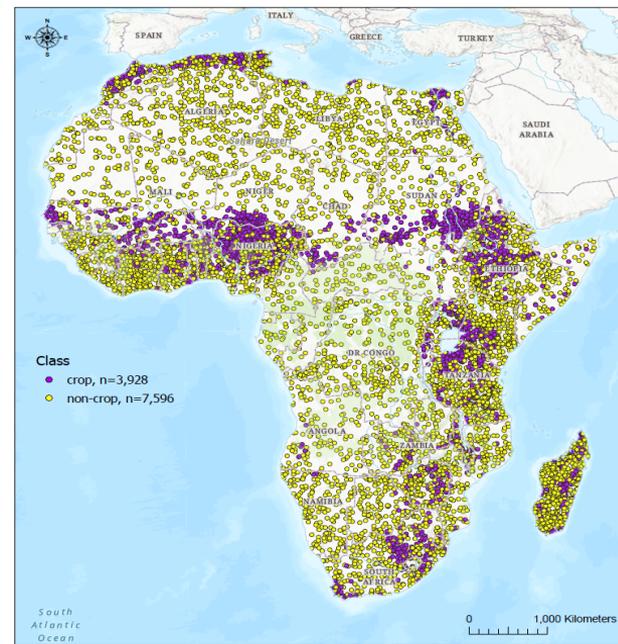
Some headline statistics on the reference data:

- 10 analysts
- Total number of samples after cleaning: >12,000
 - Total time spent on Collect Earth: >1,100 hrs
- >10,000 training samples
- 1,800 validation samples
- Overall accuracy of reference data based on external validation: 96.5 % (Radiant Earth)

Validation Data



Training Data



Three cropland products

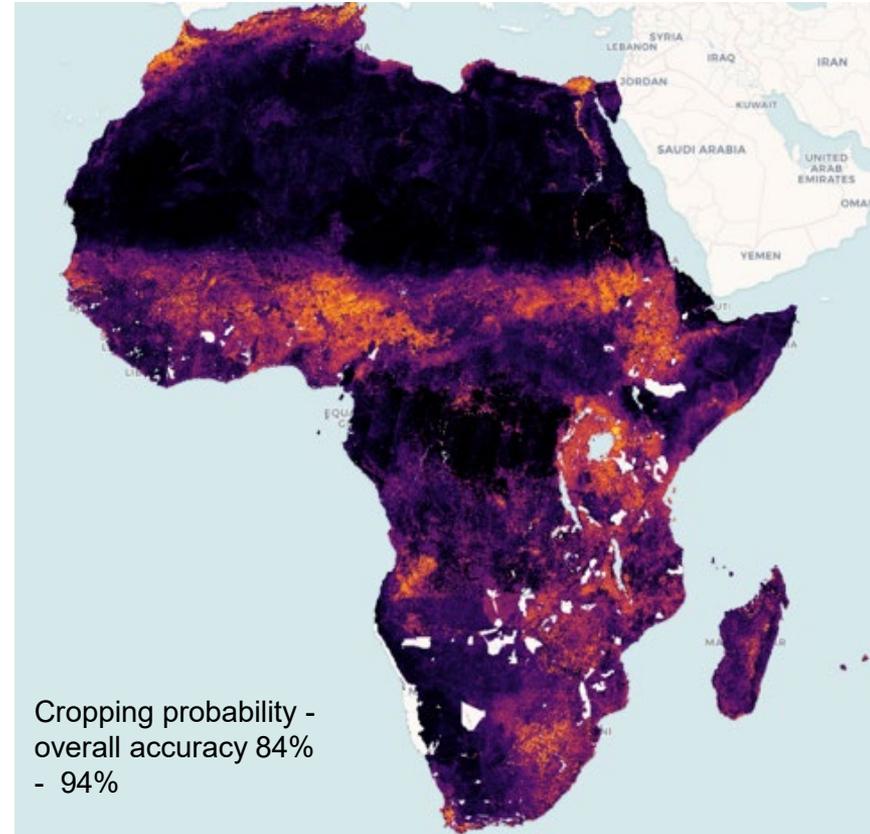
Probability - Crop mask - Object filtered



Cropland Extent Map over Madagascar with (from left to right) probability of cropping, cropped land (green) and object filtered cropped land (yellow).

Accuracy

- **Overall accuracy 84% - 94% across the AEZ**
- The **Eastern Africa** cropland extent map has an **overall accuracy of 90.3 %**, and an **f-score of 0.85**
- The **Western Africa** cropland extent map has an **overall accuracy of 83.6 %**, and an **f-score of 0.75**
- The **Northern Africa** cropland extent map has an **overall accuracy of 94.0 %**, and an **f-score of 0.91**

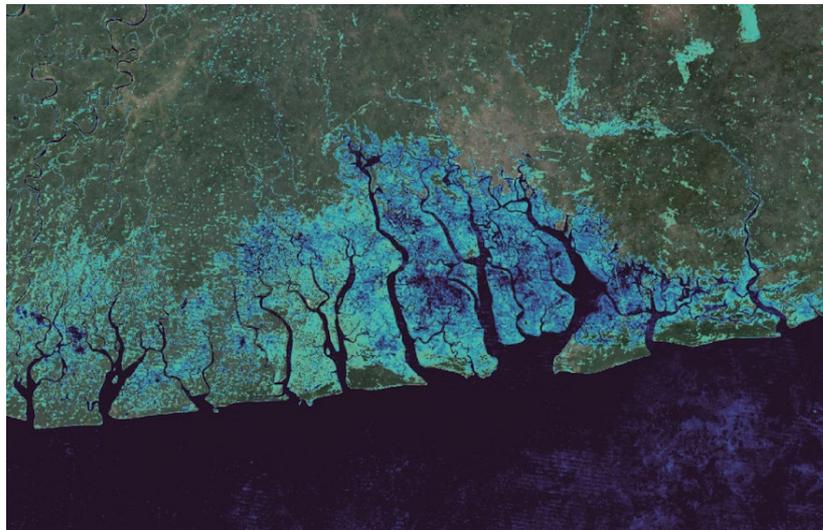


Operational Continental Services

Services are products the DE Africa has produced from one or more input datasets.

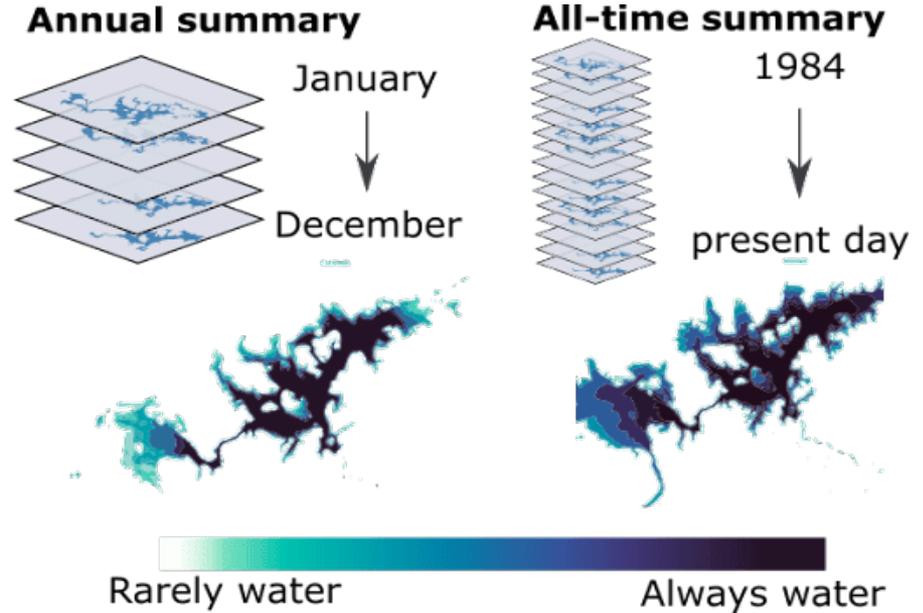
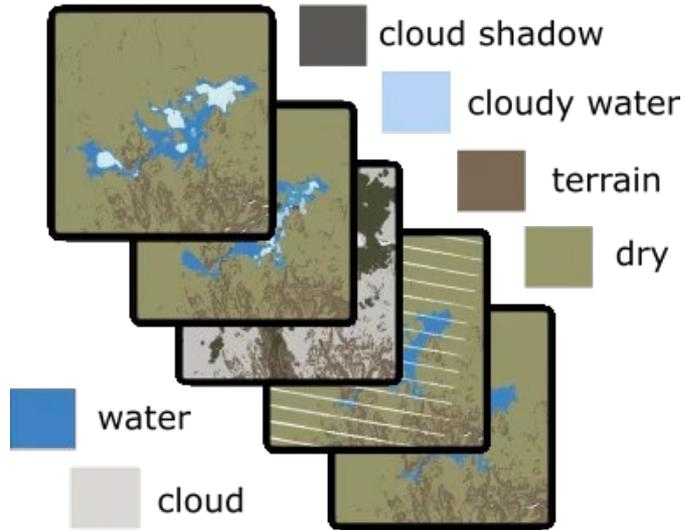
Two main types:

- Scene-to-scene products
 - Water Observations from Space
 - Fractional Cover
 - Coastlines
- Summary products
 - GeoMAD
 - WOfS Annual and All-time Summary
 - FC Annual Summary
 - NDVI Climatology and Anomaly
 - Crop Mask
 - Coastlines



Water Observations from Space

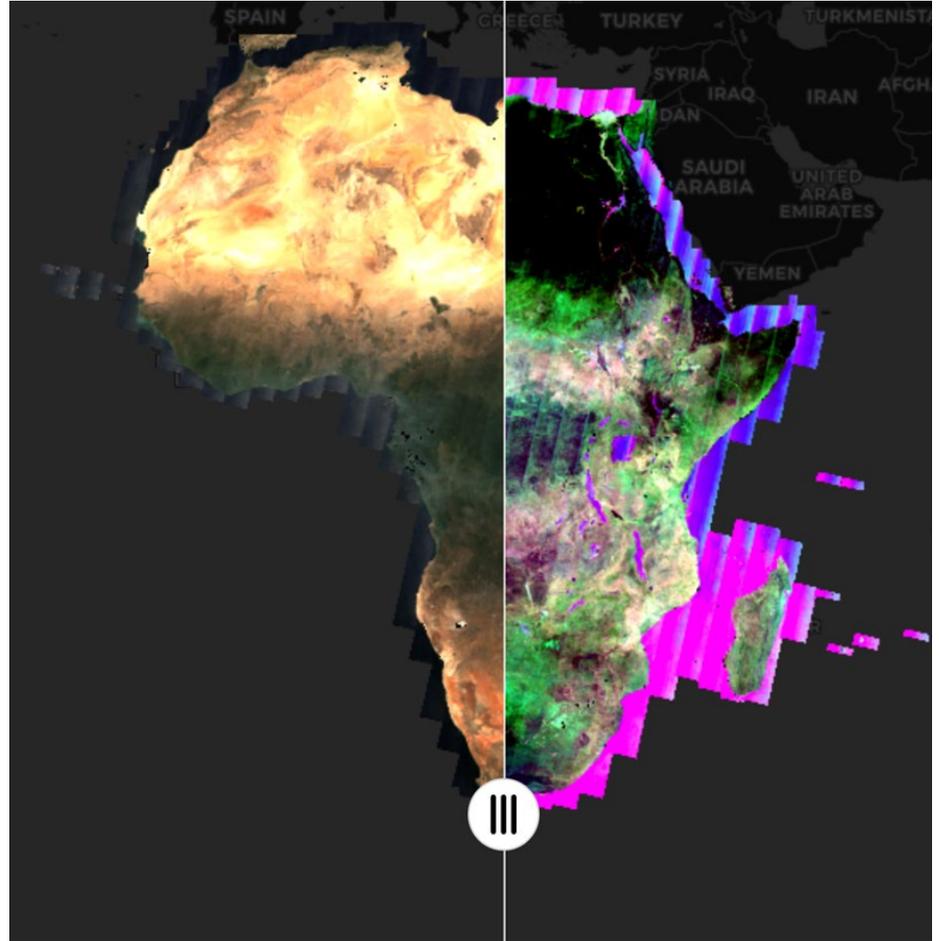
Dynamic water mapping services



GEOMAD

Annual representative
(statistically valid)
cloud-free images

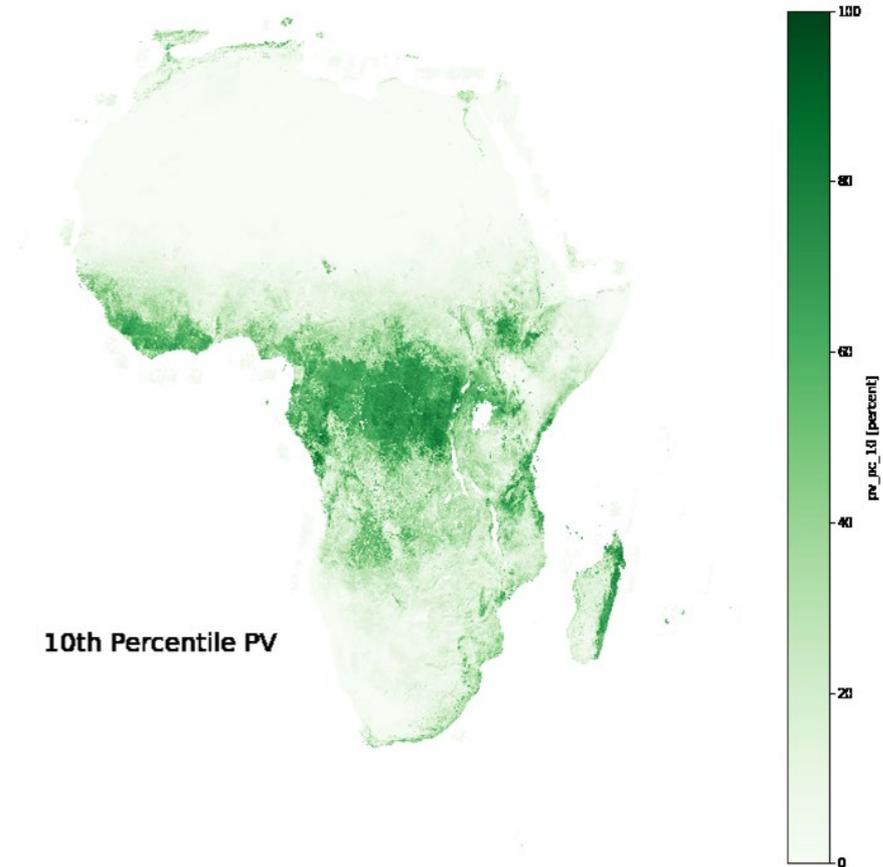
Spectral variability within
a year



Fractional Cover

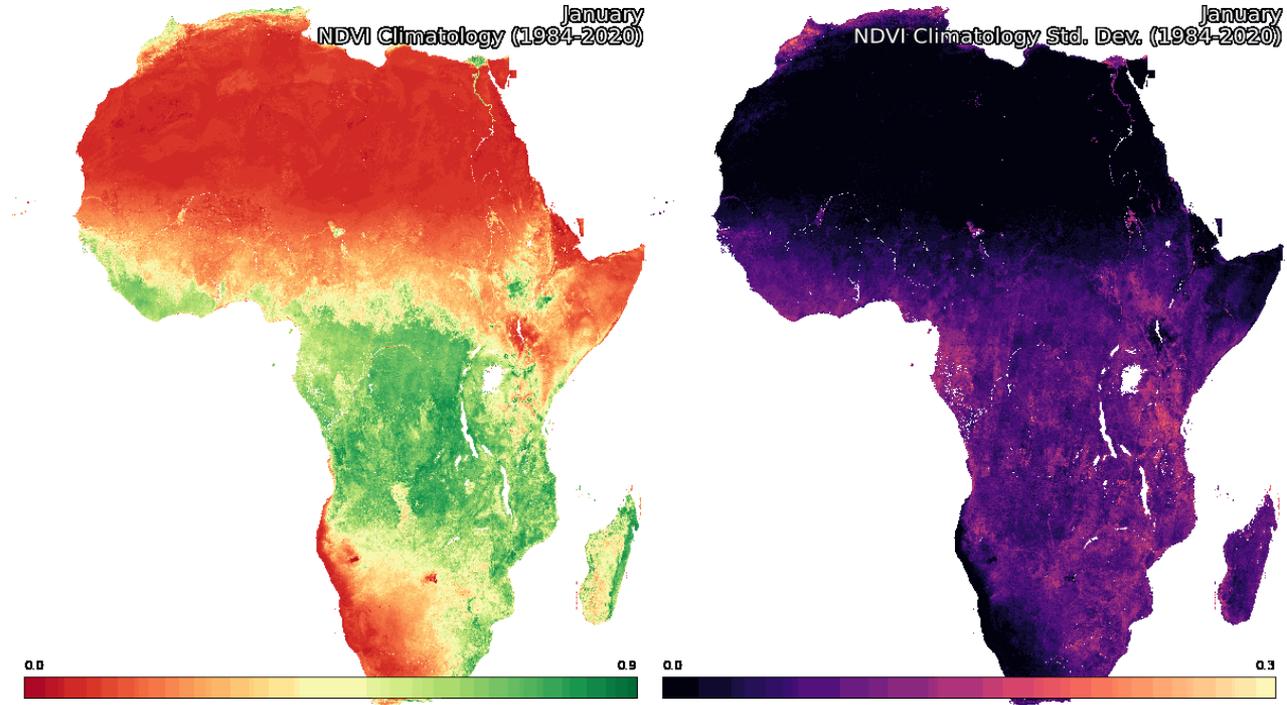
Proxy low, median and high green, non-green and bare soil percentage within a year

Example use: land cover, woody vegetation, mangrove mapping



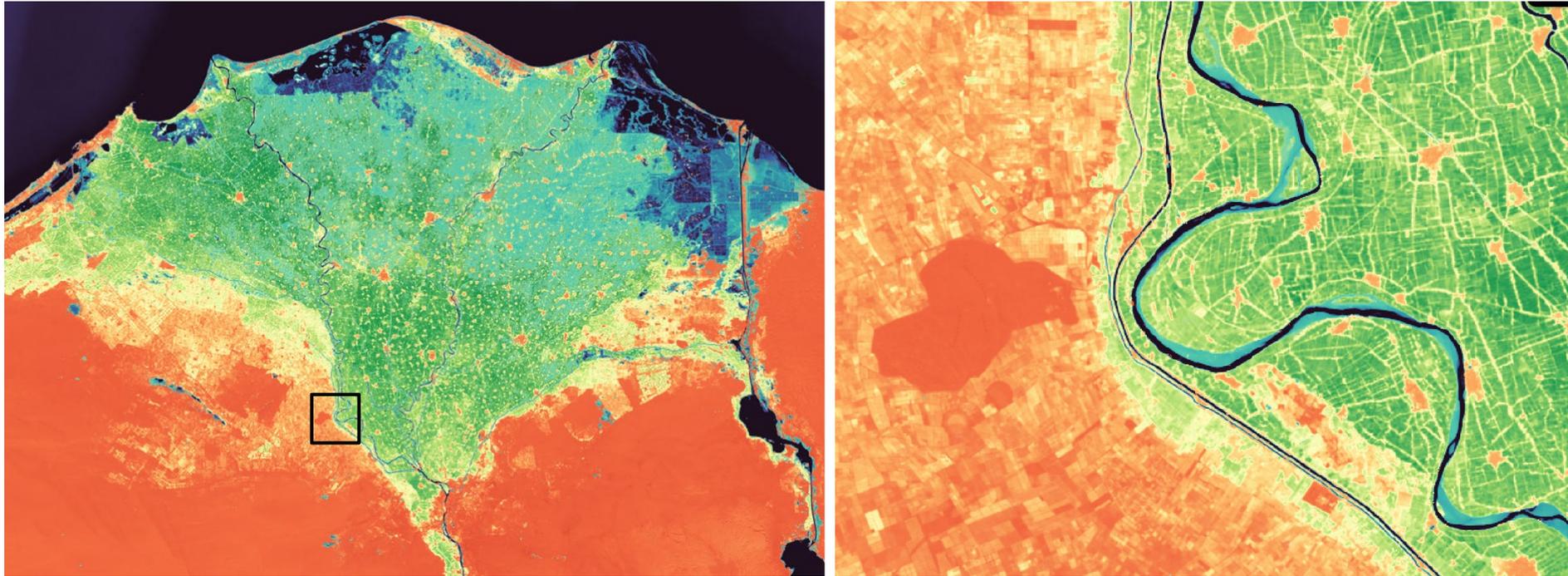
NDVI Anomalies

- For every month, mean and standard deviation of NDVI from 1984-2020
- Provides a high-resolution baseline vegetation condition for every 30x30 metre pixel over Africa
- NDVI Anomaly is the difference from this to the monthly mean, divided by the standard deviation
(monthly_mean - climatology_mean) / climatology_stddev





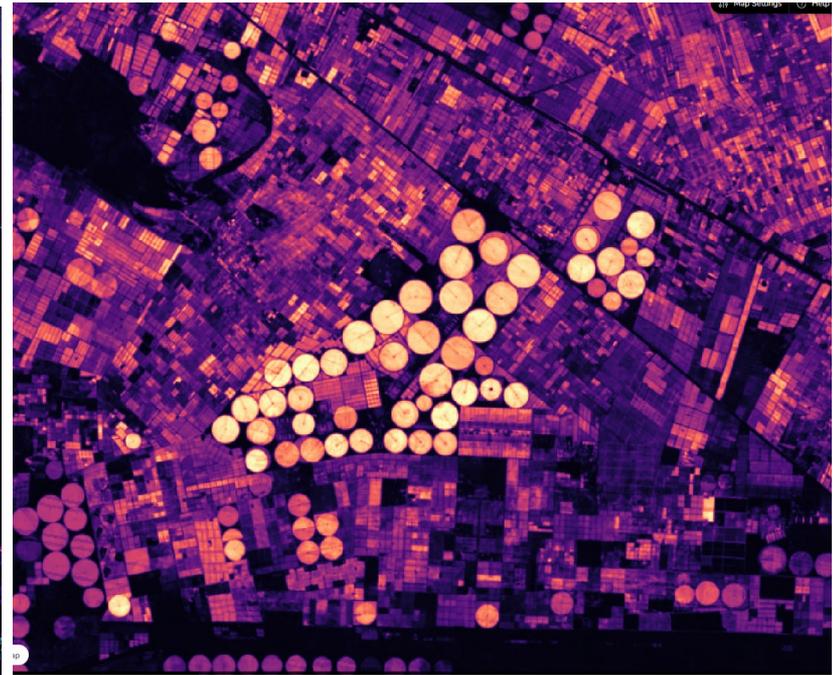
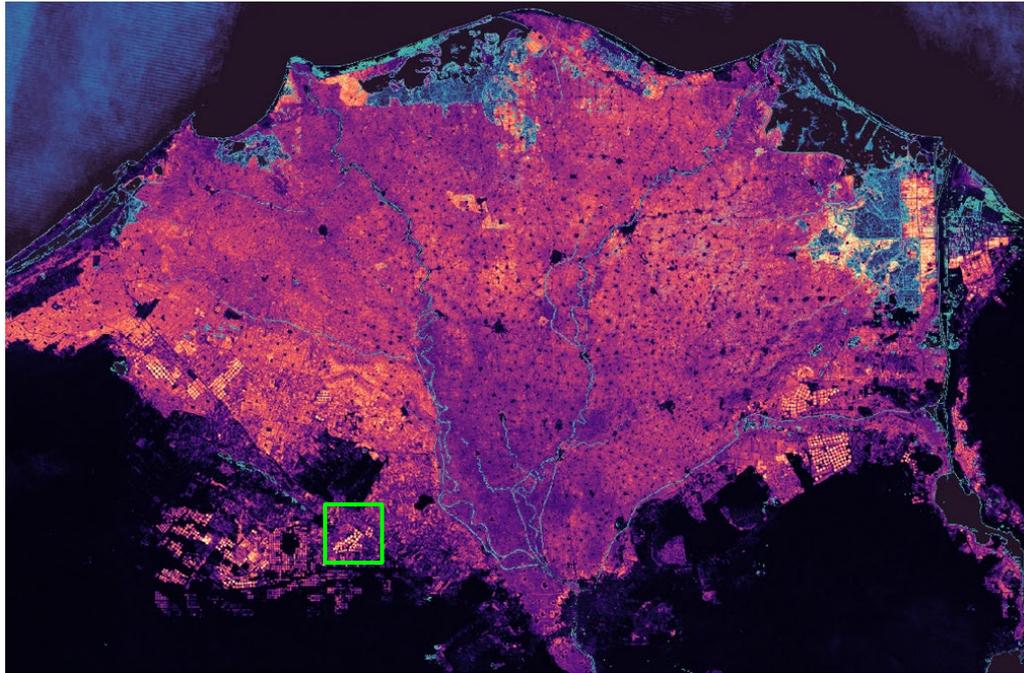
Landsat resolution monthly NDVI Standardised Climatologies/Anomalies



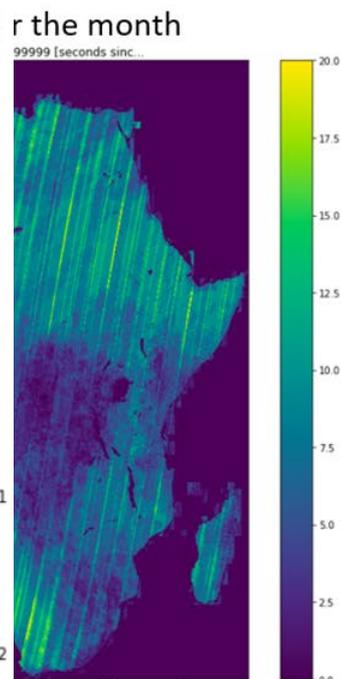
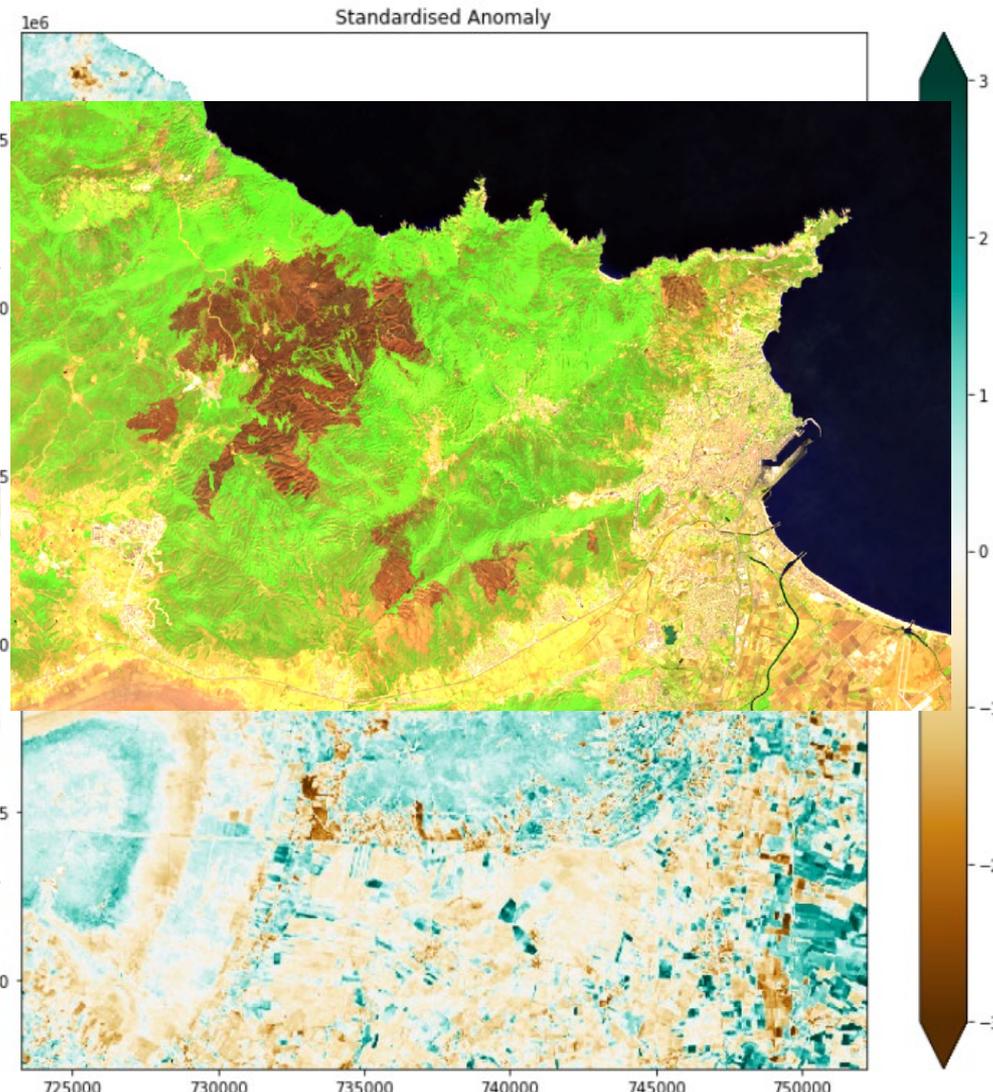
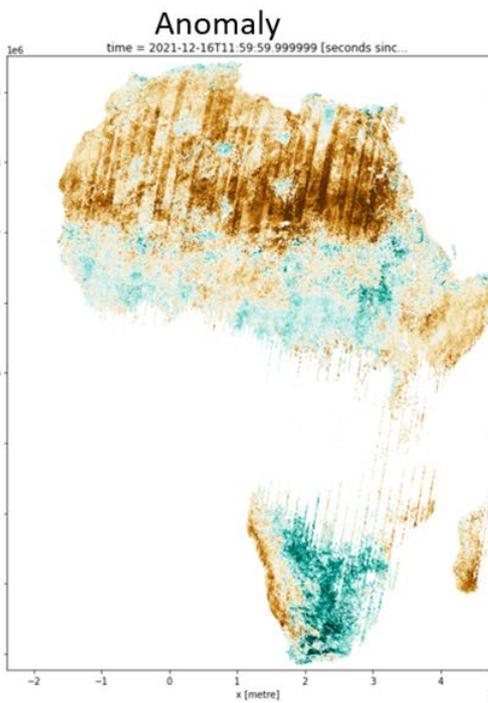
Left: Mean NDVI for Jan over Nile Delta, Egypt (WofS overlaid). Right: Zoomed in view; 30m resolution data provides a higher level of detail than other NDVI climatology products



Landsat resolution monthly NDVI Standardised Climatologies/Anomalies



Left: Std Dev NDVI for Dec over Nile Delta, Egypt (WOoS overlaid). Right: Zoomed in view; 30m resolution data provides a higher level of detail than other NDVI climatology products



Crop Type Workflow - An Open-Source Framework for Crop Type Mapping in Africa



Funded by the Enabling Crop Analytics at Scale (ECAAS) initiative initiated by Tetra Tech to develop a open source framework for crop type mapping and demonstrate an end-to-end workflow in Zambia.

Developing end-to-end workflows for crop type mapping :

- Statistical sampling
- ECAAS toolkit
- field data cleaning
- crop type classification
- accuracy assessment
- summary statistics



Field data sampling has been designed for central province, Zambia.

Crop Type Workflow - An Open-Source Framework for Crop Type Mapping in Africa



RCMRD leads engagement of government users in Zambia to understand needs, and collection of field data.



Improved Digital Earth Africa services through user feedback



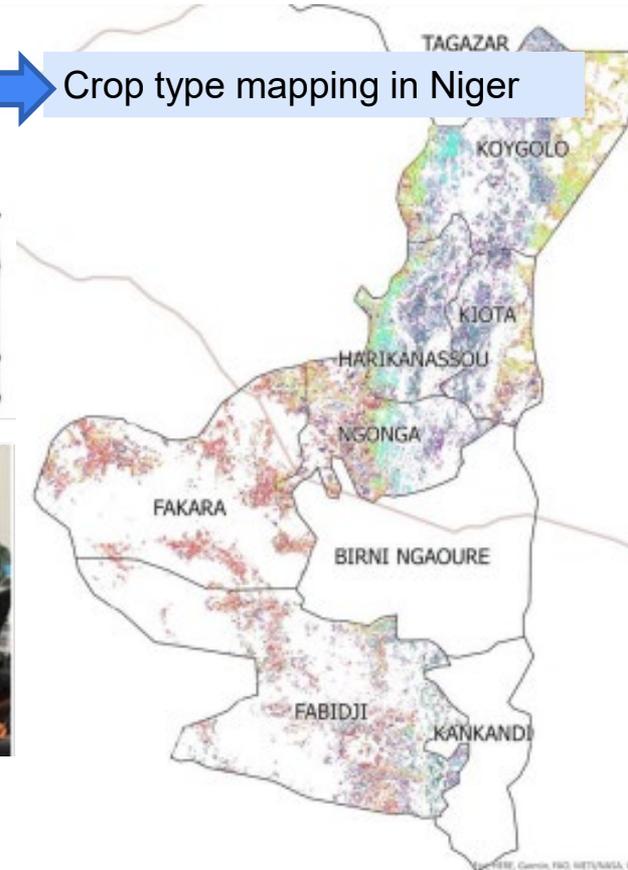
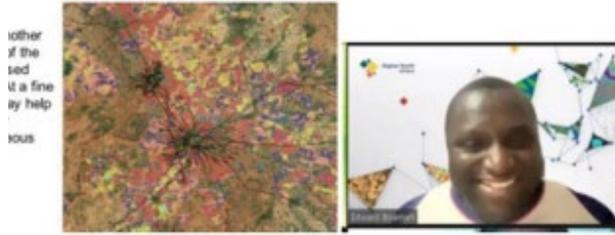
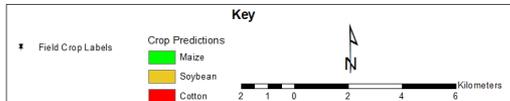
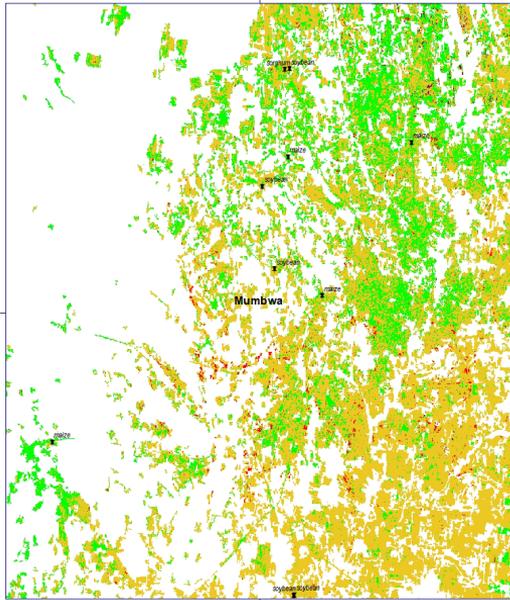
Transferable workflows example: crop type mapping

Crop type mapping in Zambia

Knowledge transfer through PDTT

Crop type mapping in Niger

ZAMBIA CROP TYPE MAPPING
SAMPLE AREA WITH GOOD CROP REPRESENTATION



Extending this framework across the continent



AFRIGIST in collaboration with
Digital Earth Africa Presents

A Workshop on Agriculture and Food Security

Date: 30th to 31st of May 2022
(English) and 1st to 2nd of June,
2022 (French)

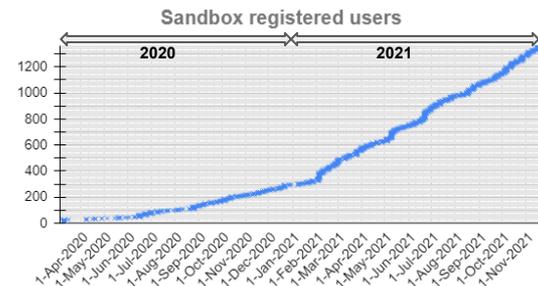
Expanding and engaged user community

Capacity development & user support



- Bilingual Platform, user support and training
- JupyterLab 3.x interface now available in French
- Worldwide thanks to DE Africa est. team

Growing user community



- Growing user engagement: >1,700 sandbox users; >9,000 unique Terria users
- Bilingual live sessions & awareness sessions

What's Next?



In Africa, For Africa



Contact me: Meghan.halabisky@digitalearthafrika.org



MANY THANKS TO THE USGS – LANDSAT PROGRAM

