

Mon 23 May 11:15-12:15 “Food Systems Science Cluster” (SAPIENS)

1. Welcome and keynotes

- Diego Fernandez, ESA
- Espen Volden, ESA
- Erwin Goor, European Research Executive Agency (REA)
- Ian Jarvis, GEOGLAM

2. Moderated panel discussion

- Pierre Dufourny (UCLouvain), Wouter Dorigo (TU Wien), Sven Gilliams (VITO),
Erwin Goor (REA), Ian Jarvis (GEOGLAM)

3. Questions and comments from the Audience

living planet symposium

BONN
23–27 May
2022

TAKING THE PULSE
OF OUR PLANET FROM SPACE



ESA Agriculture Science Activities

Espen Volden

23 May 2022



EO FOR AGRICULTURE UNDER PRESSURE

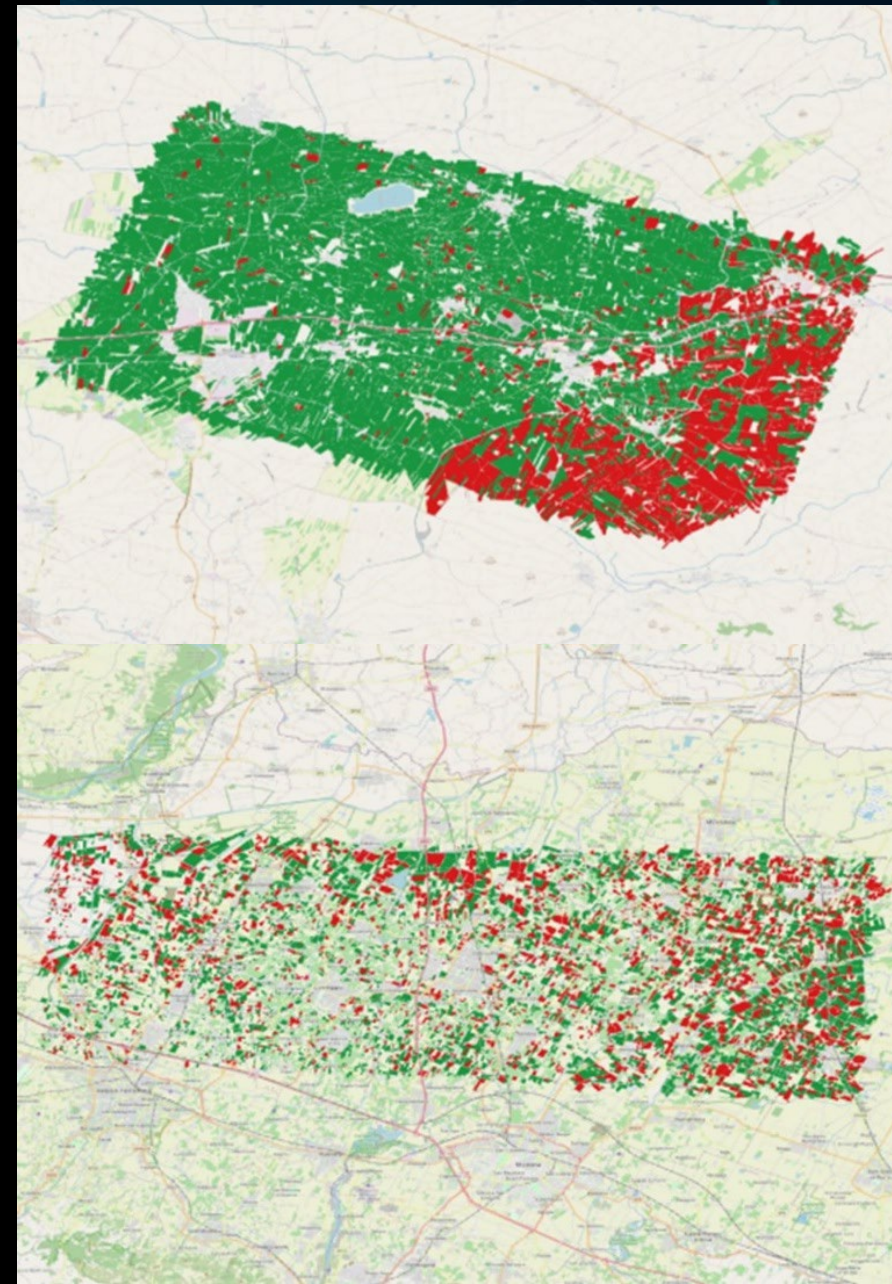
5–9 October 2020

Summary & Recommendations



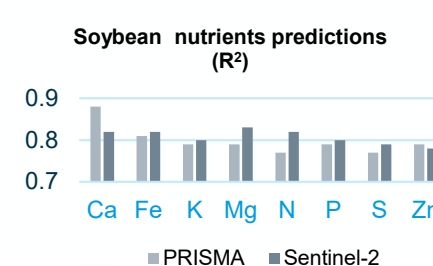
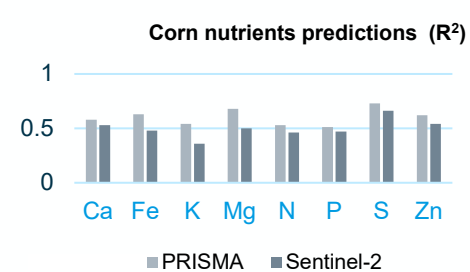
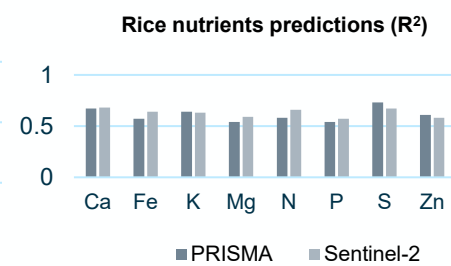
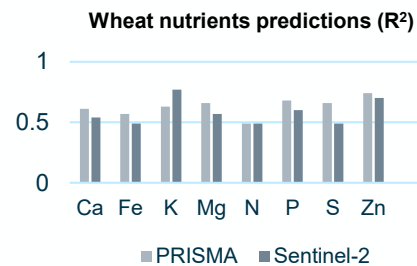
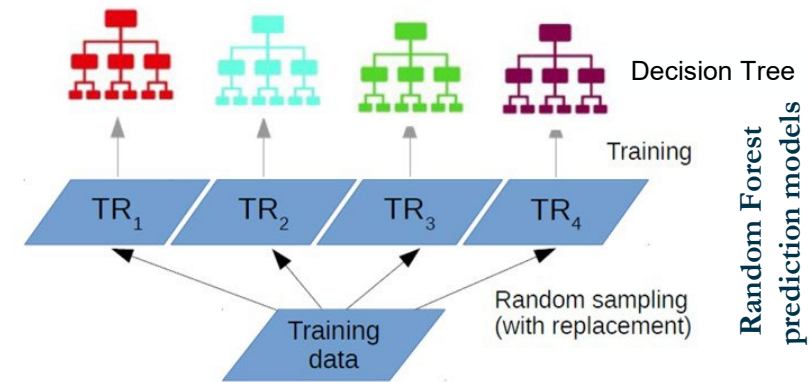
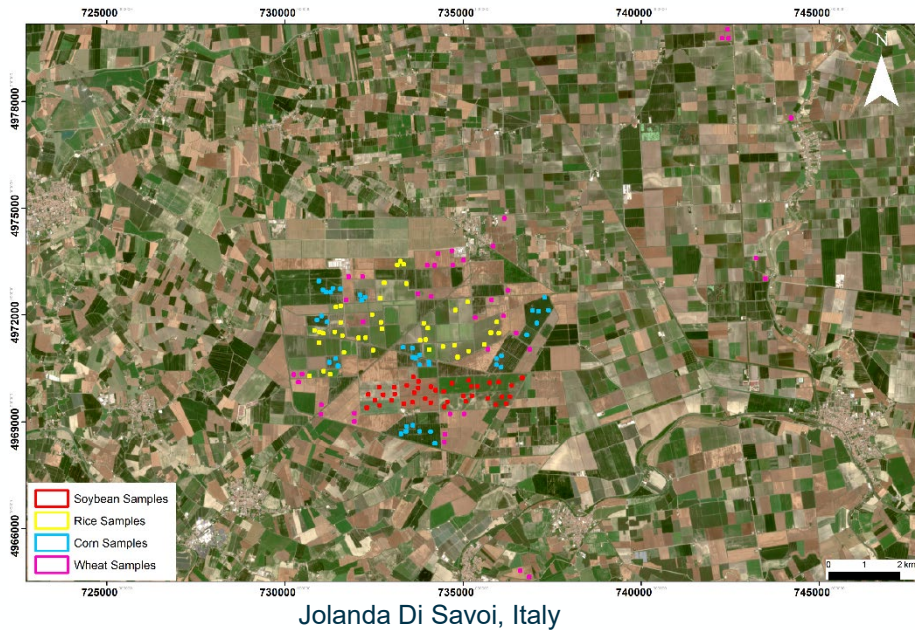
- Dynamic crop mapping
- Crop type mapping
- From crop type classification to agricultural statistics
- Vegetation status monitoring
- Large scale yield estimation and prediction (qualitative)
- Soil Moisture estimation (e.g. for agricultural drought monitoring)
- Evapotranspiration estimation (for water use monitoring)
- Supporting European countries implementing the new CAP
- Developing a global EO Soil Monitoring System (focusing first on organic carbon)
- Covid-19 impacts (harvesting dates)
- Platforms with EO and other data, tools and computing resources, e.g. Food Security TEP





HYNUTRI: SENSING “HIDDEN HUNGER” WITH SENTINEL-2 AND PRISMA

Evaluating the potential of multi-temporal Sentinel-2 and PRISMA data to predict the abundance of macro- and micro-nutrients in crops



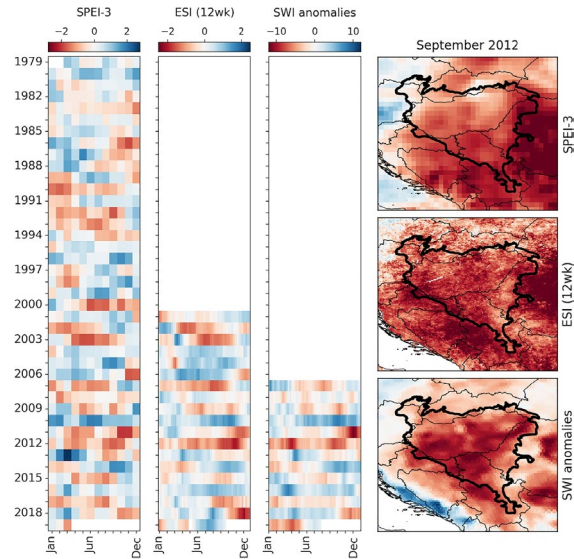
Project Objectives:

- Develop and validate **novel EO-based products** for the characterisation of drought processes in the Pannonian basin.
- Foster **new scientific results**, where space technology may provide a valuable input.
- **Promote** the use of advanced EO datasets for Drought Early Warning by **facilitating access** to the developed products.

Development and validation of:

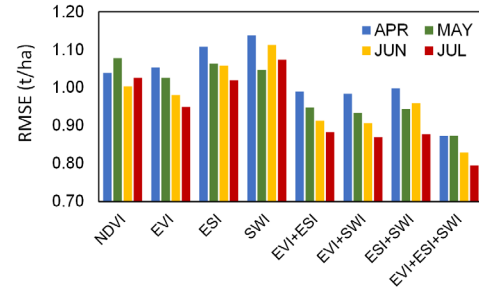
- **EO Vegetation Data:** CGLS NDVI anomalies
- **EO Soil Moisture Data:** SCATSAR SWI and ESA CCI SWI anomalies
- **Meteorological Data:** PDSI, SPEI, water balance components based on SoilClim model, ET and ESI based on LST retrievals
- **Forecasted Data:** Forecast of NDVI anomalies

Drought analysis - EO/meteorological data



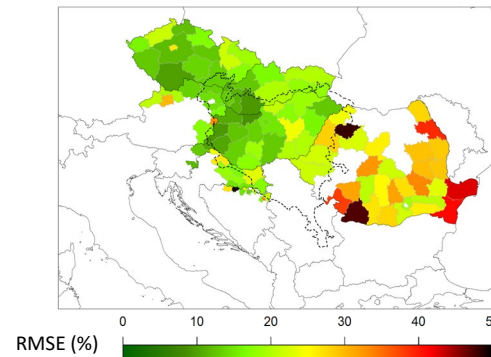
Science Cases & Impact Assessment:

- Predicting yield with **EO data** (vegetation indices, SWI and ESI) and **seasonal weather forecasts** using machine learning



NDVI - Normalized difference vegetation index
 EVI - enhanced vegetation index
 ESI - evaporative stress index
 SWI - soil water index
 RMSE - root mean square error

- The root mean square error (RMSE) is decreasing with approaching to harvest date, yet already in April the final yield is predictable



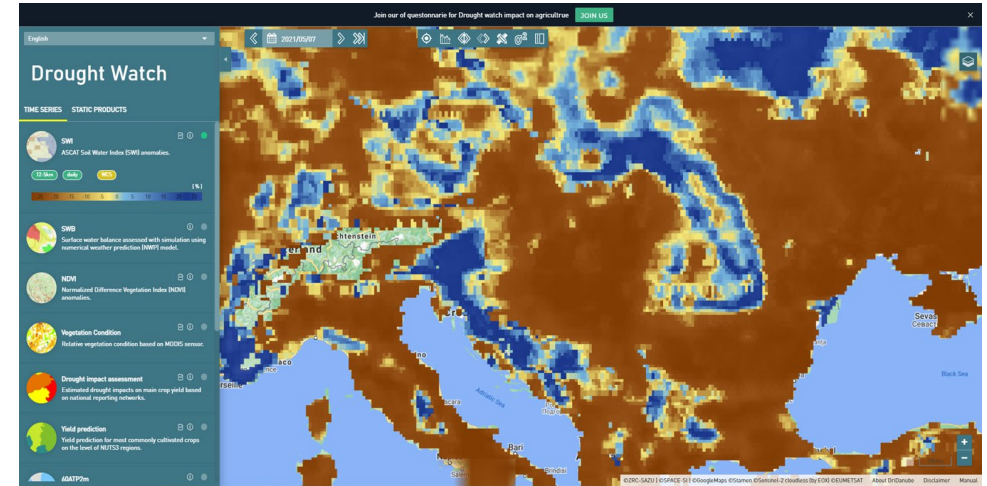
Promotion:

Earth Observation for agricultural drought monitoring in the Pannonian Basin (southeastern Europe): current state and future directions

Laura Crocetti¹ • Matthias Forkel² • Milan Fischer³ • František Jurečka³ • Aleš Grlič^{4,5} • Andreas Salenting¹ • Miroslav Trnka^{3,6} • Martha Anderson⁷ • Wai-Tim Ng⁸ • Žiga Kokalj^{4,5} • Andreea Bucur¹ • Wouter Dorigo¹

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- **Contribution** to drought early warning systems
- **Disseminate** results through:
 - **Droughtwatch** portal (www.droughtwatch.eu): ASCAT SWI, SWB, NDVI, ESI data sets
 - **Intersucho.cz** portal



Consortium:





SenCYF | Sentinel for Crop Yield Forecasting



French wheat yield

estimation and forecasting at field level

In Situ Yield Dataset

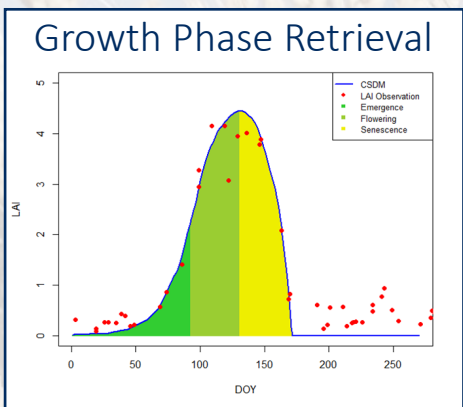
LPIS

Sentinel-2
Landsat 8

Weather
Gridded Data

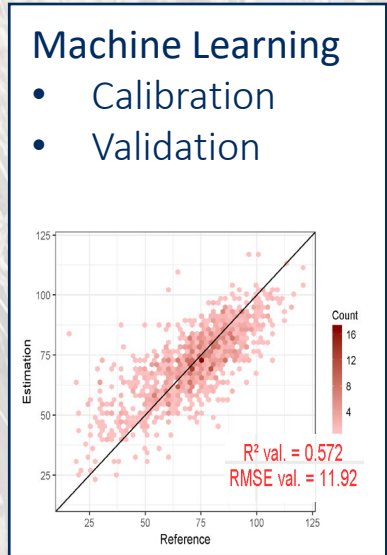
Soil Water
Index

Yield at parcel Scale



Features Extraction

Dataset Stratification
Features Selection



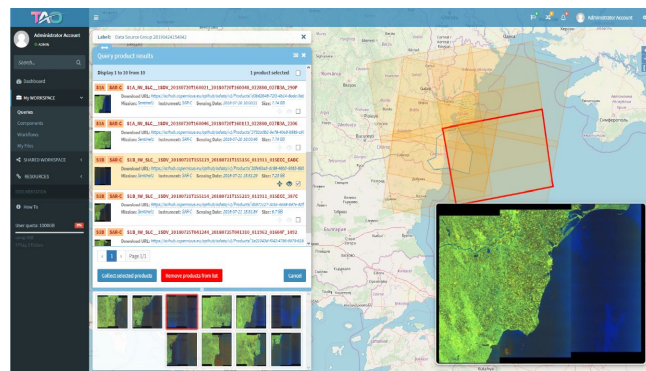
- Global data at high spatial resolution able to describe surface heterogeneity at relevant scales with adequate temporal resolution to describe dynamics
- Observed variables directly related to key processes, instead of indirect observation via proxys
- Operational availability of high spatial resolution time series
- Monitoring of vegetation status as well as soil, environmental and meteorological conditions to identify stressors
- Improve understanding of crop response to multiple stressors

Agriculture Virtual Laboratory (09/2020 – 09/2023)

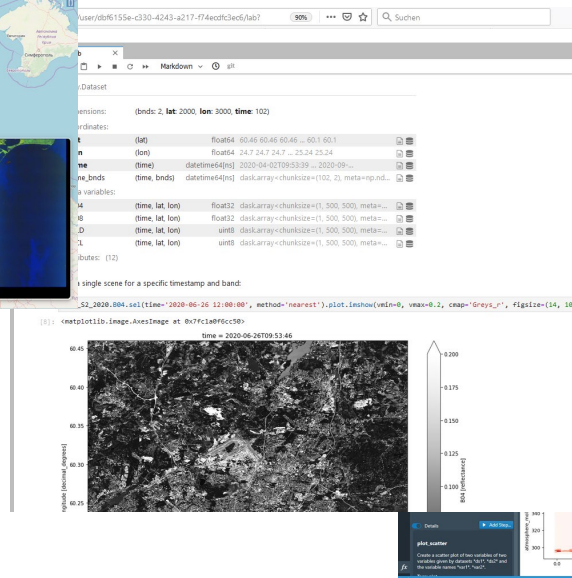
Objectives

- Facilitate research in the Agricultural Community by providing
 - Simple and efficient access to relevant data sets
 - Provide thematic processing capabilities
 - Foster collaboration by providing means to share data and source code

Thematic processing



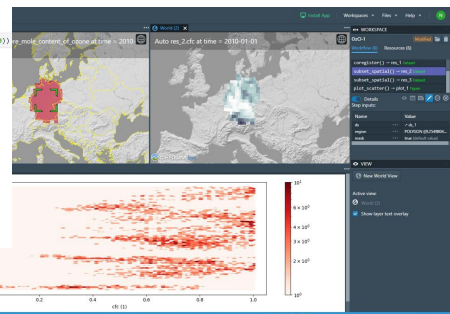
Jupyter Hub



Approach

- Base solution on proven and well-established technologies
- Focus on seamless integration rather than on re-inventing wheels
- Let users drive evolution of AVL: continuously implementing user requirements in agile development process
- Striving for long-term service beyond project

Web toolbox



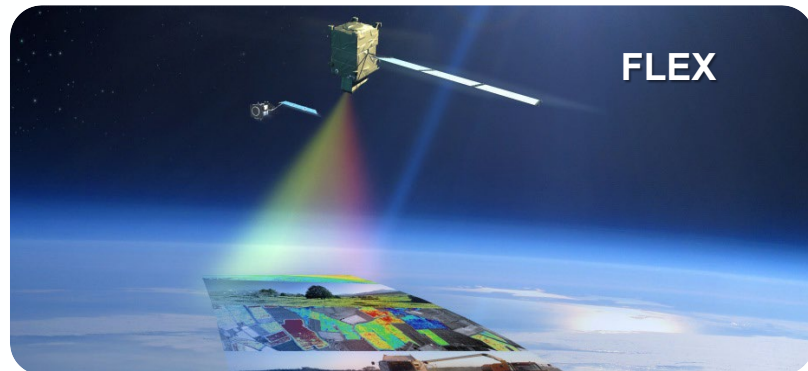
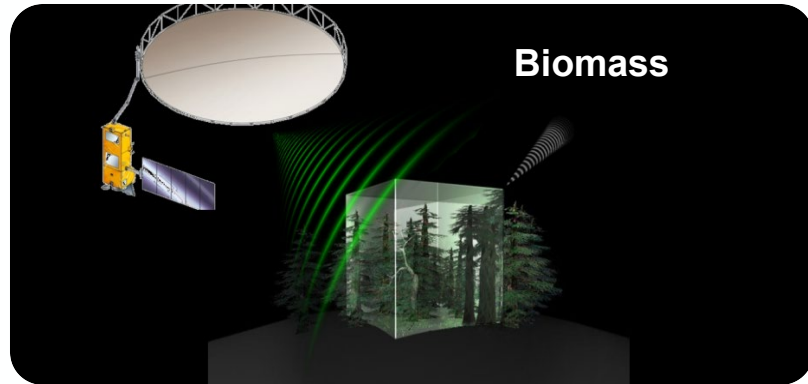
User offer

- AVL will gradually open service to research users
- Users will be provided with different services to facilitate their research
- AVL will foster publishing and sharing of algorithms, workflows, and data

Opportunity: New EO assets

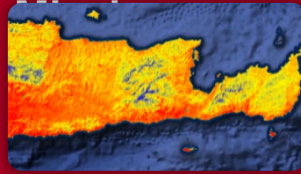
In addition to existing Copernicus Sentinels and Next Generation:

ESA Earth Explorers

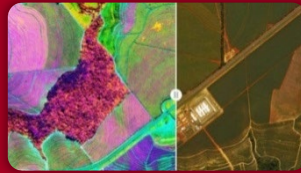


Copernicus HPCMs

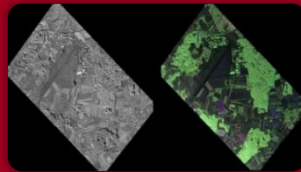
LST – Land Surface Temperature



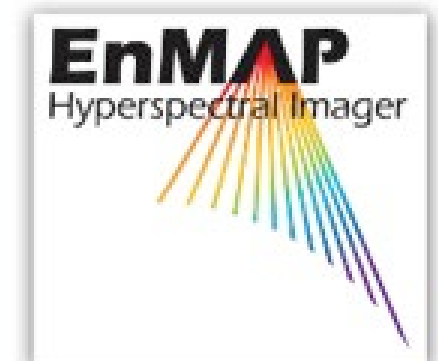
CHIME – Hyperspectral Imaging Mission



ROSE-L – L-band SAR Mission



National, European



1. New projects starting Q3
2. Planning 2023-24 activities, including with DG RTD
3. Official launch of science cluster Q4
4. New ITTs from 2023 onwards
5. Visiting scientists in the Science Hub in ESRIIN