EO Africa EXPLORERS - EO MAJI

Progress Meeting Towards Milestone 2

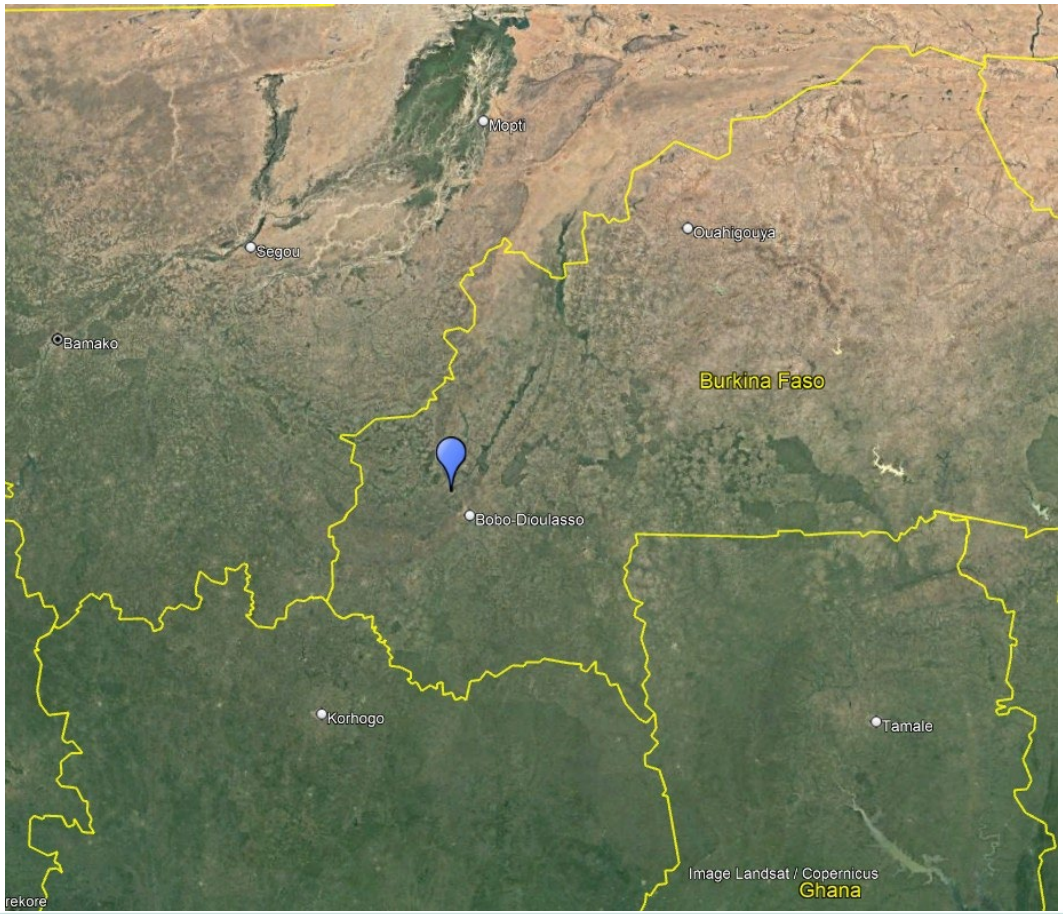
CSIC DHI UNIVERSITY OF LEICESTER

Recap from Milestone 1

- DHI leading two deliverables:
  - D02 African Early Adopters Characterisation and Benefit Analysis Report
  - D05 Agile Development Plan

D02 User Requirements: Burkina Faso

- Area of Interest



- Crop: **rice**. (maize and potato as secondary)
- Irrigation practice: Floodplain
- Objective:
  - Managing existing irrigation schemes with better insight and monitoring methods
  - Supporting farmer associations by capacity building

D02 User Requirements: Botswana

- Area of Interest

- Crop: **Vegetables and fruits**. (potato as secondary)
- Irrigation practice: drip and sprinkler
- Objective:
  - Support development of irrigation licensing schemes
  - Map irrigated areas outside the irrigation schemes

D02 User Requirements: South Africa

- Area of Interest

- Crop: **Wheat and maize**. (Soybean as secondary)
- Irrigation practice: Mostly rainfed, some irrigation implemented
- Objective:
  - Co-development of algorithms and product evaluation
  - Improve water crop-yield efficiency in better resolution (current resolution is not sufficient for small-scale farms), especially for dryer years

D02 Product Specification

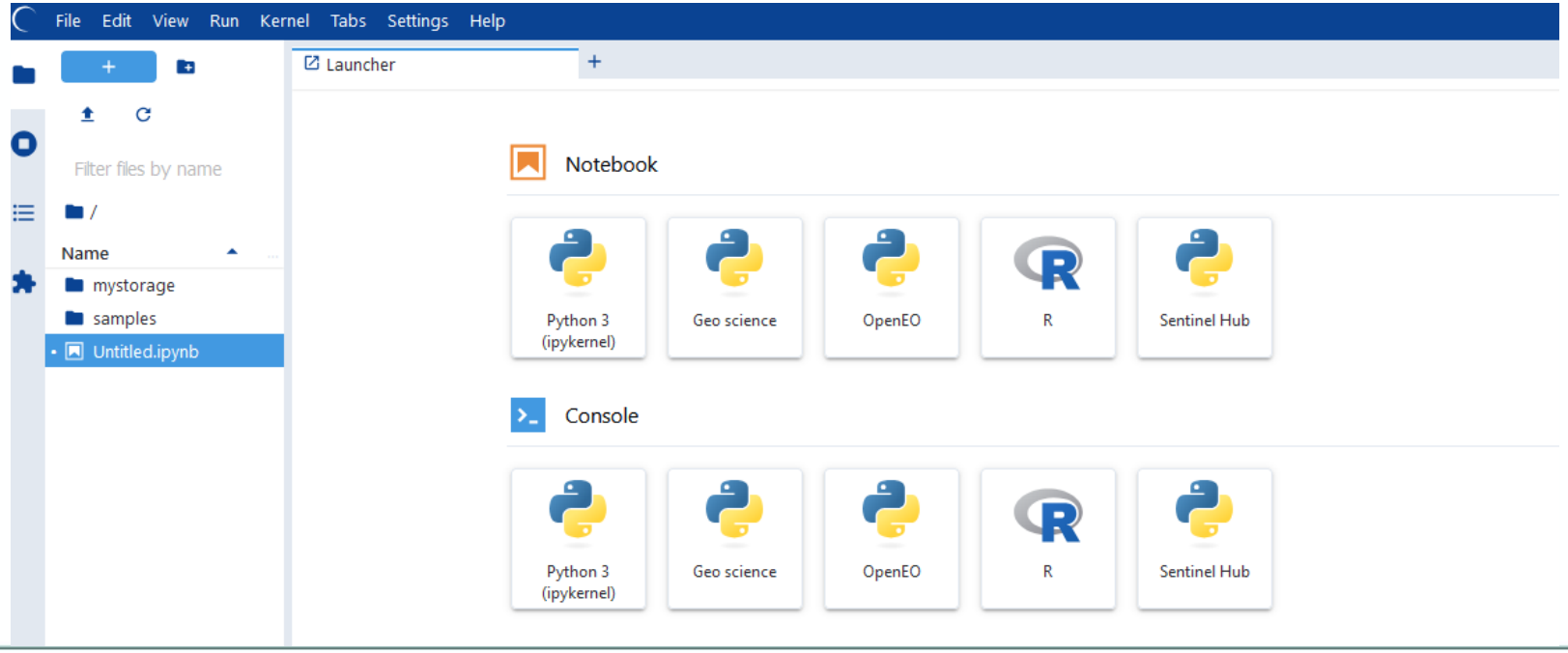
	Irrigation delimitation	Irrigation accounting	Crop yield
Physical unit	Binary (Presence/absence)	mm/ha or m^3	kg/ha
Spatial Coverage	Regional	Regional	Regional, provided for a given crop
Spatial Resolution	20 m	100 m	20 m
Temporal Coverage	2021-2023	2021-2023	2021-2023
Temporal Resolution	Annual	Monthly	Annual or 2 per year

Plans for Milestone 2 (and beyond)

1) **Prototype** development and testing
   - Integrate models and tools into a consistent software package
   - Deploy it in Copernicus Data Space Ecosystem using openEO
   - Documentation of software (D8v1)
2) ECOSTRESS and Sentinel **data fusion**
   - daily field-scale LST and ET
3) ET **gap-filling** methods
4) **Irrigation** delineation and accounting

Prototype development and testing

- Copernicus Data Space Ecosystem (CDSE)
  - openEO – seamless access to Sentinel and third-party data
  - Jupyterhub – Jupyter notebooks run within CDSE infrastructure



Prototype development and testing

- Currently implementing two notebooks
  - Data fusion using **Data Mining Sharpener** (DMS - https://github.com/radosuav/pyDMS) and DMS-bias correction (https://github.com/hectornieto/dms-bias-correction)
  - Evapotranspiration modelling with **TSEB model** (https://github.com/hectornieto/pyTSEB)
- **More tools** will be implemented as they become ready
- The architecture will be documented in **D8v1**

ECOSTRESS and Sentinel data fusion

- Fusion of Sentinel-2, Sentinel-3 and Landsat for daily field-scale ET estimation

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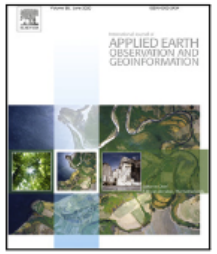
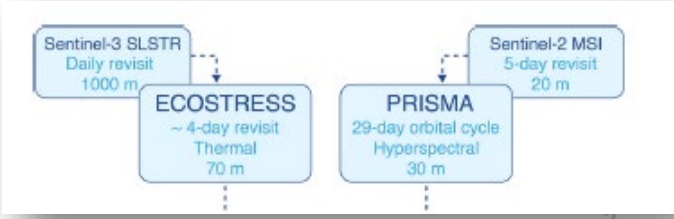


Check for updates

Improving field-scale crop actual evapotranspiration monitoring with Sentinel-3, Sentinel-2, and Landsat data fusion

Radoslaw Guzinski [a,*], Héctor Nieto [b], Rubén Ramo Sánchez [c], Juan Manuel Sánchez [d], Ihab Jomaa [e], Rim Zitouna-Chebbi [f], Olivier Roupsard [g,h,i], Ramón López-Urrea [j]

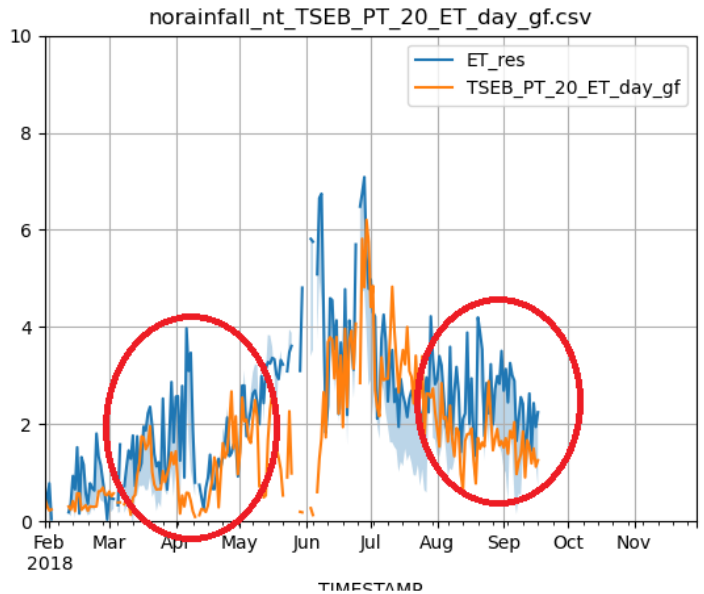


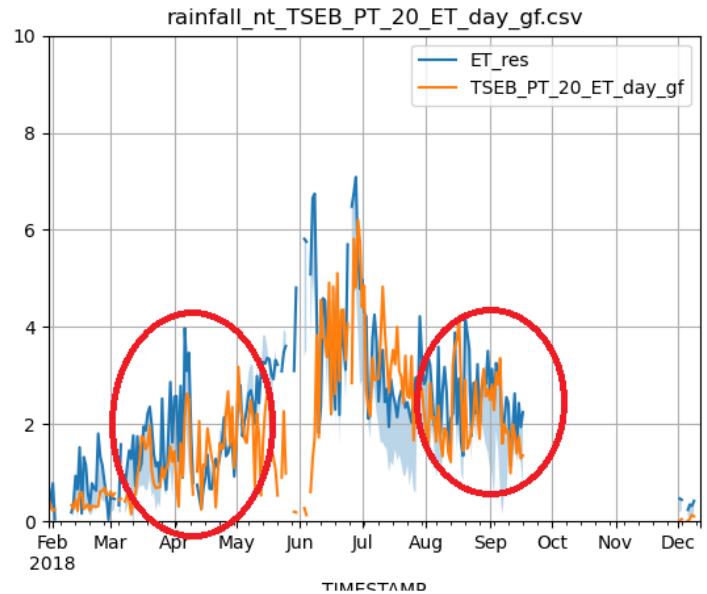
ECOSTRESS and Sentinel data fusion

- Replace / complement Landsat LST with dense ECOSTRESS timeseries
  - Both as explanatory variable and in post-processing step
- Compare against in-situ or high-resolution satellite LST
- Implement necessary changes in pyDMS and DMS-bias-correction Python modules

ET gap-filling methods

- Traditionally using a ratio of ET to a reference quantity
  - Does not take rainfall into account
- We are developing a method which uses a simple water balance model to account for rainfall





Irrigation delineation and accounting

- Modify a method first developed for soil-moisture
  - If ratio of actual to potential ET increases locally but not regionally then irrigation probably occurred
- Daily probabilities can be summed to monthly values to improve robustness
- Accounting based on difference in sum of ET in irrigated and non-irrigated parcels

Irrigation classification and irrigation probability in July 2021