RAMONA

Rangeland Monitoring for Africa

Using Earth Observation - Continental Demonstrator

Project achievements – Sponsor request 3525Qa

2023-12-20

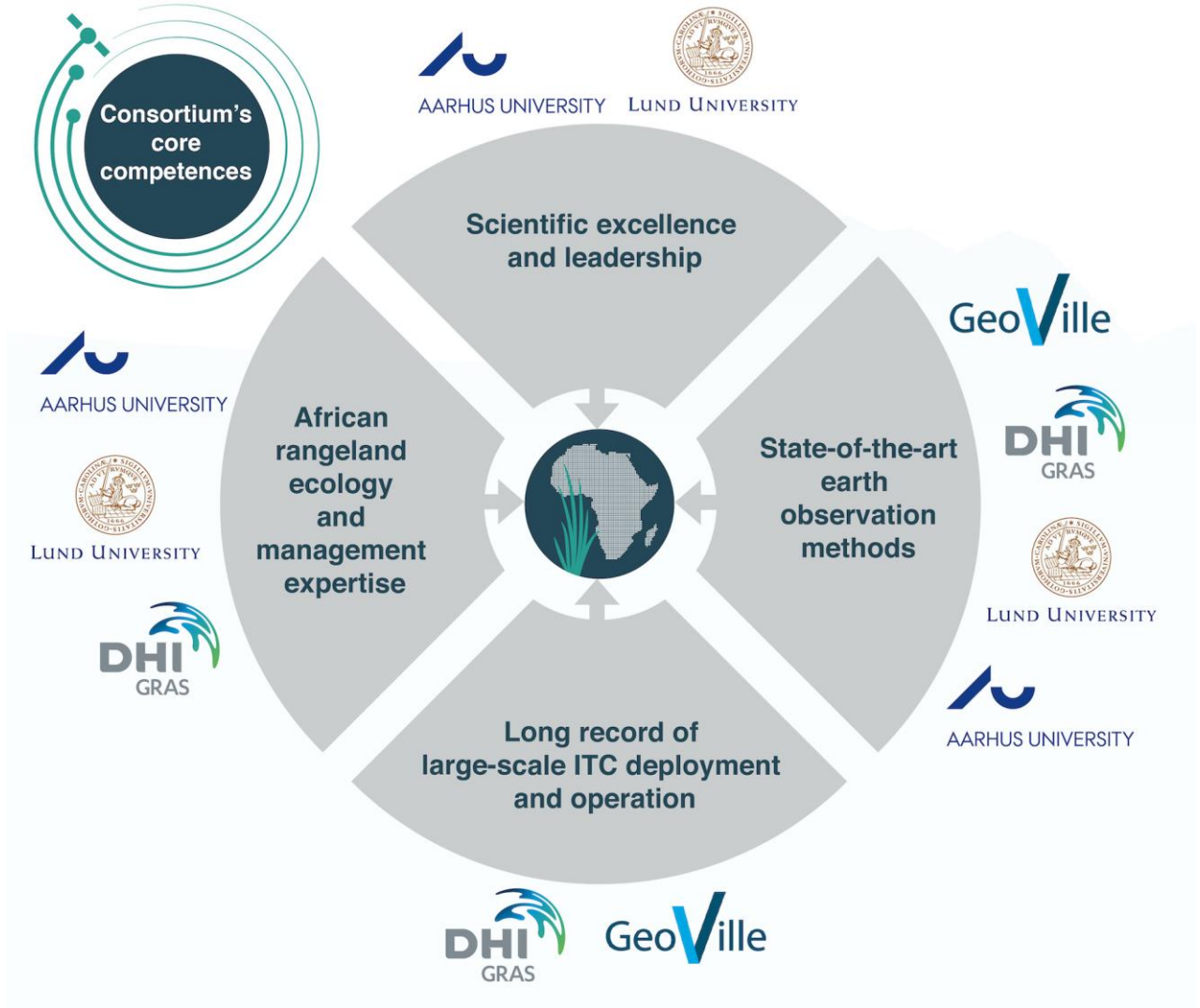
AARHUS UNIVERSITY

LUNDS UNIVERSITET

DHI GRAS

GeoVille

Consortium & Partners:



Joint Research Centre JRC

GEOGLAM RAPP Rangeland and Pasture Productivity

ILRI INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

WFP

FAO FIAT PANIS

IFAD

UNIVERSITAS STUDIORUM MEDIOLANENSIS

NoR

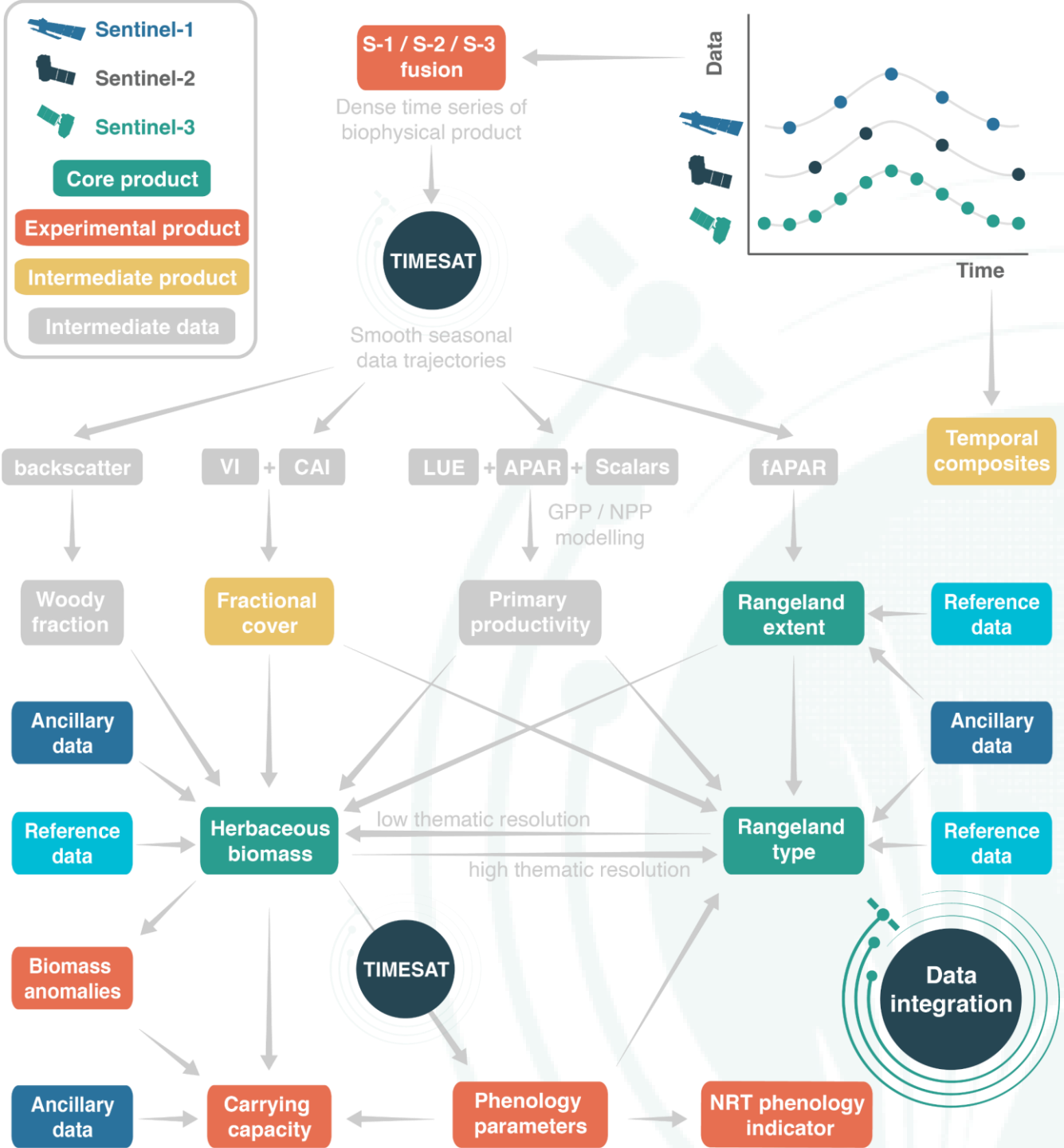
Project objectives

- Develop and implement a prototype for an EO based rangeland monitoring system at continental scale for Africa. It shall be based on synergetic utilisation of Sentinel-1 SAR and Sentinel-2 as well as Senitnel-3 multi-spectral data and shall cover the entire continent at 10m spatial resolution.

- The products, under which the core products are Rangeland type, extent and herbaceous biomass, makes use of the synergies from the three Sentinel constellations in order to get cloud-free dense timeseries data.

- More information available at: https://www.ramona.earth/

Detailed project flow



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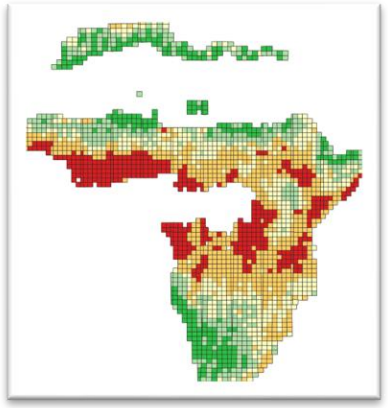
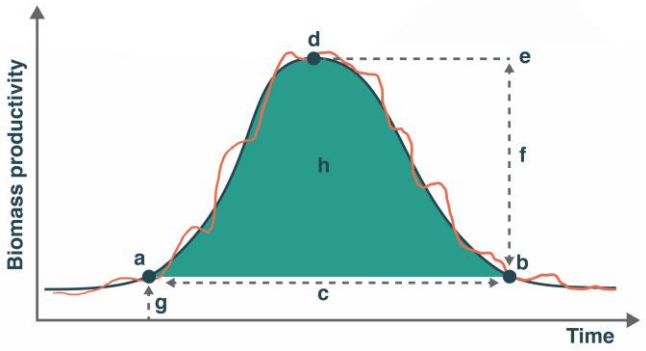
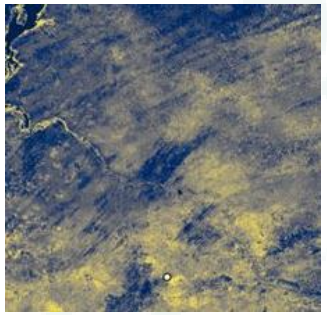
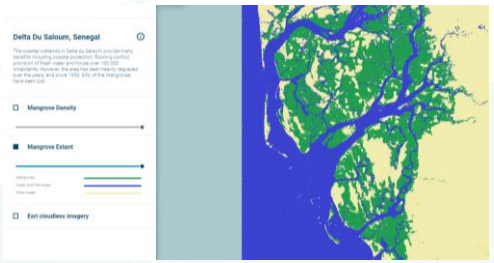
Simplified project flow









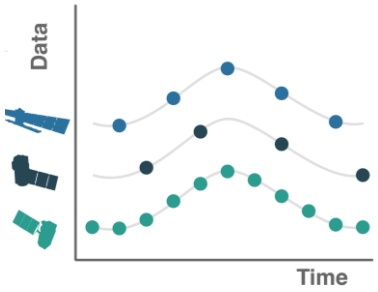
1.Input data → 2.TIMESAT → 3.Products → 4.Continental scale

Sentinel synergetic input data

Smoothing

Core & experimental

Finalize and scale



TIMESAT

Smooth seasonal data trajectories

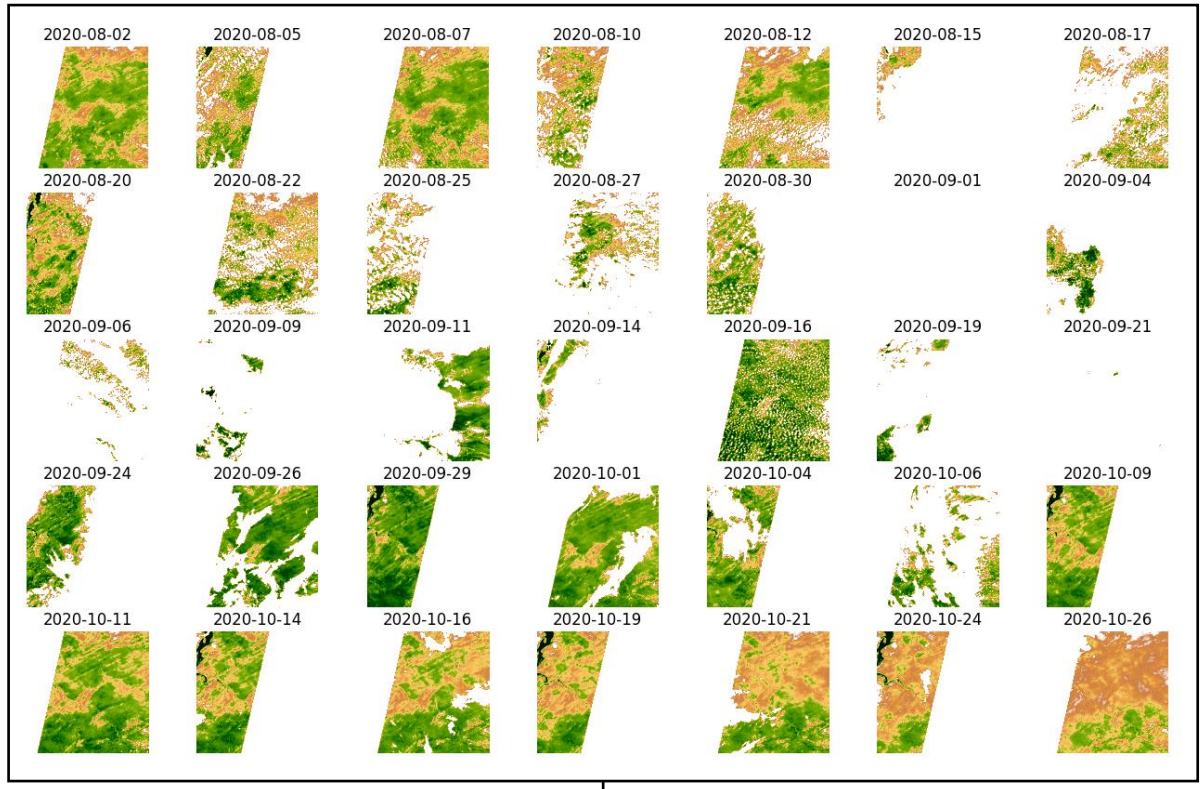
Rangeland extent
Rangeland type
Herbaceous biomass
Phenology parameters
Biomass anomalies
NRT phenology indicator
Rangeland Performance

Note: *This is also the structure used for the presentation moving forward*

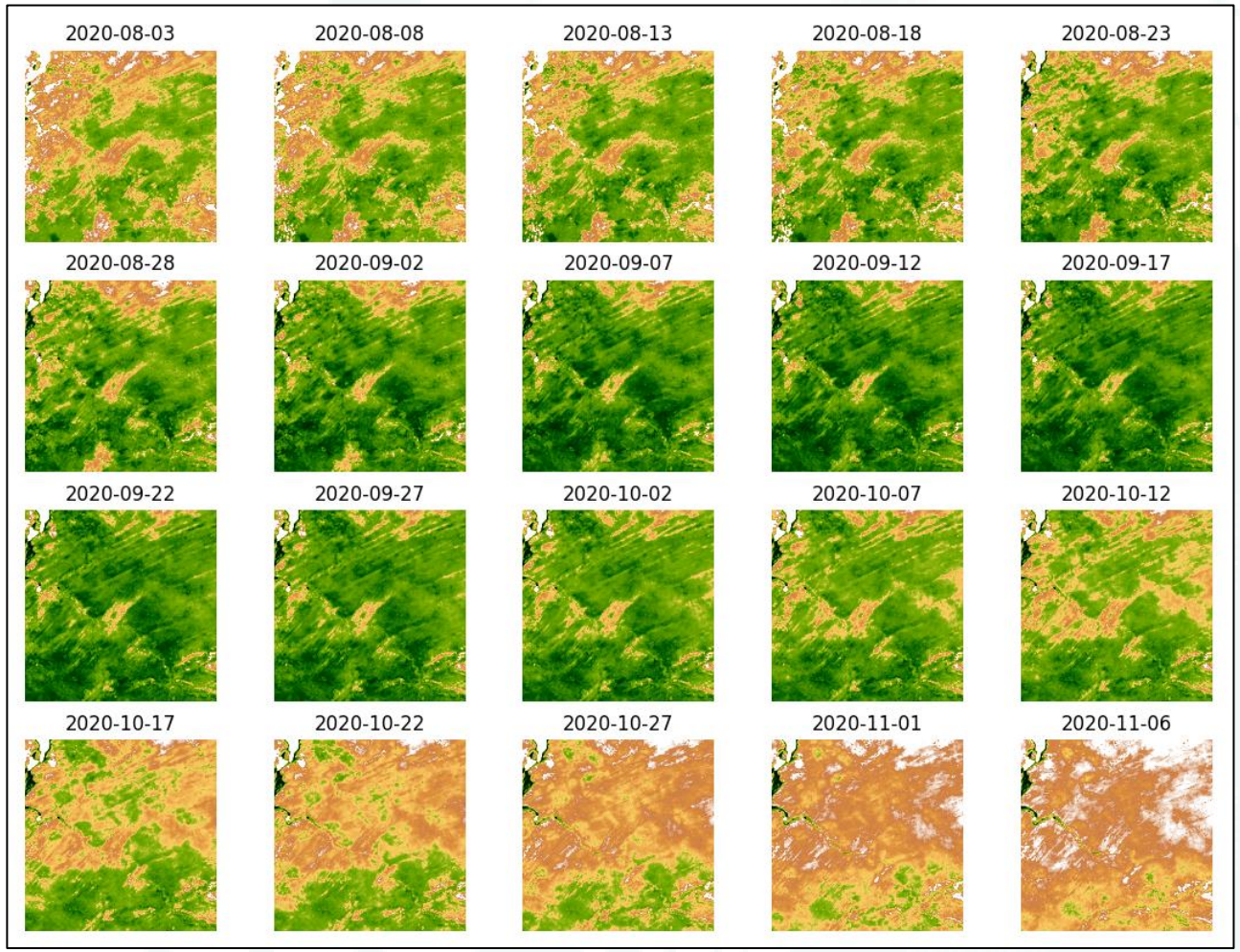
1. Fusion product output

Example of the output from the first step of the project workflow (Fusion step):

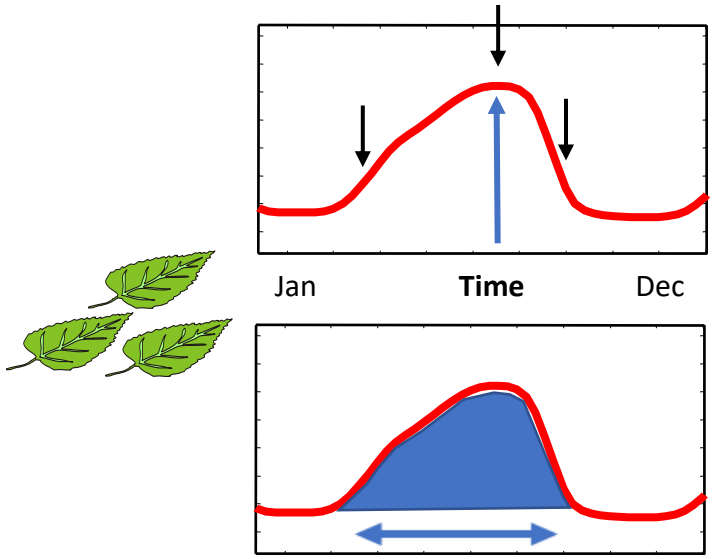
Sentinel-2



Fusion products



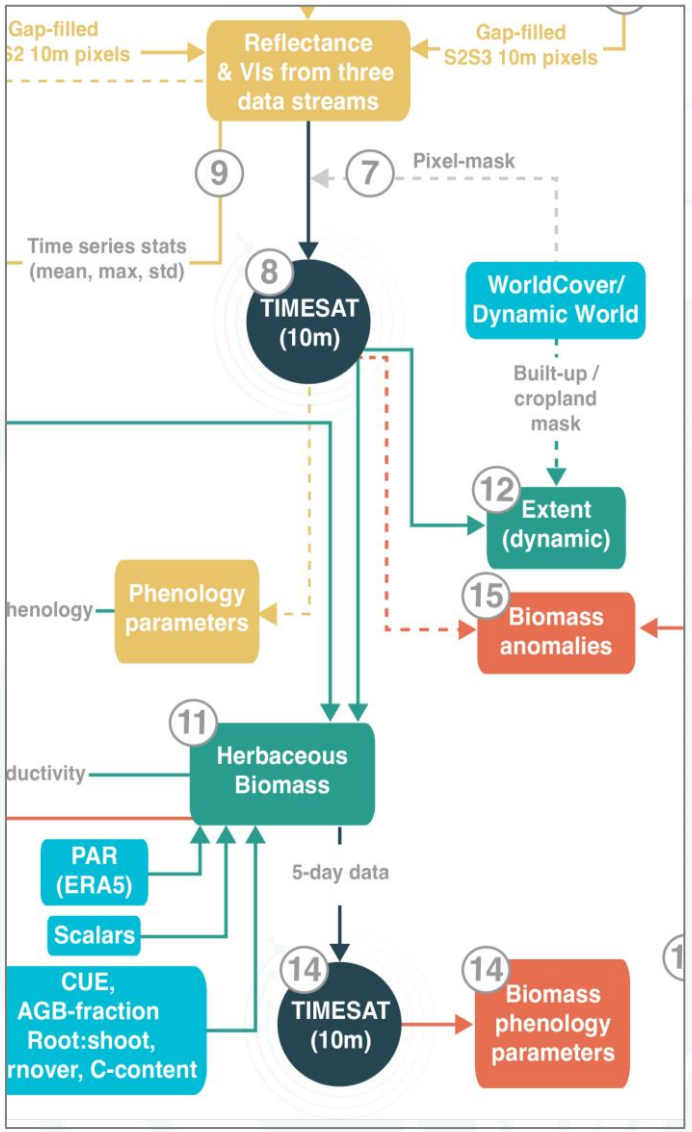
2. TIMESAT product output



- Start of season
- End of season
- Length of season
- Total productivity
- Amplitude
- etc.

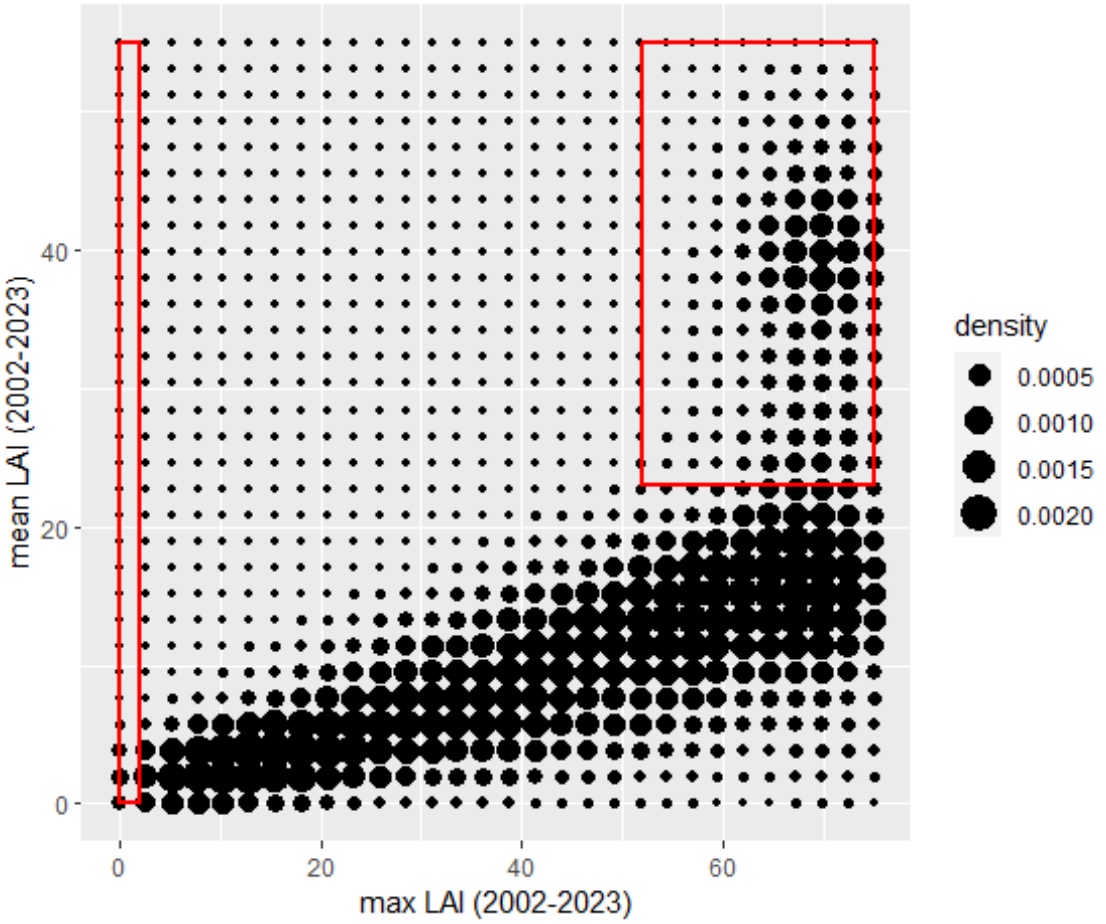
Output

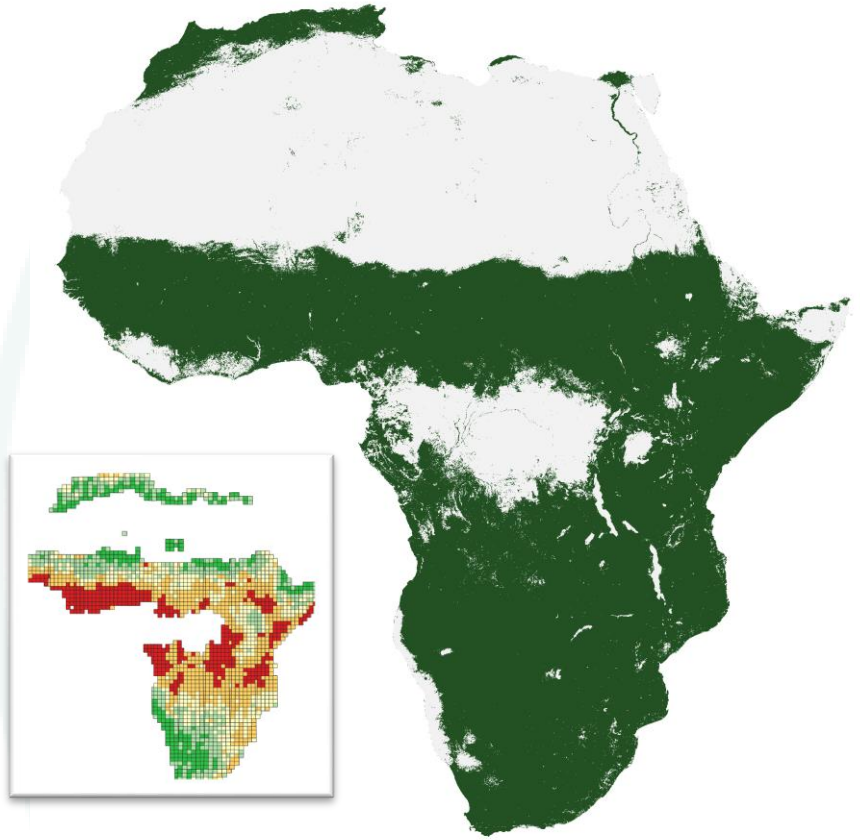
- Smooth seasonal profiles – output at 5-day time steps
- Phenological parameters



3. Rangeland Extent

By utilizing the TIMESAT output data, the Rangeland extent map can be produced:



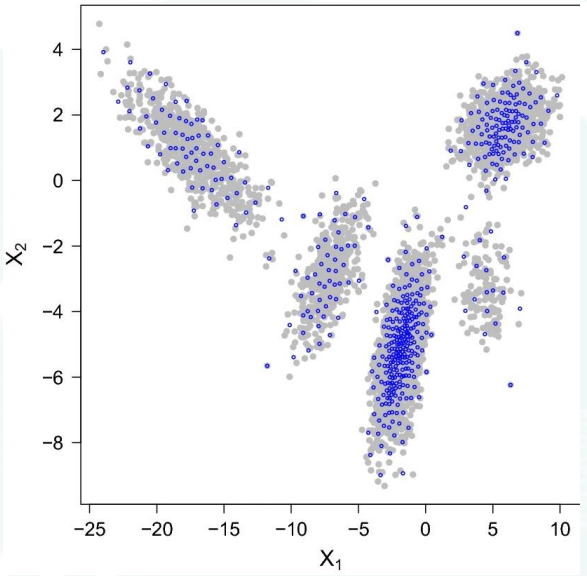


3. Rangeland Type

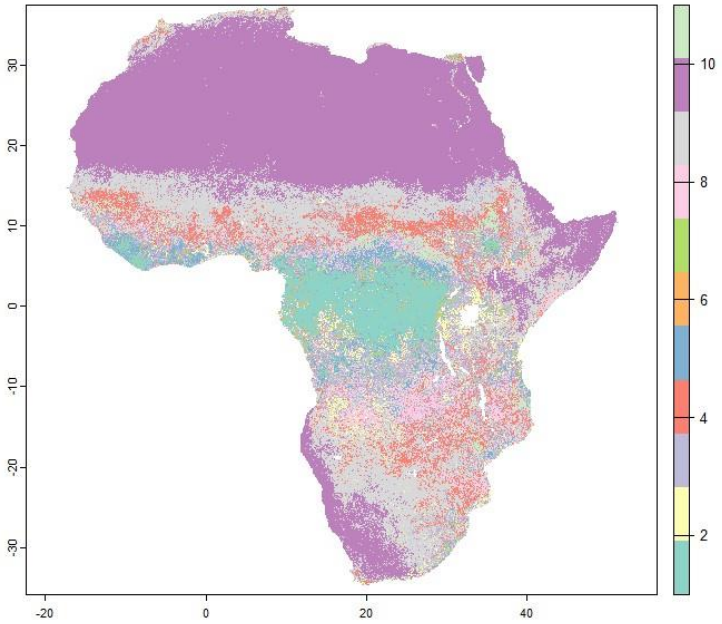
By utilizing the TIMESAT output data and additional ancillary data the Rangeland type can be produced, for this a Two-step approach is followed:

- Pre-clustering using kmeans (due to data size)
- Followed by further clustering small kmeans clusters using mixture model

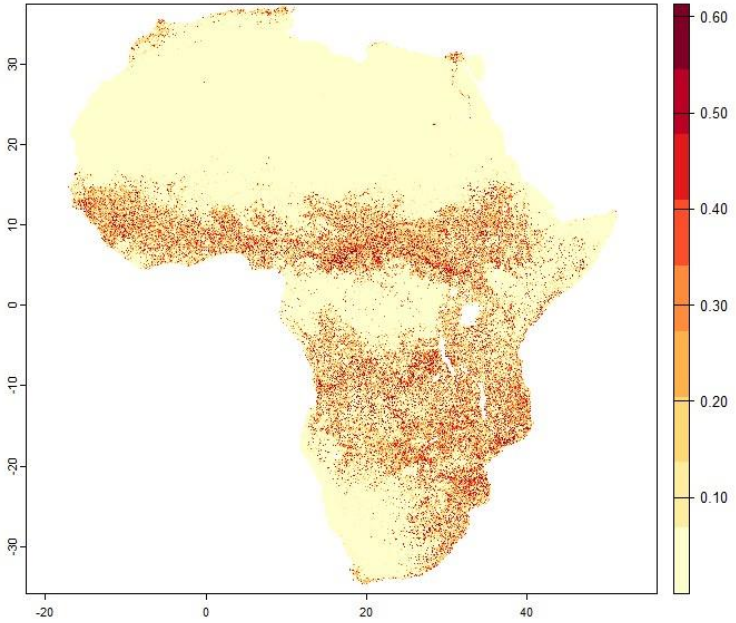
I. Ullah, K. Mengersen, *J Big Data*. **6**, 29 (2019).



11 classes

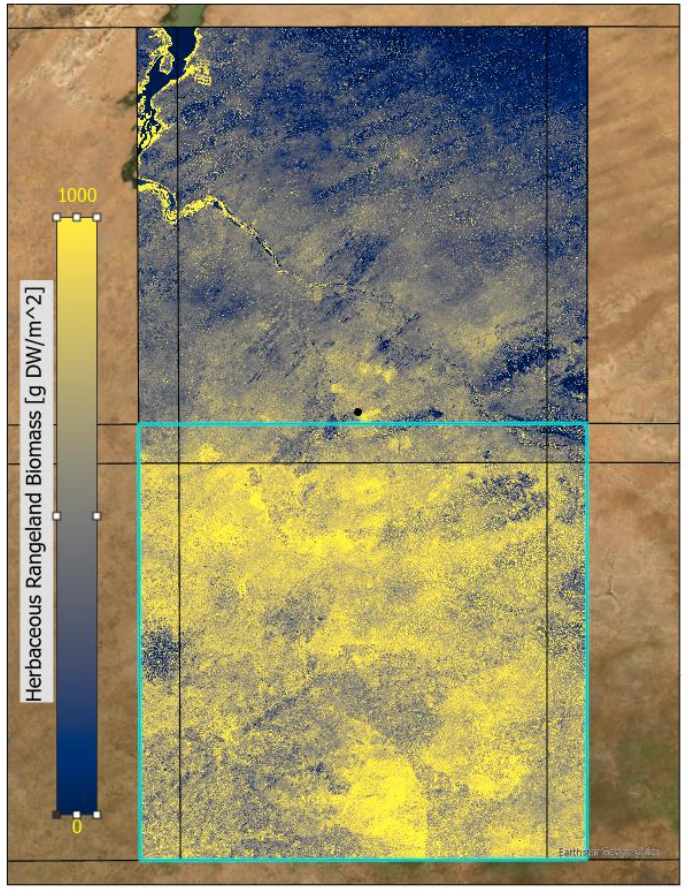


Uncertainty

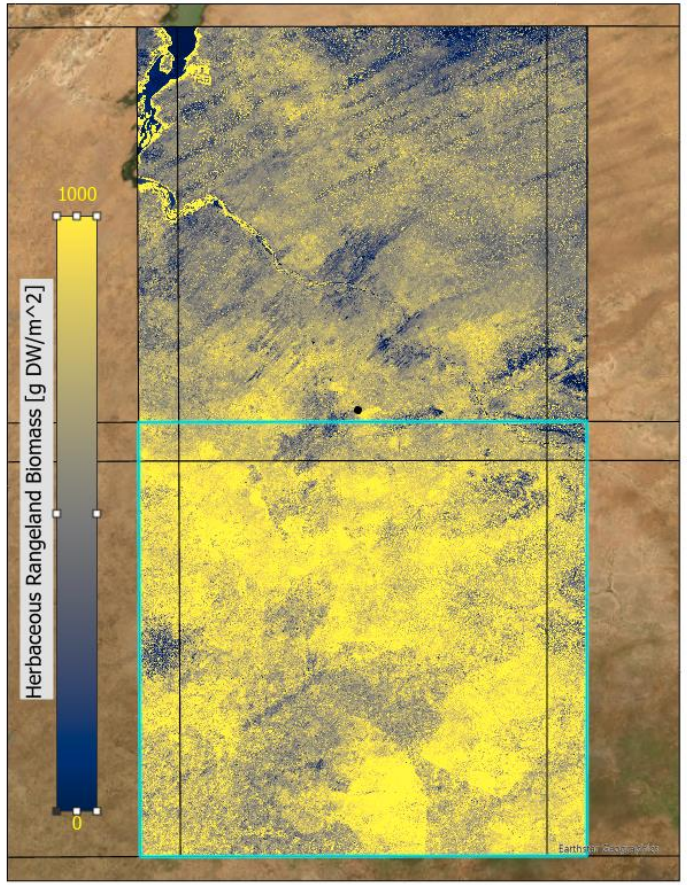


3. Herbaceous Rangeland Biomass (HRB)

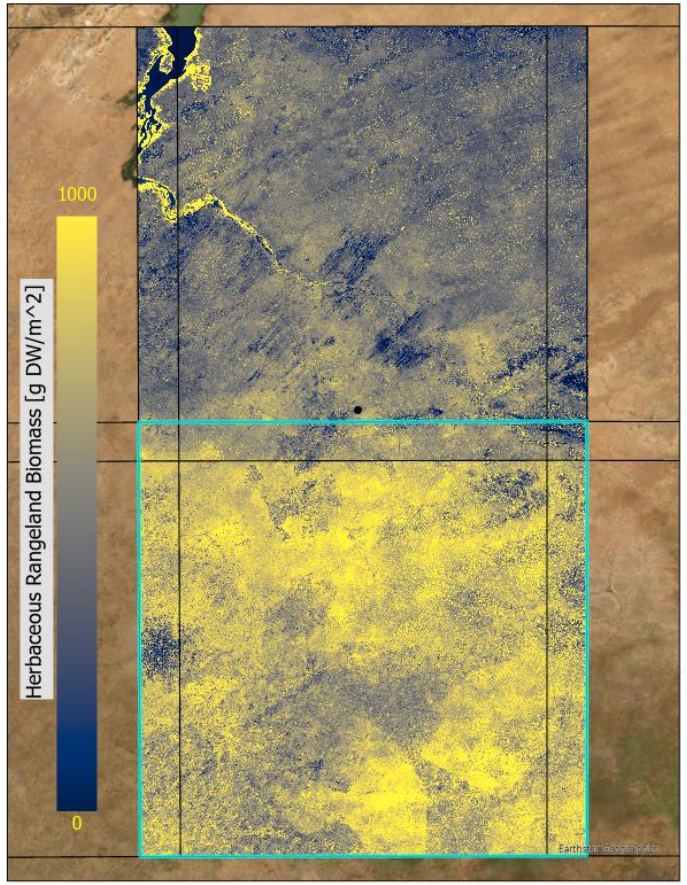
2019



2020



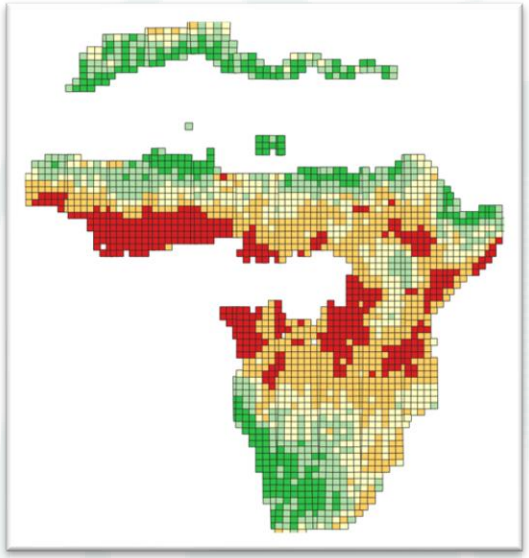
2021



Senegal, tile 28PDC and 28PDB using fAPAR from fused Sentinel-1 and Sentinel-2

4. Continental Scale Production

- All the products mentioned in this presentation are therefore being produced at 10m spatial resolution.



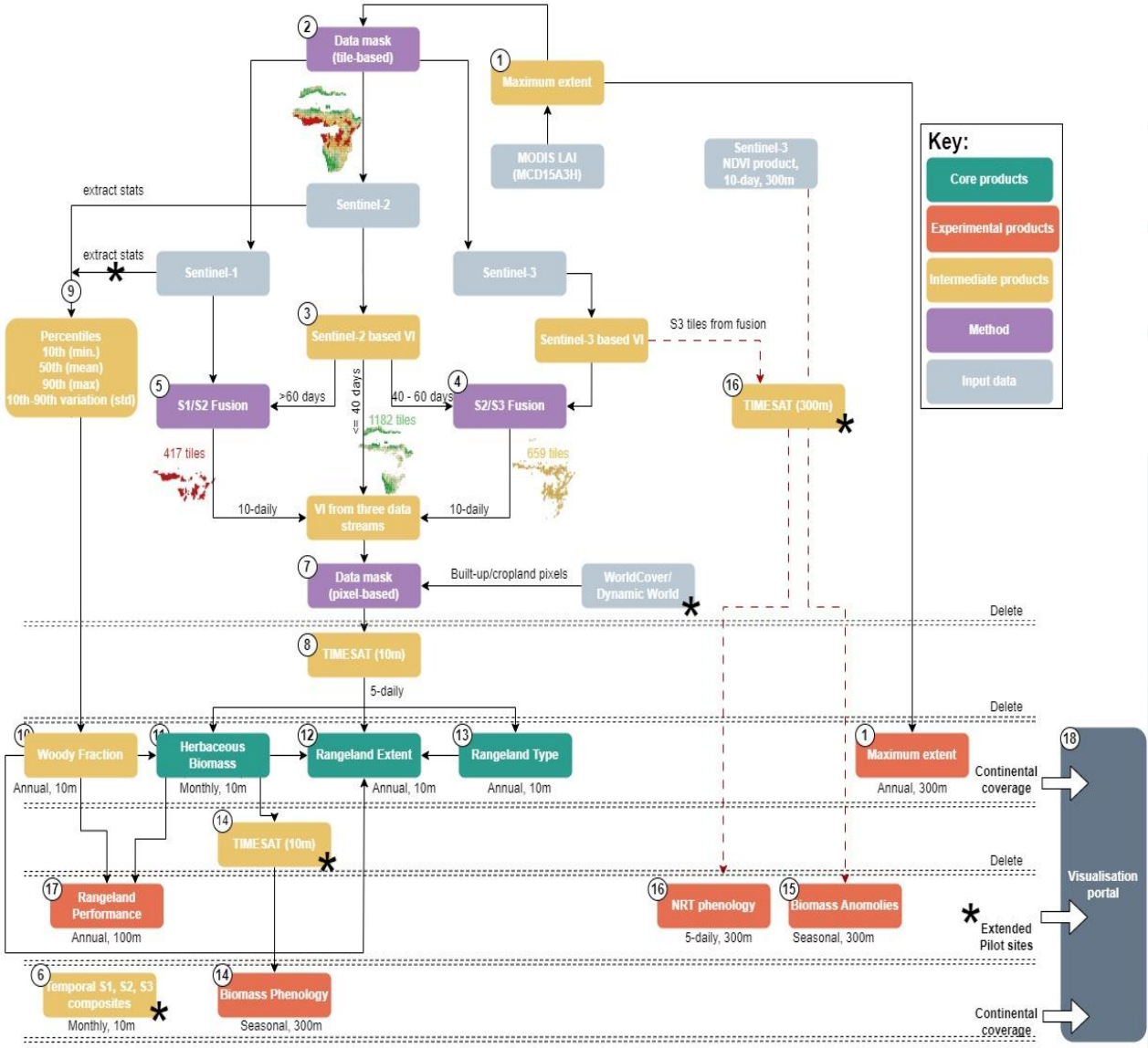
- The following Sentinel-2 tiles classifying as “Rangeland” will be produced:

- The products cover the period:
  01.08.2021 – 31.01.2023

- The products will be made available on a project portal and will be accessible via the same address, currently used for the project brochure: https://www.ramona.earth/

Status update

- The majority of the products have been produced for extended pilot sites (this include areas scattered over Africa equal to an area of 130 Sentinel-2 tiles)
- The results will be shared with the Scientific Steering Committee and Key Users in the new year (2024) upon which feedback will be received
- This valuable feedback will then be integrated into the continental scale production
- The data viewer can temporarily be accessed via: https://ramonaapp.z16.web.core.windows.net/#/



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Thank you!

Project supported by ESA Network of Resources Initiative