AWS re:Invent

NOV. 29 – DEC. 3, 2021 | LAS VEGAS, NV

Digital Earth AFRICA

WPS204

Addressing climate change from space

Adam Lewis
Senior Advisor
Digital Earth Africa

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Head of Solutions Architecture, Sub-Saharan Africa
AWS

aws

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Outline

Who is Digital Earth Africa?

Unlocking Earth observation data for an entire continent

Benefits

Data foundations

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Our vision

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



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Digital Earth Africa



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Our network

- Governing Board members
- Program Management Office
- DE Africa Staff
- Digital Earth Africa Implementing Partners
- Technical Advisory Committee




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CSE


Fatou Mar
OSS


Omar Seidu
Ghana National Statistics Service


Edward Boamah
Digital Earth Africa


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Global Partnership for Sustainable Development Data

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Digital Earth Africa


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Joseph Tuyishimire
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Solofo Rakotondraompiana
University of Antananarivo

Emmanuel Nkurunziza
RCMRD

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COOi Studios

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Data, decisions, development



POWERED BY:

OPEN DATA CUBE

2 ZERO HUNGER

6 CLEAN WATER AND SANITATION

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

13 CLIMATE ACTION

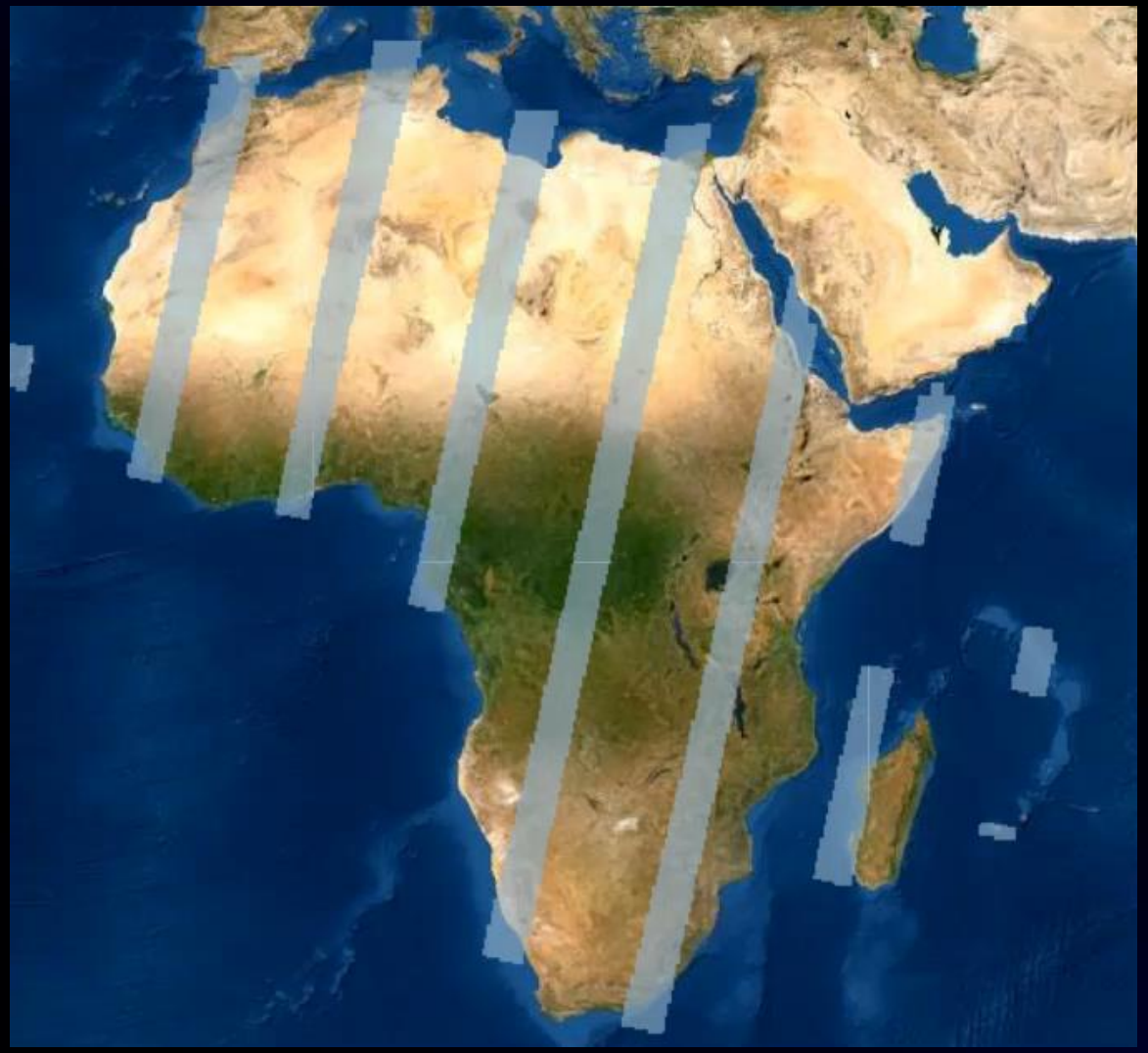
14 LIFE BELOW WATER

15 LIFE ON LAND

Agenda 2063
The Africa we Want

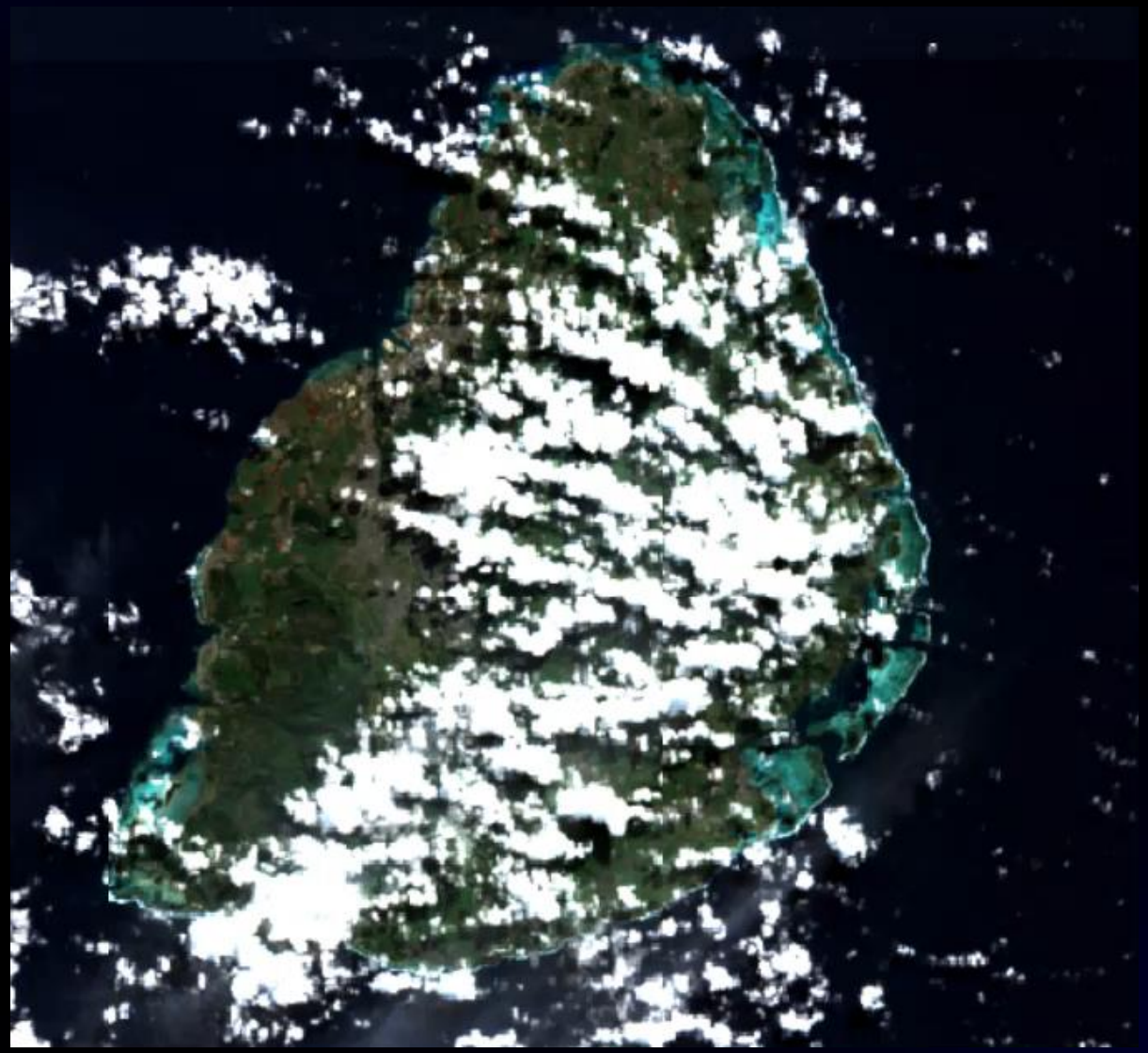
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Africa daily satellite observations



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Satellite data is messy!



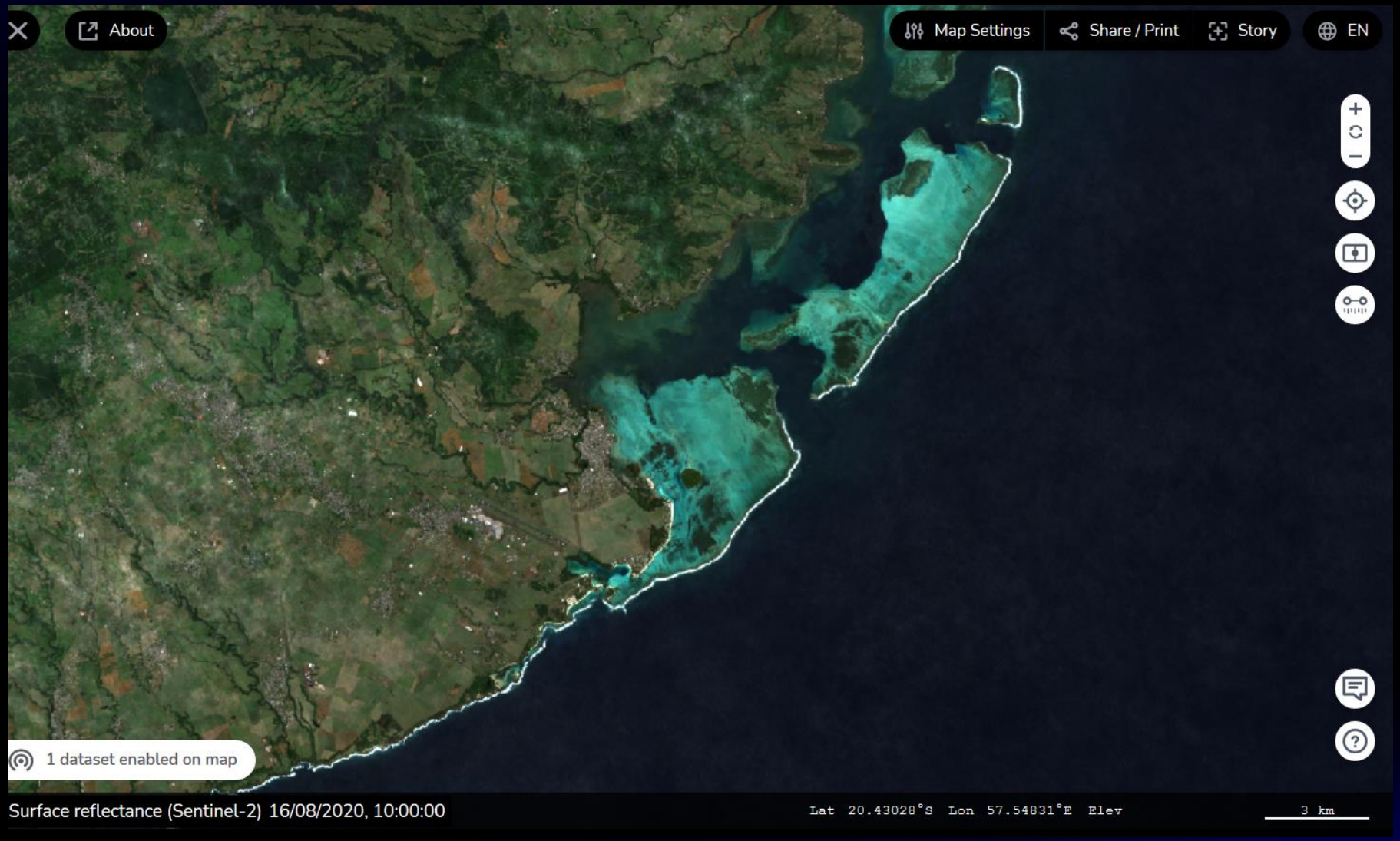
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Ship grounding, Mauritius, August 2020



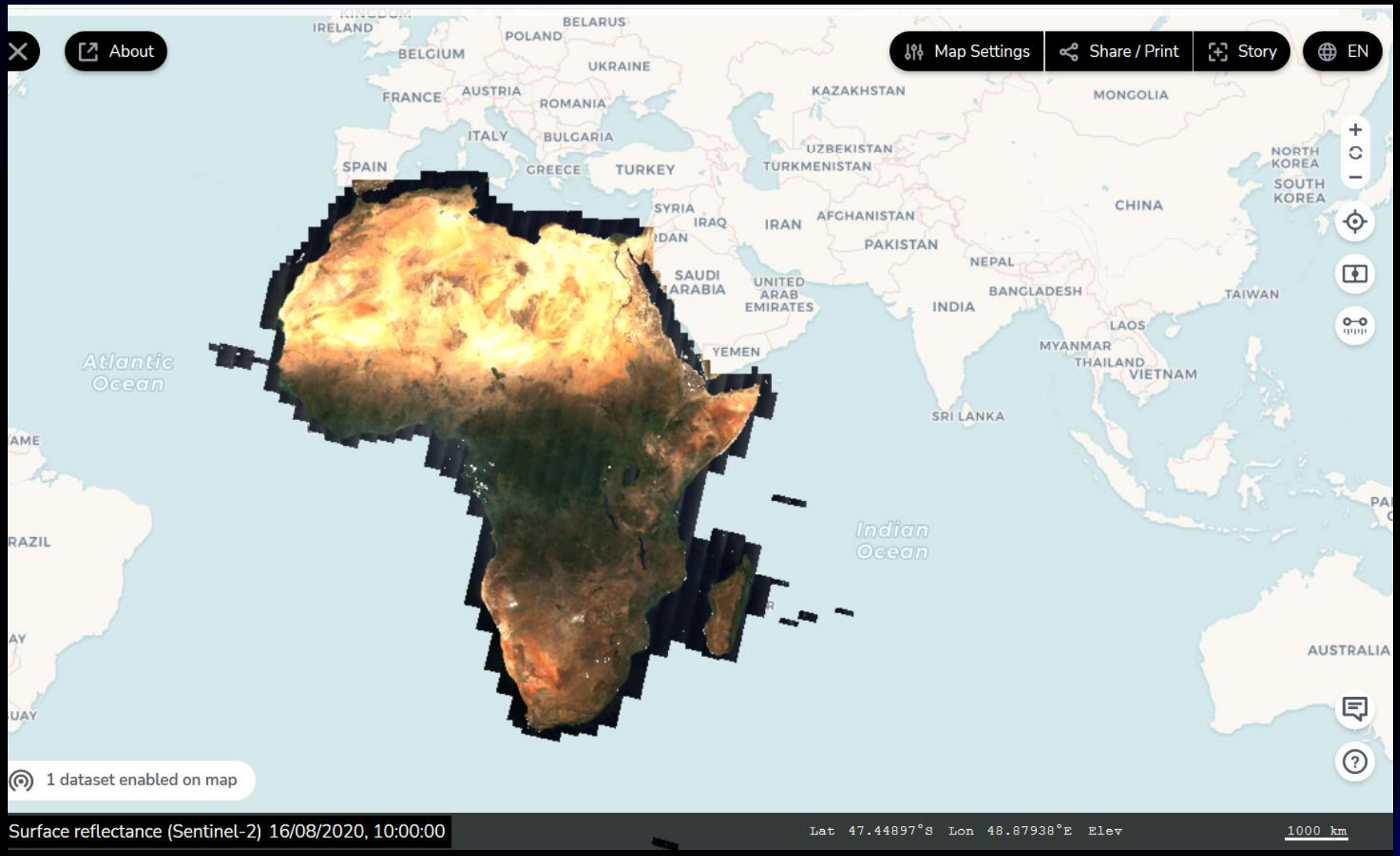
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Median image, 2020



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Median image, 2020

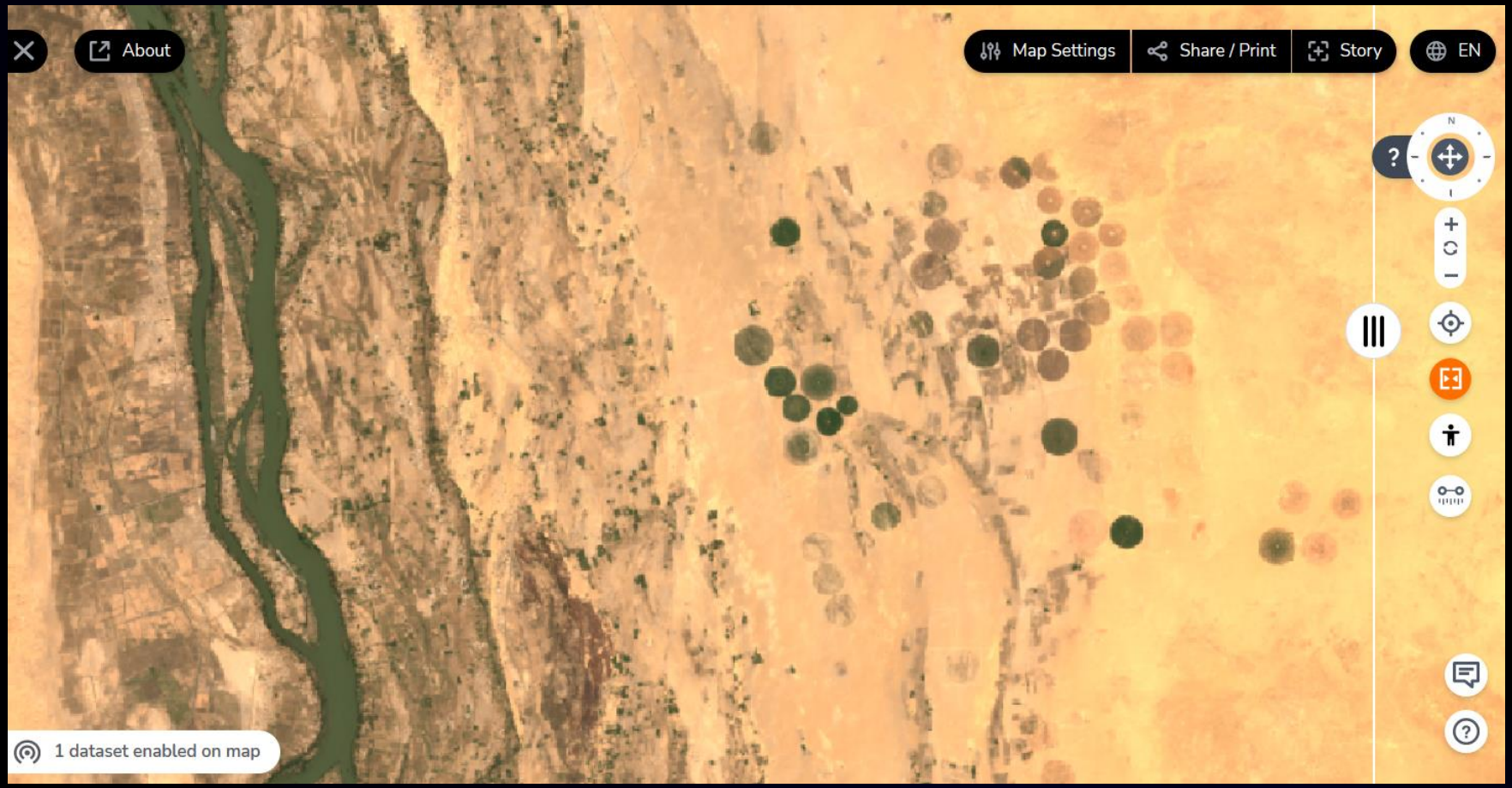


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Same dataset, multiple measurements

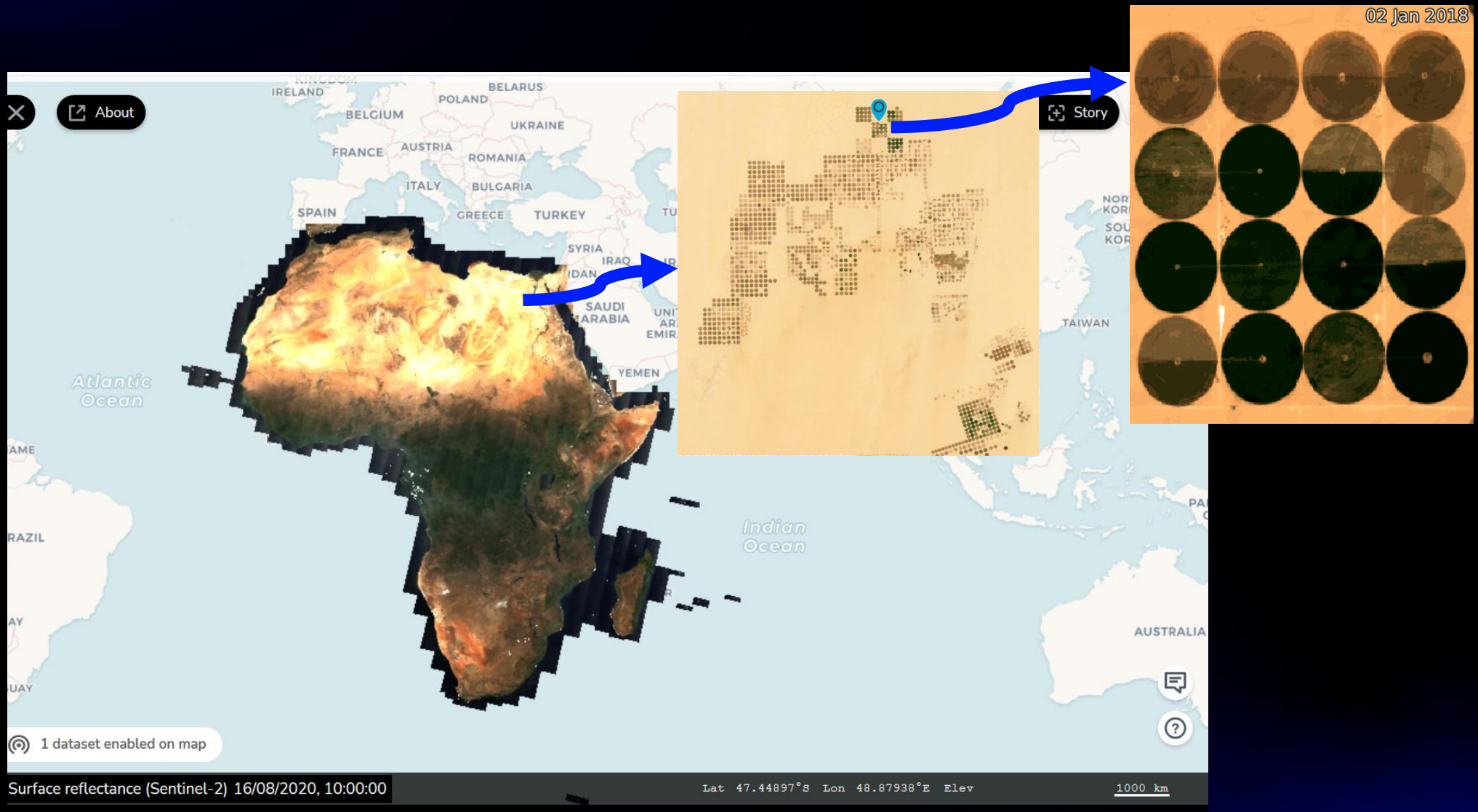
- Surface reflectance
- Vegetation
- Water
- Water quality
- Temperature
- Roughness
- Annual variation
- Surface reflectance

[Digital Earth Africa map]



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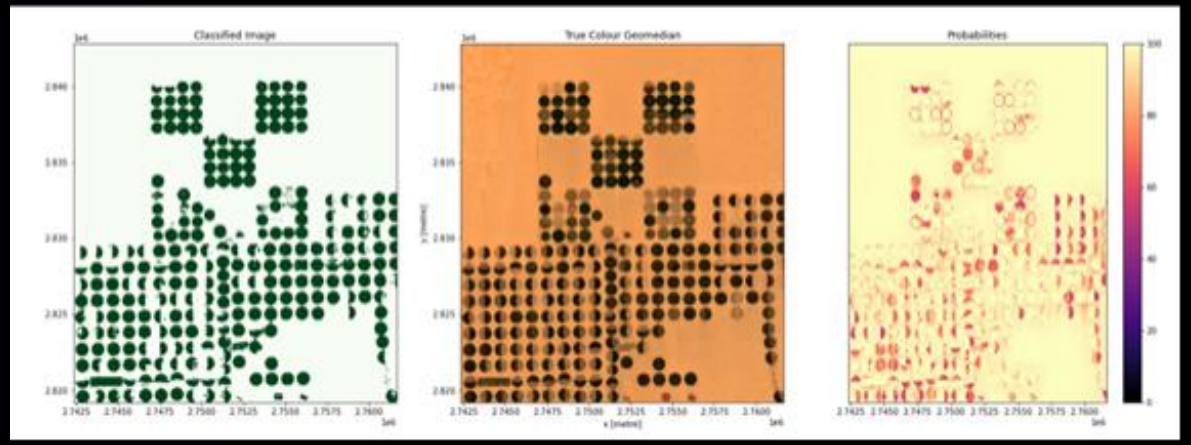
Median image, 2020

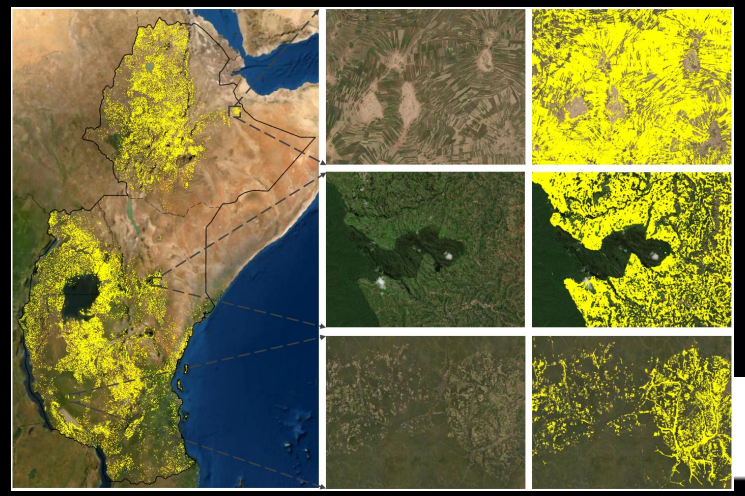


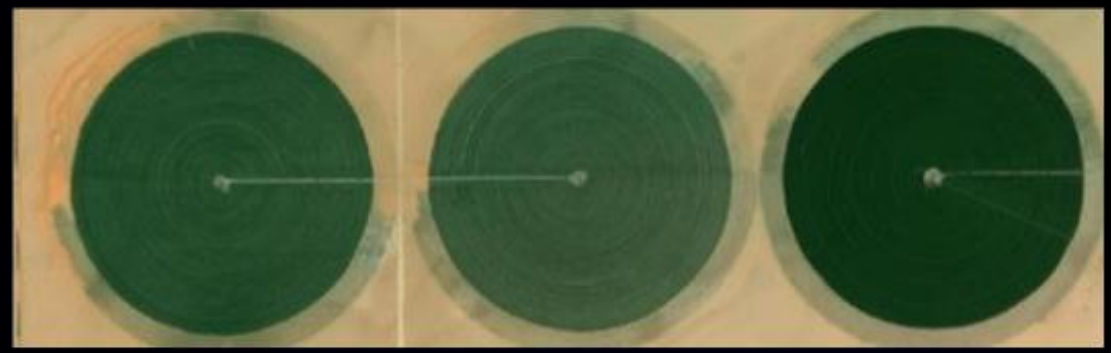
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Crop mapping

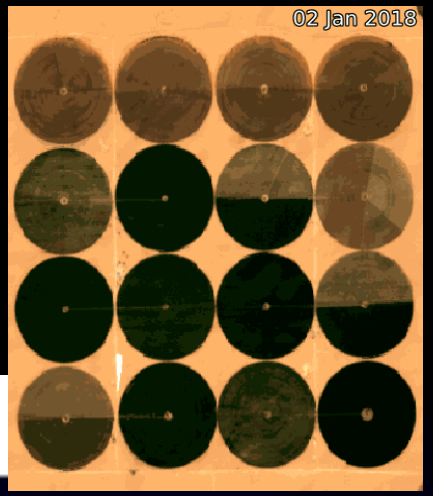






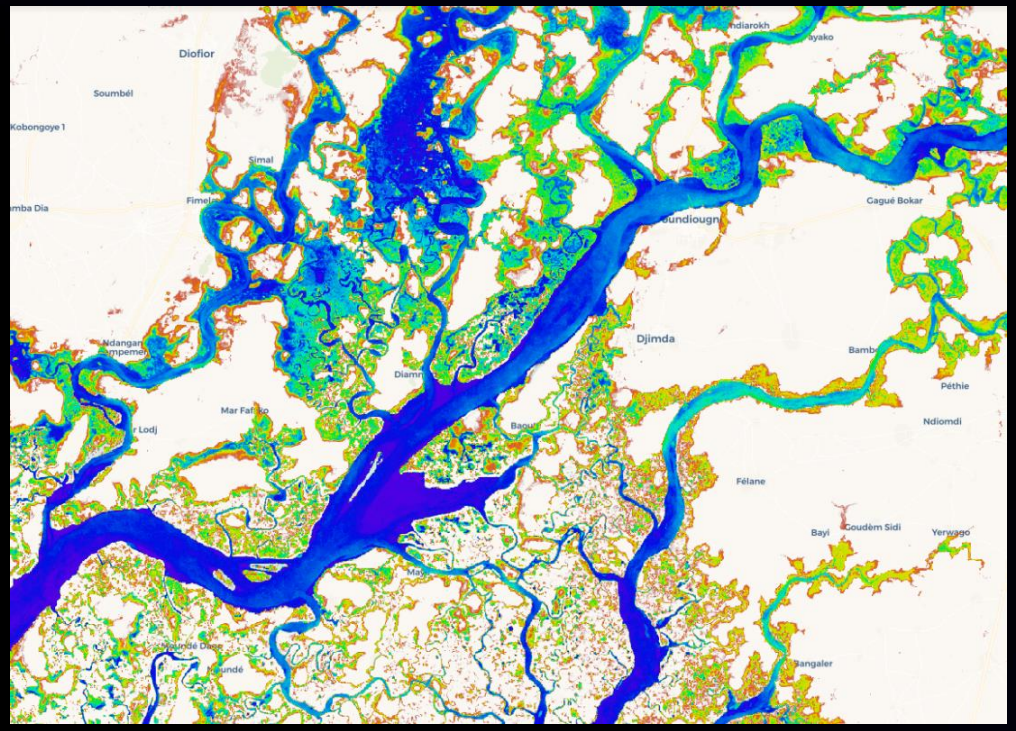


Al Wahat Al Dakhla Desert, New Valley Governorate, Egypt. (22°45'54.1"N 28°34'08.7"E)

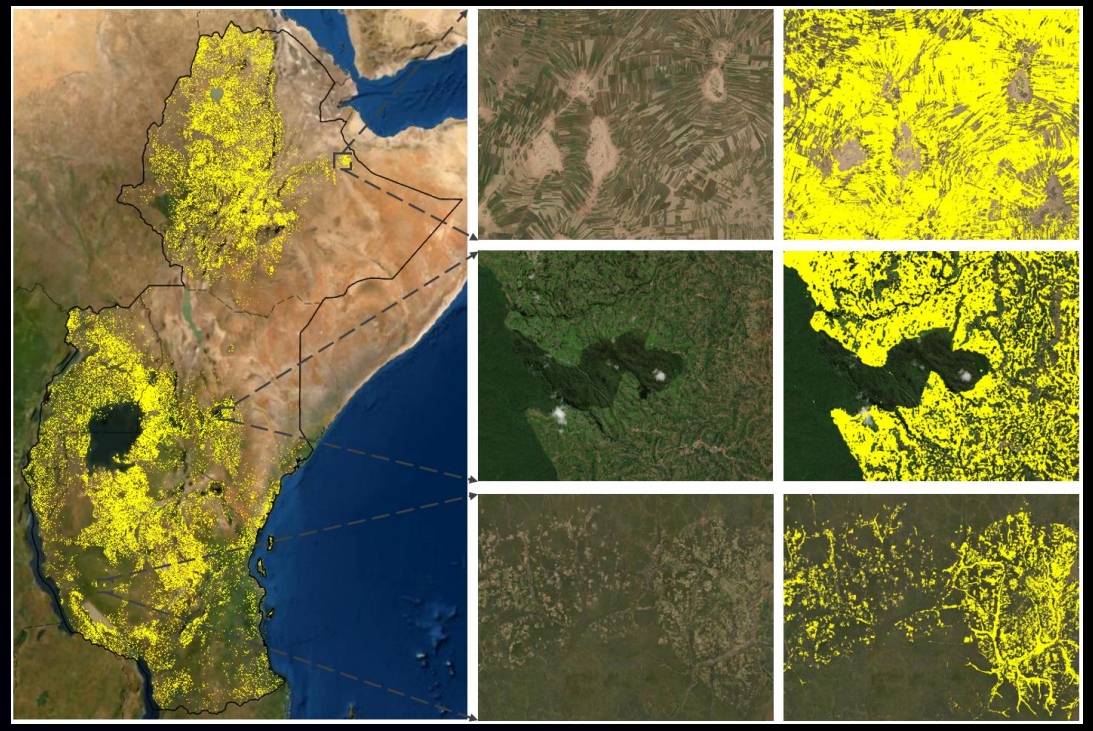


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Continental information services



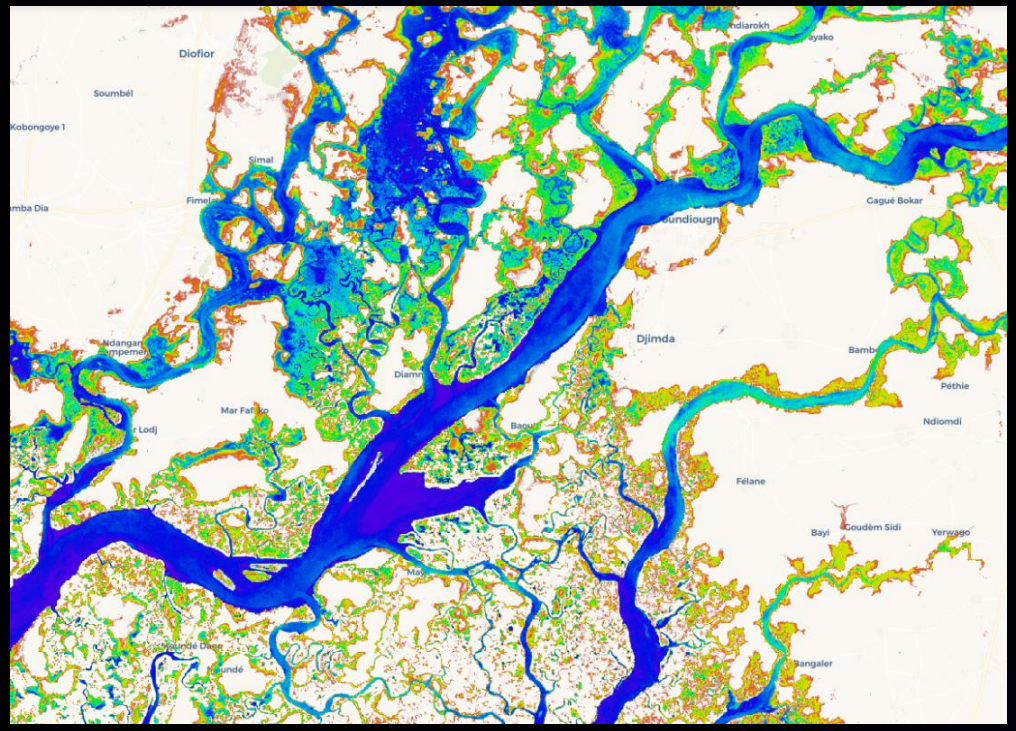
Water observations from space help to monitor water extent over time



Prototype cropland area map for East Africa; this product will help to accurately define farmland areas and the change to crops over time

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Continental information services

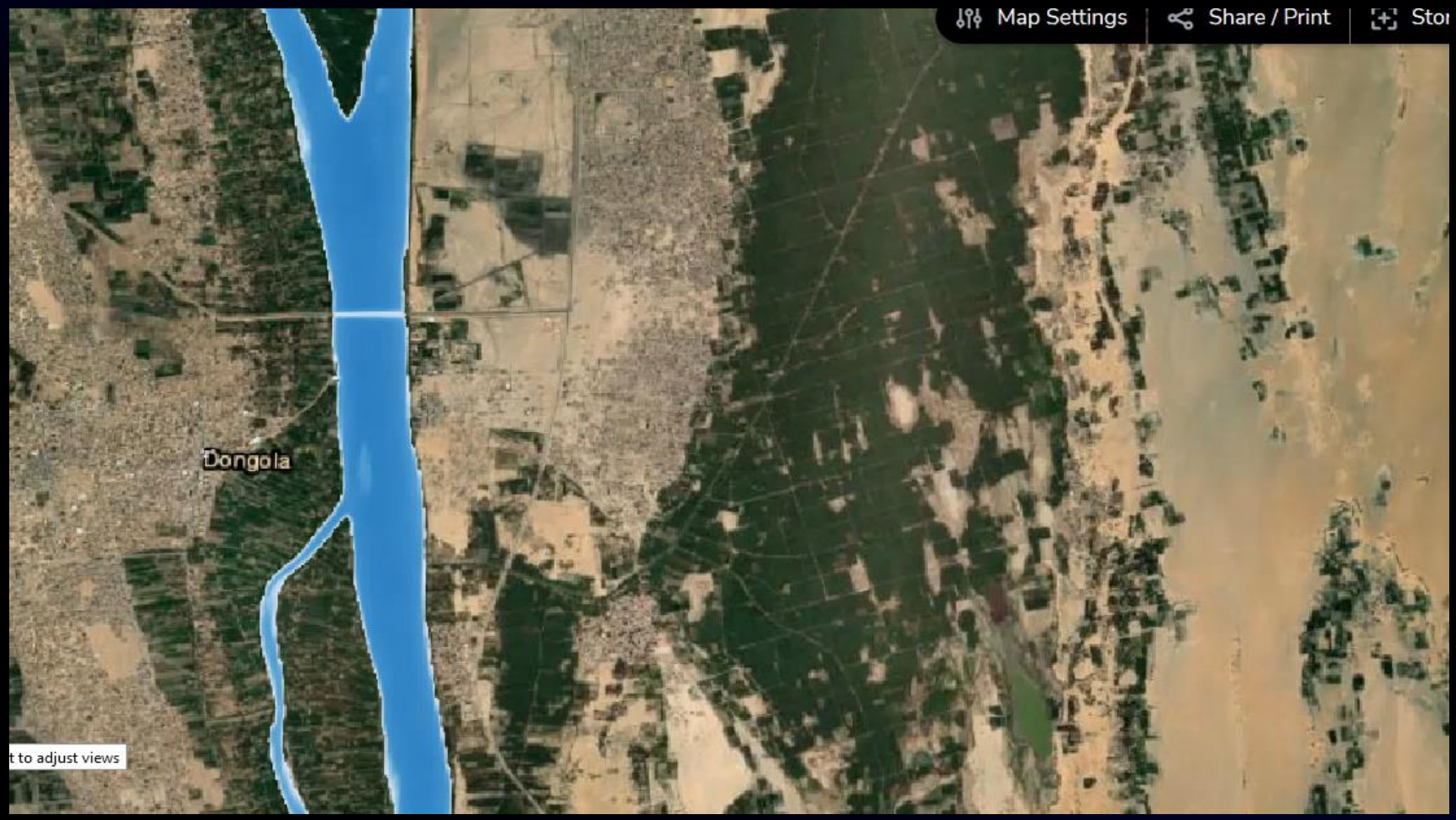


Water observations from space help to monitor water extent over time



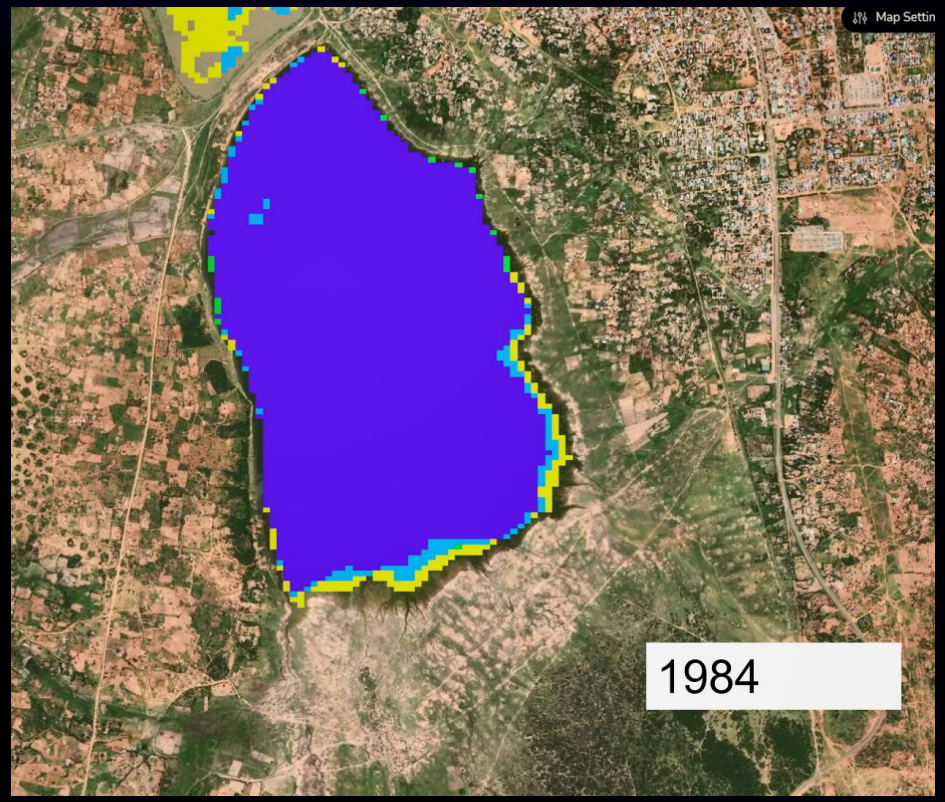
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Sudan floods, September 2020



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Rift Valley lakes



Singida, Tanzania

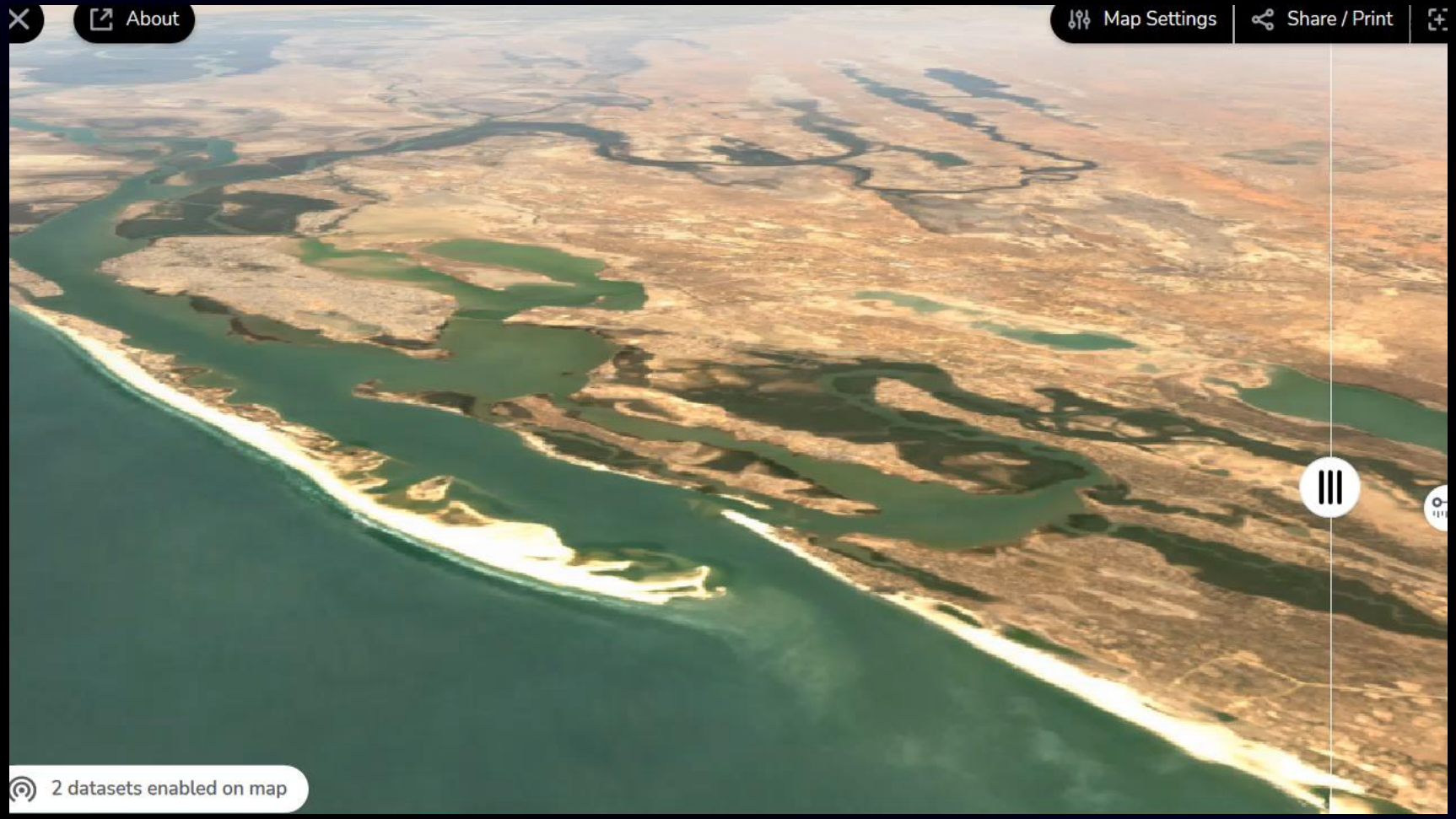




Lake Baringo, Kenya, September 2020

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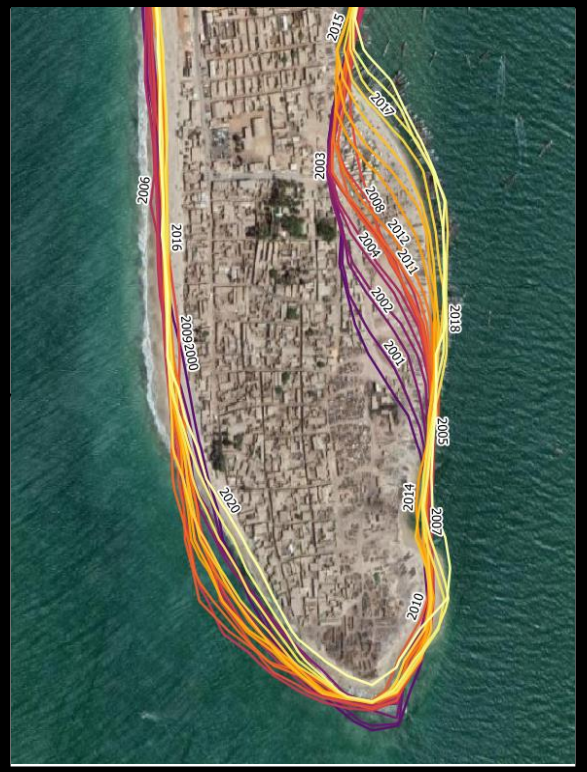
Senegal coastal change, 2017–2019



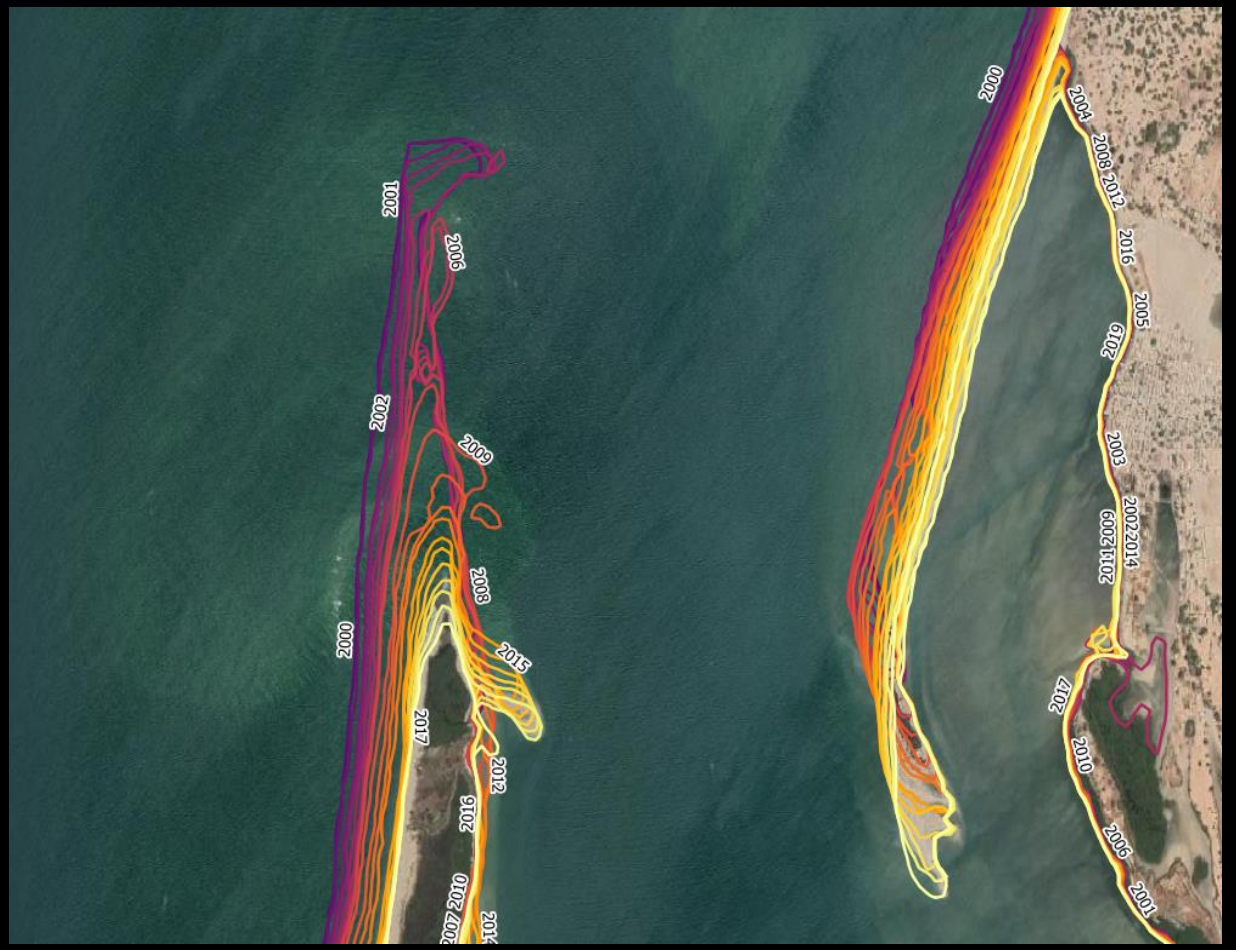
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Senegal coastal change, 2017–2019





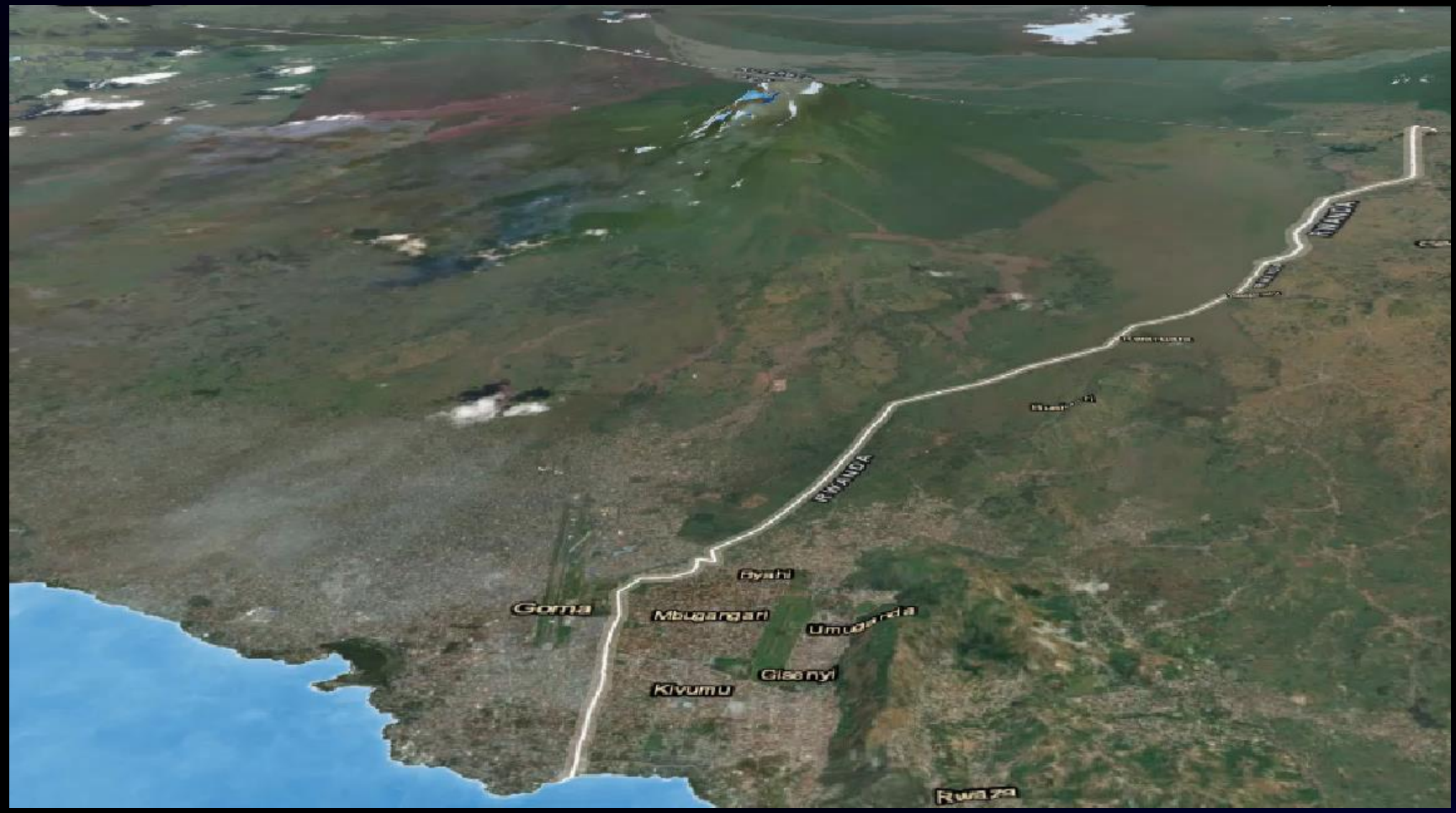
Point of Sangomar, Senegal, 200 m



Dionewar, Senegal

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Goma lava flows, May 2021 (radar)



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From products to people

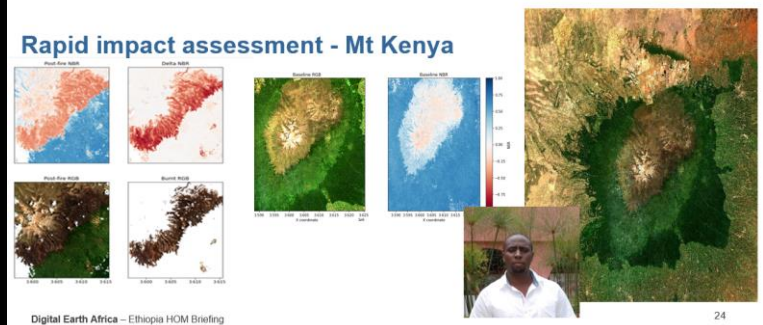
APPLICATION CASE STUDIES

Mapping forest fires

RCMRD

Digital Earth AFRICA

Rapid impact assessment - Mt Kenya



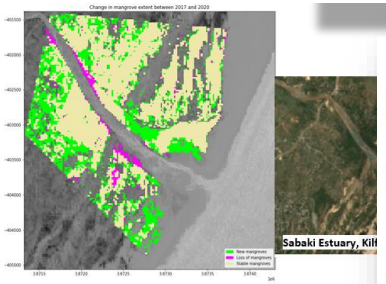
Digital Earth Africa – Ethiopia HOM Briefing

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Earth observation to protect wetlands

Preservation of mangroves in Sabaki Estuary, KEFR

- Wetlands, including river deltas, peatlands and mangroves are a crucial part of the Kenyan landscape and biodiversity. The Kenya Forest Research Institute (KEFRI) has been supporting the monitoring and protection of wetlands in the country, taking part in World Wetlands Day to celebrate the six Ramsar sites across Kenya.
- Dr. Stanley Nadir, a research scientist in Soil Science and Water Management with KEFRI recognised the need to protect this important ecosystem against Digital provide

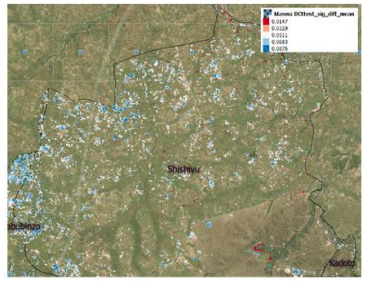


Sabaki Estuary, Kil

Co-developing Use Cases as Path to Decision Makers

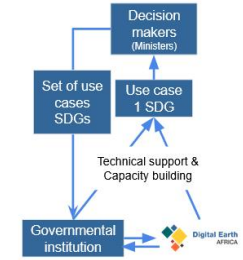
Digital Earth AFRICA

Cotton Farming in Simiyu District, Tanzania









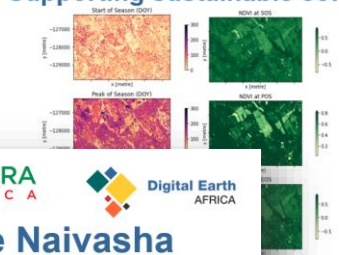
Minister of Finance and Planning Dr Phillip S Mpango

35

Intelligent agriculture

Digital Earth AFRICA

Supporting sustainable coffee production in Kenya





21

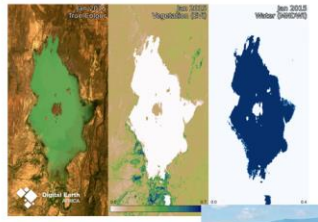
Giraffes, satellite data & a shrinking island

Digital Earth AFRICA

Climate resilience in Kenya

- DE Africa platform was recently used to assess the habitat of a herd of endangered Rothschild's giraffes, who were living on an island in the centre of Kenya's Lake Baringo. The island, whose shoreline has been receding for some time, eventually became uninhabitable for the giraffe population, which was moved by raft to safer territory.
- Published both as a Story Map and a Video
- Collaboration with the Northern Rangelands Trust, Kenyan conservation groups, and the Global Partnership for Sustainable Development Data.

Digital Earth Africa





Cane poaching

Food security & local farmers



Digital Earth Africa

22

Unsustainable agriculture, Lake Naivasha

LENTERA AFRICA

Digital Earth AFRICA

Impact of pesticide overuse on water quality

- Pesticides overuse is a serious problem in Kenyan farms with wide-reaching consequences for human health and the environment.
- Lentara (AgriTech company) are working with the World Wildlife Fund to raise awareness on the negative impacts of bad farming practices.
- Joyce Siundu used DE Africa to demonstrate impact on water quality and quantity in Lake Naivasha, Kenya through time and help encourage use of organic farm inputs as a substitute for chemical fertilizer.





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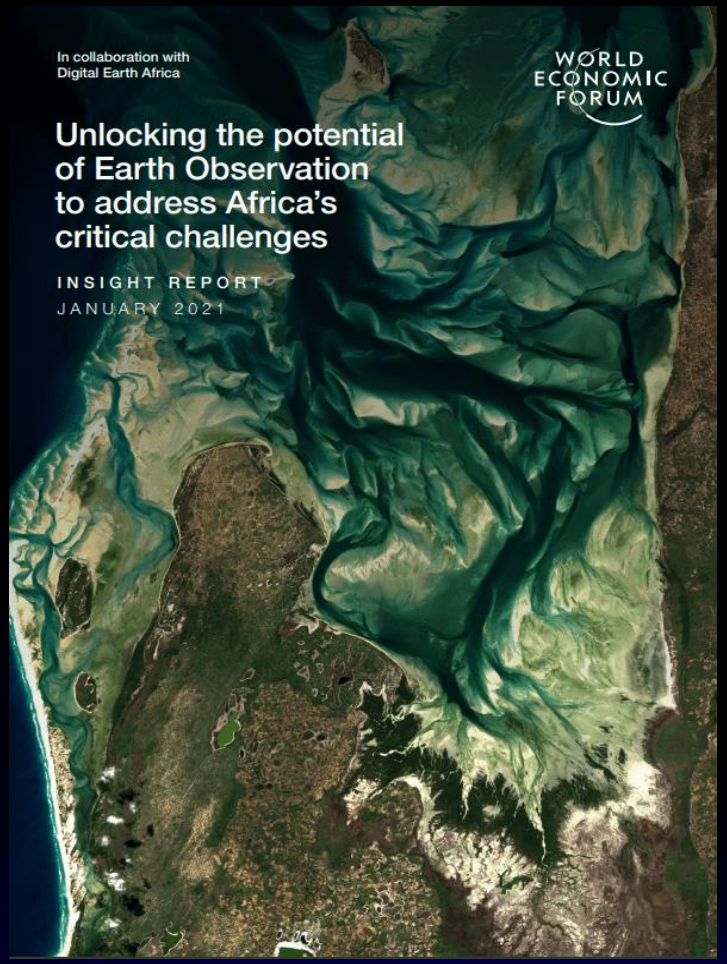
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The value of Earth observation data

REALIZING THE POTENTIAL

- The potential (economic) value of EO data for Africa is in the billions of dollars – through improvements in agricultural production, water use, regulation of mining, digital transformation/accelerated growth, etc.
- Digital Earth Africa (DE Africa) aims to unlock this potential!

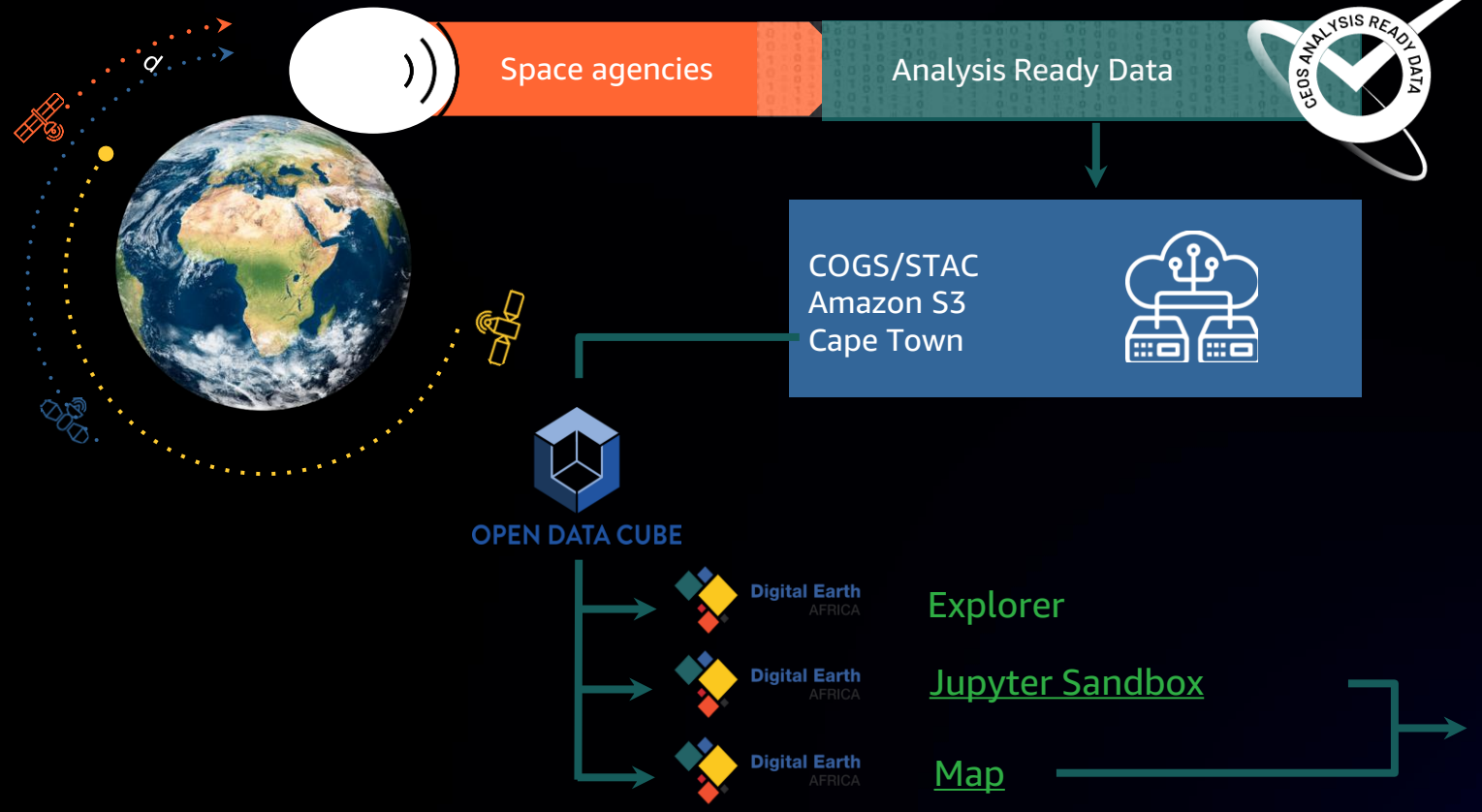


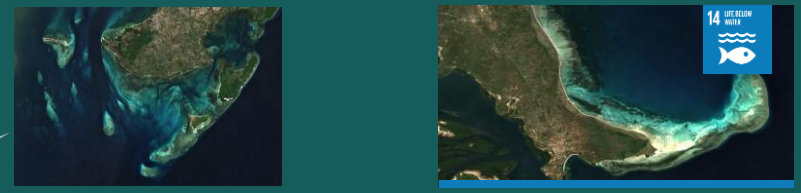


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Analysis-ready EO data pipelines

OPERATIONAL DATA PIPELINES ARE THE FOUNDATION FOR DIGITAL EARTH AFRICA

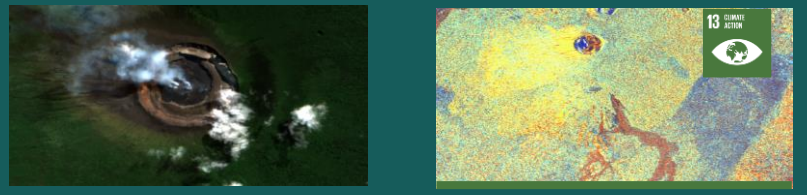




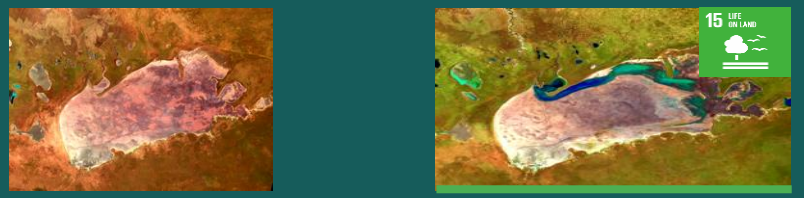
Studying the Tanzanian coastline with GeoMAD, 2019, RGB



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 color

Find out more technical detail in Digital Earth Africa documents

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Analysis-ready EO data pipelines

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Services and analysis tools

- WOfS – water observations from space
- GeoMAD
- Food security
- Coastal erosion
- Chlorophyll-a in water bodies
- Monitoring mangroves
- Tidal data
- Wetlands
- Changes in urban extent
- Changes in vegetation

UNLOCKING THE PROMISE OF TOMORROW FROM THE PATTERNS OF THE PAST

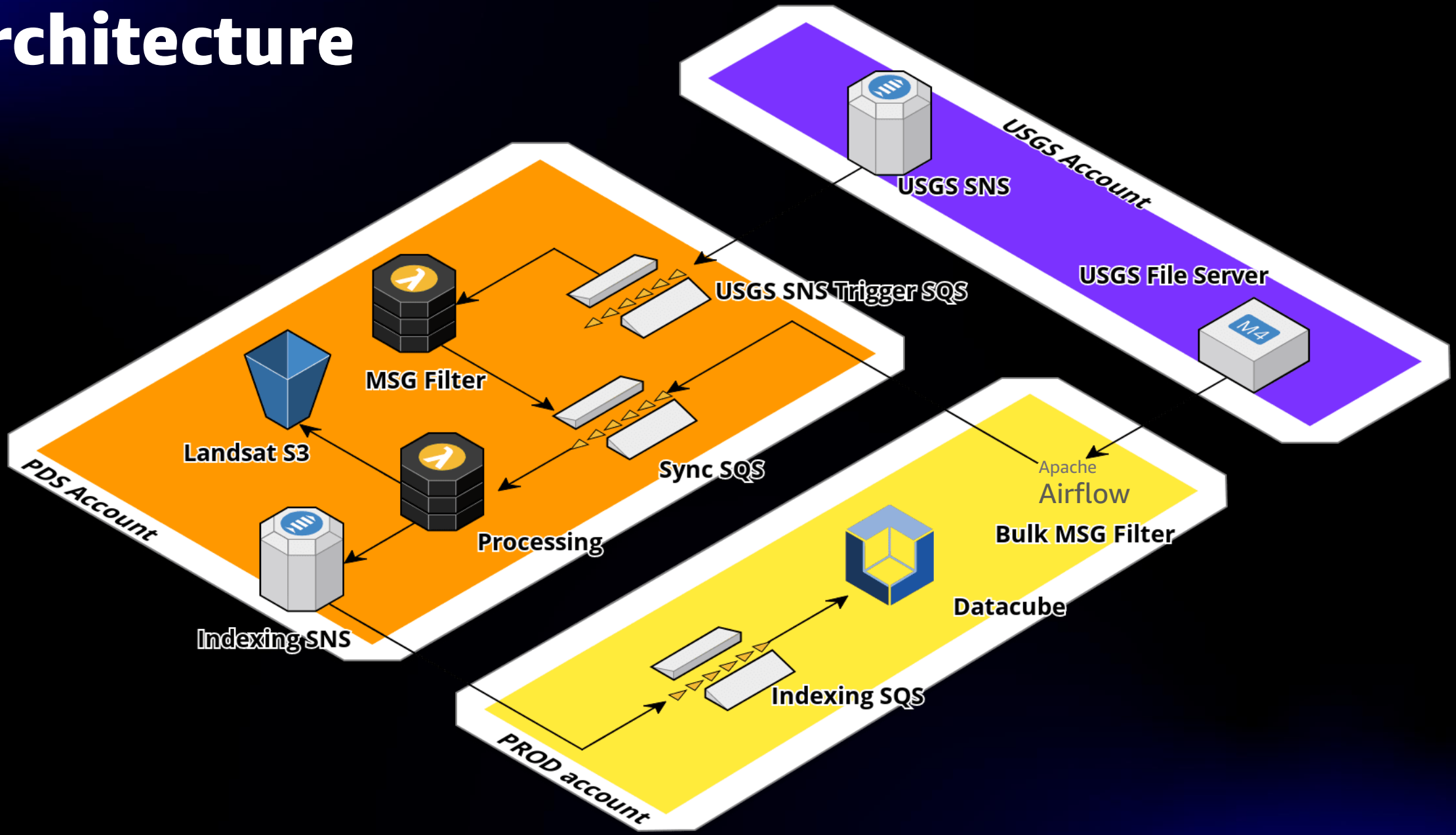


Digital Earth AFRICA



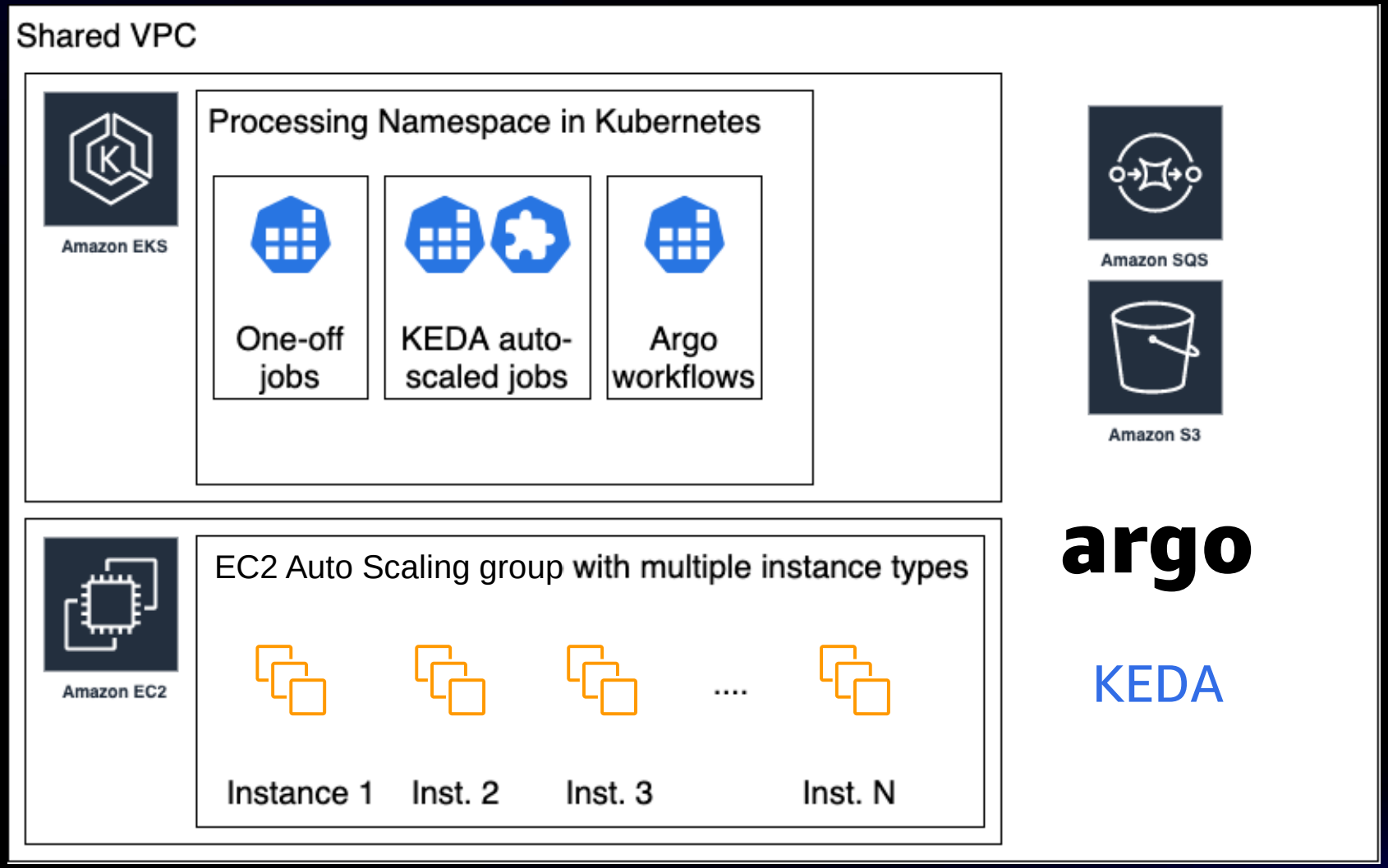
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Architecture



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Managing containers



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Amazon ECS or Amazon EKS?



Amazon ECS

Powerful simplicity



Amazon EKS

Open flexibility

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Open flexibility



EKS

Gain agility and efficiency with AWS-optimized Kubernetes, and standardize operations everywhere

Secure, highly available, with observability across all Kubernetes deployments

Build with choice of solutions from the broader community around Kubernetes

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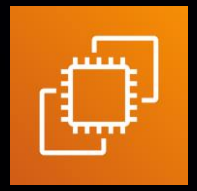
Run your containers anywhere based on your workload needs

Serverless



AWS Fargate

EC2 options



Amazon EC2



Spot Instance

Edge and 5G



AWS Local Zones



AWS Wavelength

On premises



AWS Outposts



Amazon EKS Anywhere

Amazon ECS Anywhere

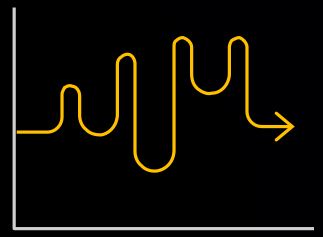
aws

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Lower TCO with Amazon EC2 purchase options

On-Demand

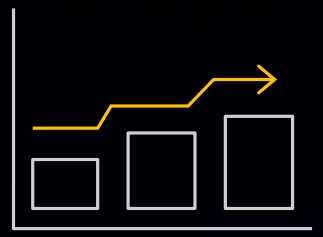
Pay for compute capacity by **the second** with no long-term commitments



Spiky workloads, to define needs

Reserved Instances and Savings Plan

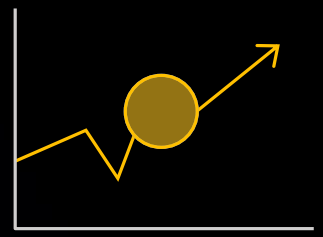
Make a commitment and receive a significant discount off compute



Committed and steady-state usage

Spot Instances

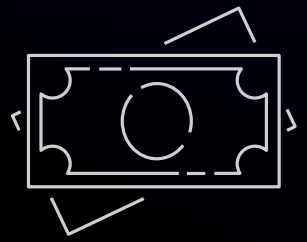
Spare EC2 capacity at **savings of up to 90%** off On-Demand prices



Fault-tolerant, flexible, stateless workloads

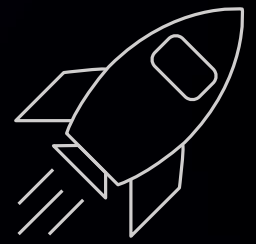
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Do more for less with Spot Instances



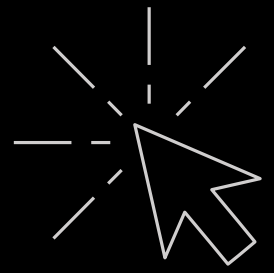
Low, predictable prices

Up to 90% discount over On-Demand prices



Faster results

Increase throughput up to 10x while staying in budget



Easy to use

Launch through AWS services (e.g., ECS, AWS Batch, Amazon EMR) or integrated third parties

Spot Instances are reclaimed with a 2-minute warning and only when On-Demand needs capacity back – **no bidding**

aws

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1 million scenes

- 1M Landsat scenes
- 300 compute nodes
- 2,000+ vCPU
- 5.5 TB RAM
- 4M GeoTIFF images
- 10 hours

Digital Earth AFRICA

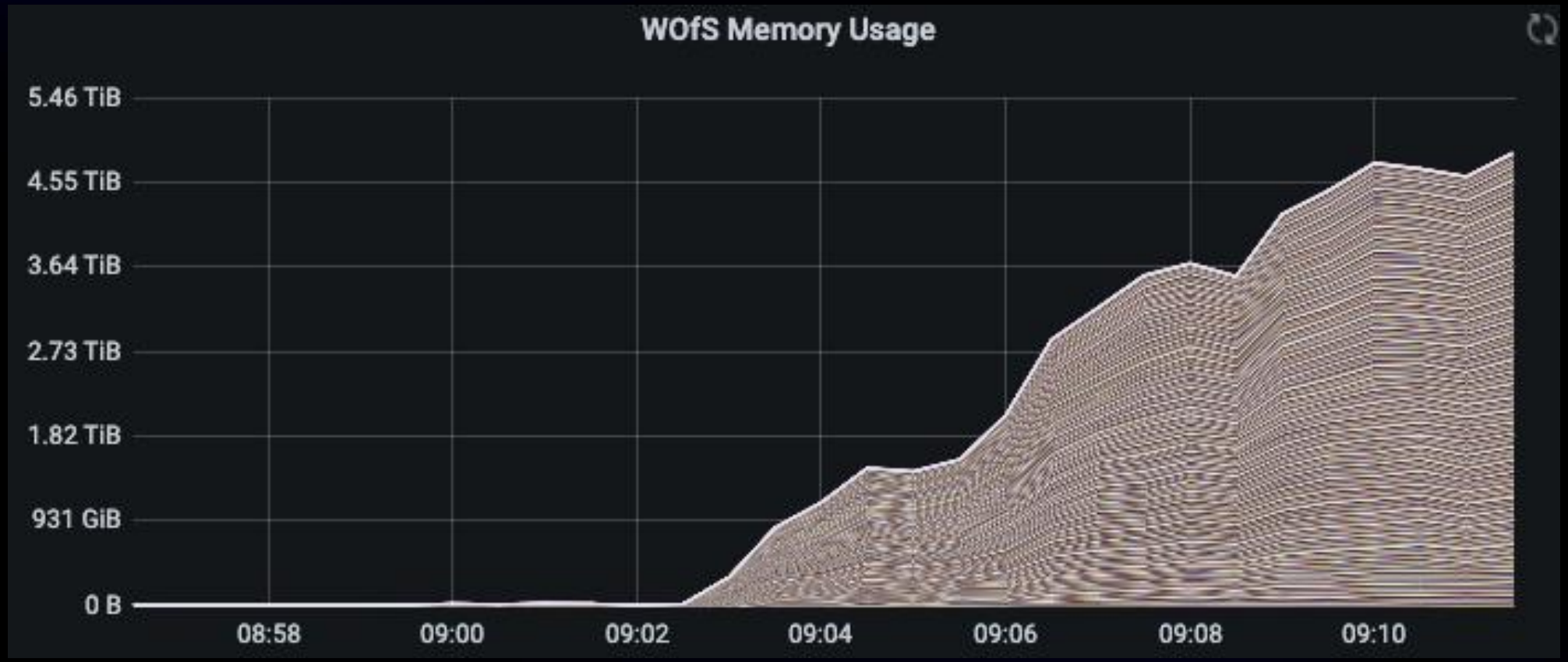
UNLOCKING THE PROMISE OF TOMORROW FROM THE PATTERNS OF THE PAST



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WOfS memory usage



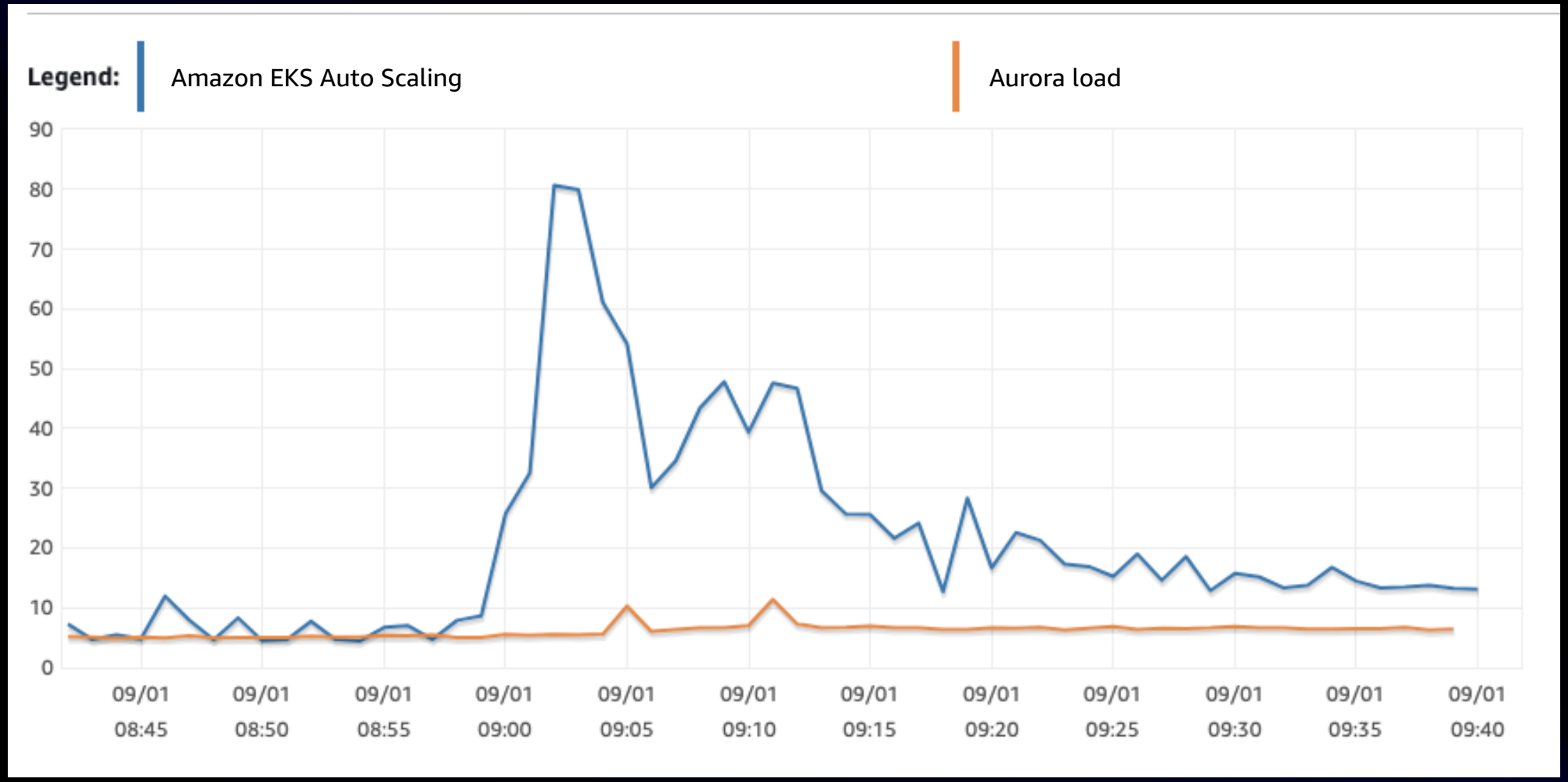
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WOfS EC2 instance count



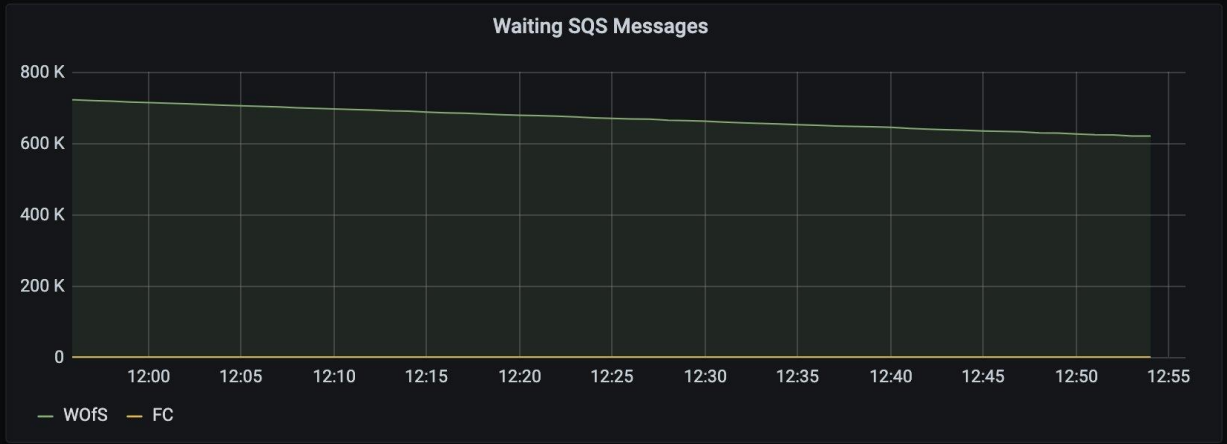
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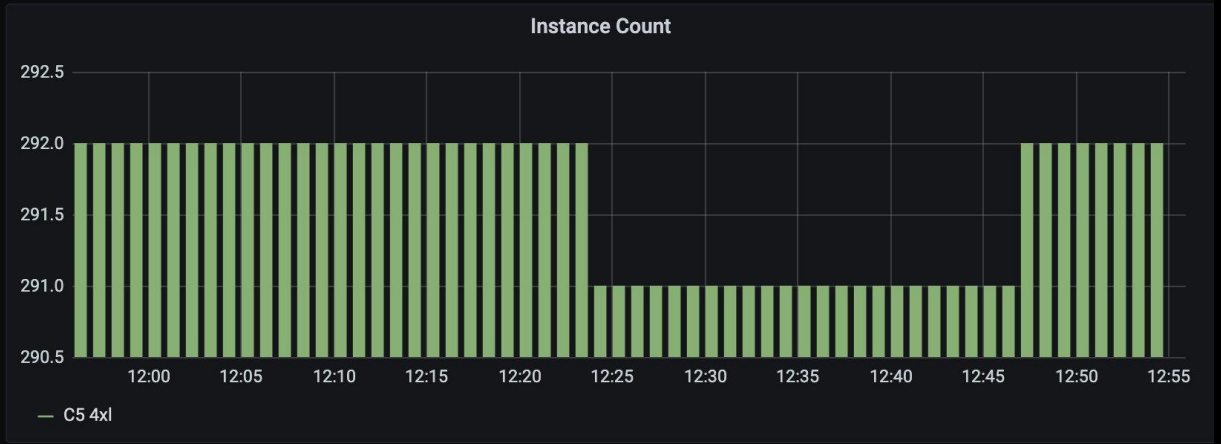
WOfS Amazon Aurora load



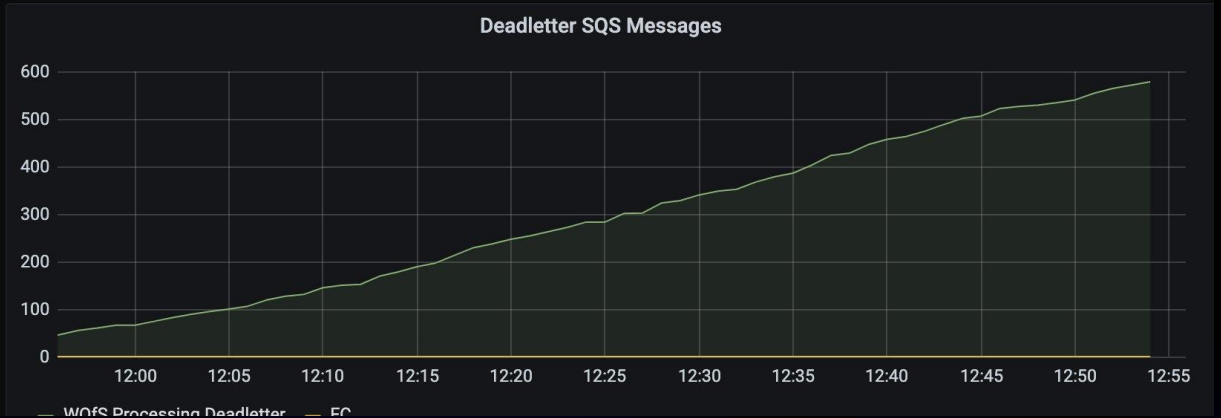
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WOfS dead-letter queue









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1 million scenes

- 1M Landsat scenes
- 300 compute nodes
- 2,000+ vCPU
- 5.5 TB RAM
- 4M GeoTIFF images
- 10 hours
- Total cost = $700

Digital Earth AFRICA

UNLOCKING THE PROMISE OF TOMORROW FROM THE PATTERNS OF THE PAST



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Value proposition

- An African solution
- Insights for all of Africa
  - Prebuilt services available
  - Build your own
- It’s free

Digital Earth AFRICA

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Thank you!

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