2024 DRAGON SYMPOSIUM

DRAGON 5 FINAL RESULTS REPORTING

24-26 JUNE 2024

SUSTAINABLE AGRICULTURE

Results Highlights
Sustainable Agriculture

Lachezar Filchev, Bulgarian Academy of Sciences

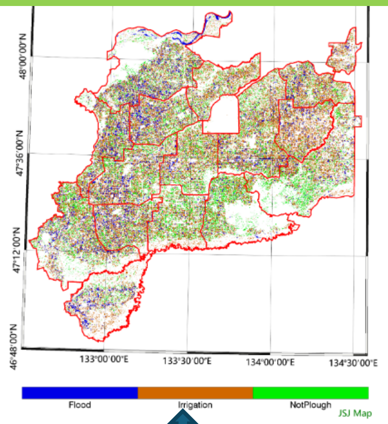
1. **Crop Classification**:
   - Accurate differentiation of winter wheat and winter rapeseed using the April S2 composite.
   - Reliable classification of sunflower and maize in June, with improved accuracy by incorporating information from the April composite.
   - Enhanced accuracy for alfalfa and pastures through composite combination.
2. **SenET Plugin**:
   - High spatial resolution Water productivity mapping for Bulgarian agronomical conditions.
   - Detection of evapotranspiration (ET) variations in small agricultural fields.
   - Potential complementarity with Landsat data (Harmonised with S2 time series).

Results Highlights

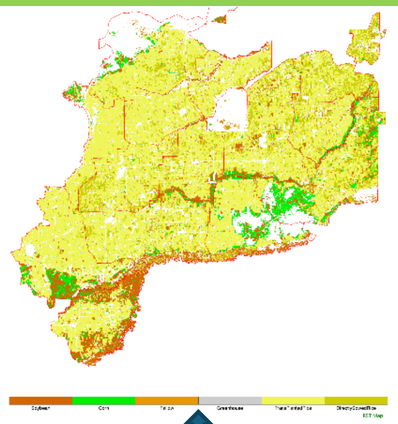
Sustainable Agriculture

Jinlong Fan, National Satellite Meteorological Center

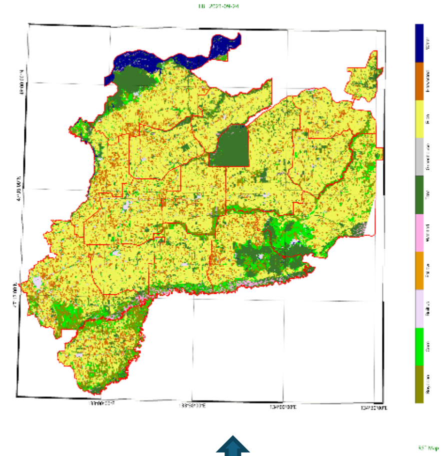
Promoting the remote sensing application in large and modern farms



Multiple images of field preparation



Crop type map



Harvest and plough maps

Middle April to Middle May
Field Preparation

Middle June to Middle July
Crop Type Maping

Middle Sep. to end Oct.
Harvest and plough

	4/19 S2A		
农场	平地泡田	灌水未整地	未耕作
创业农场	22%	59%	19%
大兴农场	24%	60%	16%
红卫农场	11%	53%	36%
洪河农场	13%	59%	27%
浓江农场	23%	56%	20%
七星农场	19%	54%	26%
前锋农场	16%	62%	22%
前进农场	20%	56%	24%
前哨农场	16%	68%	16%
胜利农场	10%	48%	42%
八五九农场	12%	52%	36%
二道河农场	18%	70%	12%
勤得利农场	29%	49%	22%
青龙山农场	22%	58%	20%
鸭绿河农场	11%	65%	24%

Statistics for every farm

2021年建三江各农场农作物遥感面积

水稻种植方式遥感监测结果				
插秧稻（万亩）	直播稻（万亩）	水稻（万亩）	大豆（万亩）	玉米（万亩）
53.9	3.0	56.9	6.6	13.3
48.7	8.6	57.2	4.7	3.3
89.5	24.8	114.3	8.1	3.1
58.6	9.6	68.2	7.5	1.3
57.7	3.4	61.2	2.1	1.9
81.5	14.2	95.7	5.1	6.0
59.1	4.7	63.9	0.1	0.0
44.5	6.8	51.3	2.7	0.2
72.5	17.5	90.0	1.7	0.4
55.3	5.2	60.5	0.3	0.2
105.7	3.2	108.9	14.9	13.1
51.6	2.8	54.4	24.7	13.2
74.0	29.3	103.2	15.9	26.9
47.5	11.4	58.8	2.5	2.9
46.2	30.0	76.2	3.0	1.0
946.4	174.5	1120.8	99.9	86.7

Cultivated acreages for paddy rice and dryland crops

农场	水稻收获占比(9.24)
胜利	20.4%
红卫	8.8%
前锋	4.6%
洪河	12.7%
青龙山	19.4%
勤得利	14.8%
浓江	12.3%
鸭绿河	5.5%
前进	16.9%
创业	10.8%
七星	19.4%
大兴	18.7%
八五九	8.5%
二道河	6.3%
前哨	9.5%
平均	12.6%

Statistics for Harvest and plough in fall

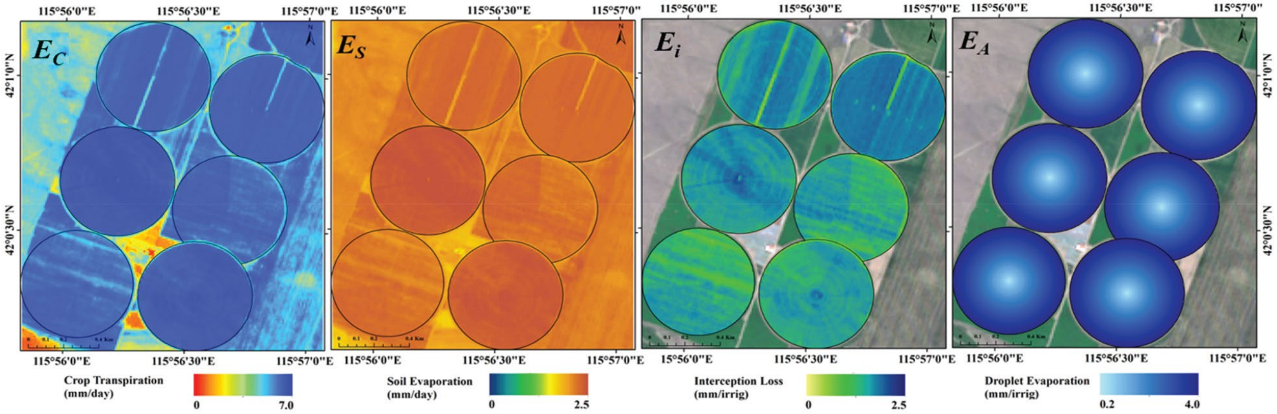
Results Highlights
Sustainable Agriculture

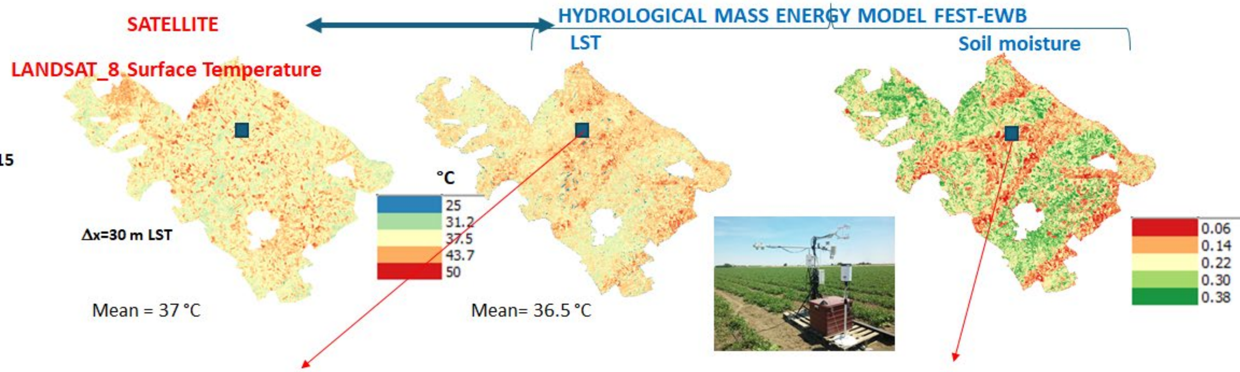
Chiara Corbari, Politecnico di Milano, Sat4IrriWater
Improving Irrigation Water Management

- Crop mapping d early-season crop identification using Sentinel-2 MSI data
- Biomass and crop yield estimation in Shiyang river basin
- Surface soil moisture algorithms, topographic effect, downscaling
- Water balance in ungauged basins
- Crop water use and irrigation efficiency at farmland scale
- Land surface model calibration combing multiple satellite data of LST, LAI, SM
- Crop production simulation in Italy within a crop-water-energy balance model model
- improvement in evapotranspiration estimates for crop trees
- Optimized irrigation volumes combining EO data and hydrological model

Spatial variation of ET

Example in 14th July, 2019





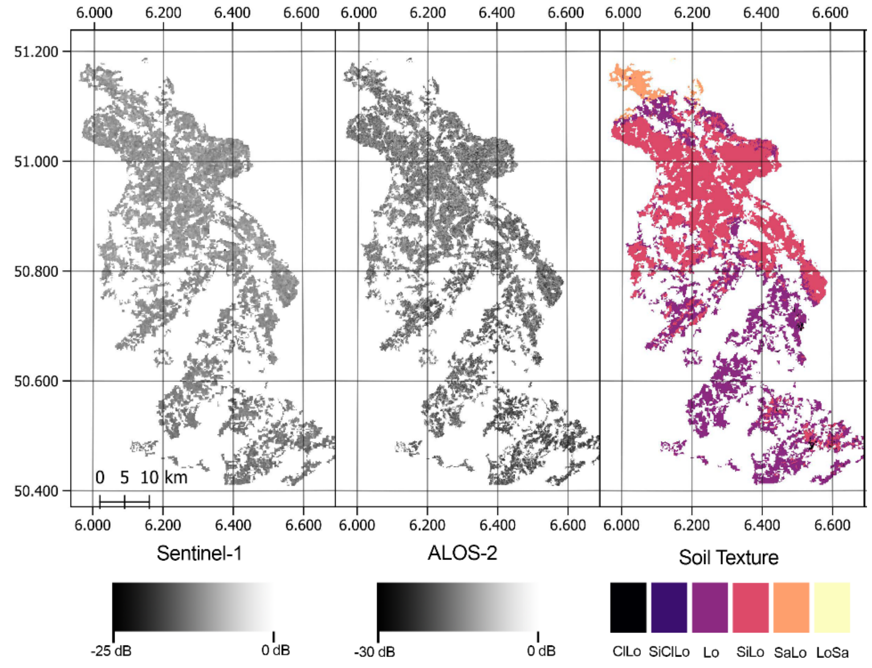
Results Highlights
Sustainable Agriculture

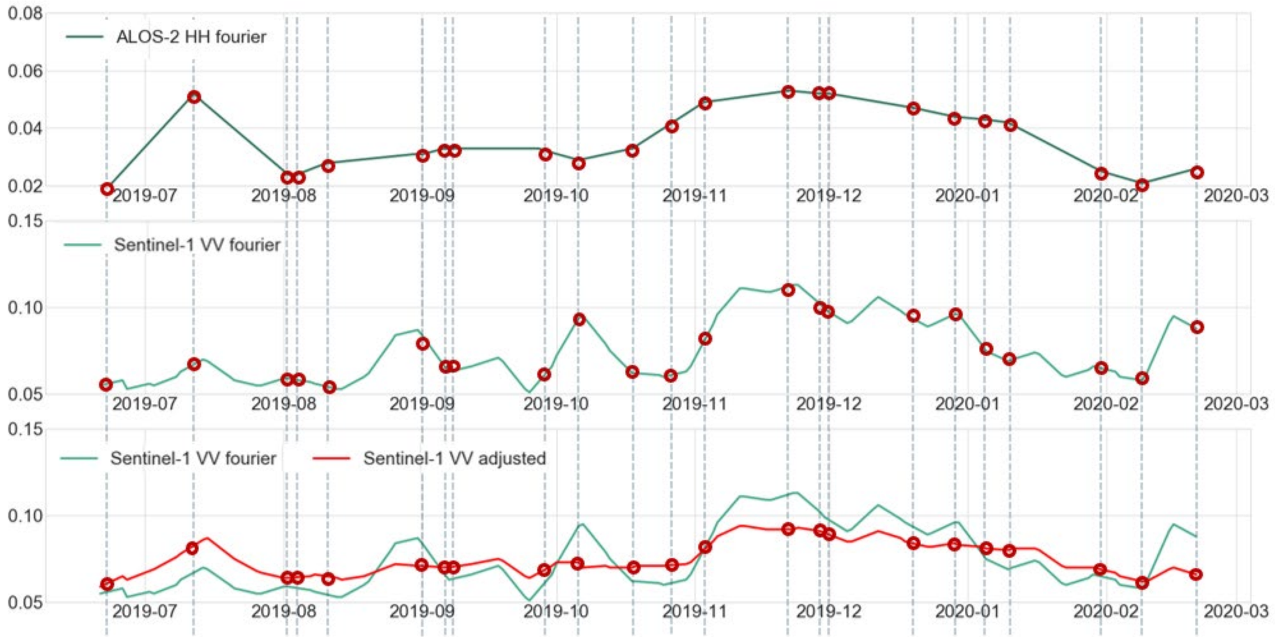
3. Obs. hydrolog. states

Carsten Montzka, Research Centre Jülich

C- and L-band SAR combination

- Changes in the L-band are less influenced by vegetation and serve as "reference points“
- Between observations in the L-band, the time series in the C-band are scaled to match the observed scenes in the L-band
- Soil texture is used for inverting soil moisture to dielectric constant

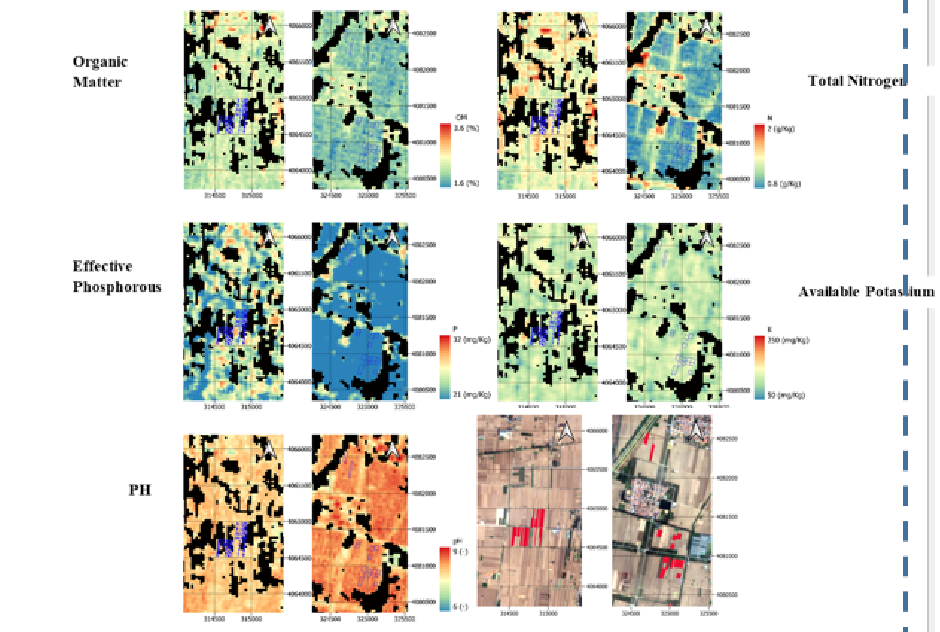


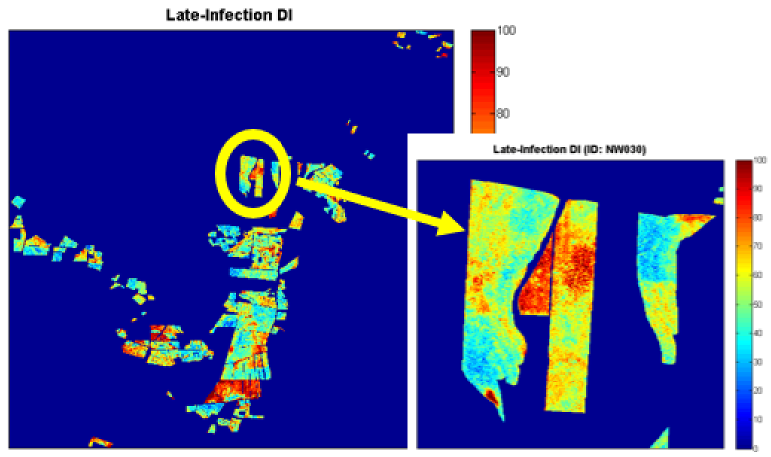


Results Highlights
Sustainable Agriculture

ID# 57457 SINO-EU OPTICAL DATA TO PREDICT AGRONOMICAL VARIABLES AND TO MONITOR AND FORECAST CROP PESTS AND DISEASES

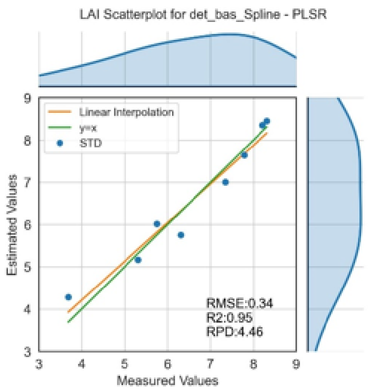
Soil nutrients predictions by using hyperspectral (PRISMA) are better than those obtained by S-2 both in terms of RMSE and RPD.
Absorbance data resulted as the most performing pre-treatment, while MLR algorithms performances are not constant among the analyzed soil parameters (texture, SOC, PH and nutrients).

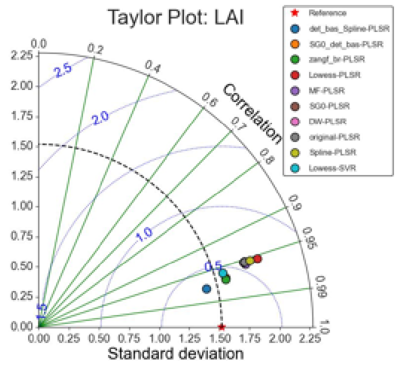




Disease Index (DI) applied to S2 is apt to map at field scale the late infection rust disease.

Hybrid retrieval methods, combining RTM, MLR and active learning strategies produce the better crop byophisical variables retrieval at field scale by using hyperspectral EO





Seed questions: Science & Application
Sustainable Agriculture

What are the remaining issues concerning the exploitation of current mission data?

- Spatial and temporal resolution
- Access to Raw data
- Recordings, on demand data,
- frequent updates of data repositories,
- access to Chinese data via hubs/web portals
- Computational Power for Processing and parameter retrieval

Seed questions: Science & Application
Sustainable Agriculture

What is the general performance and what are the limitations of geophysical parameters retrieval?

- Extrapolation and transfer from local to general applications still a challenge
- Working on individual regions, recommend to collaboratively work on single target areas (e.g. JECAM)

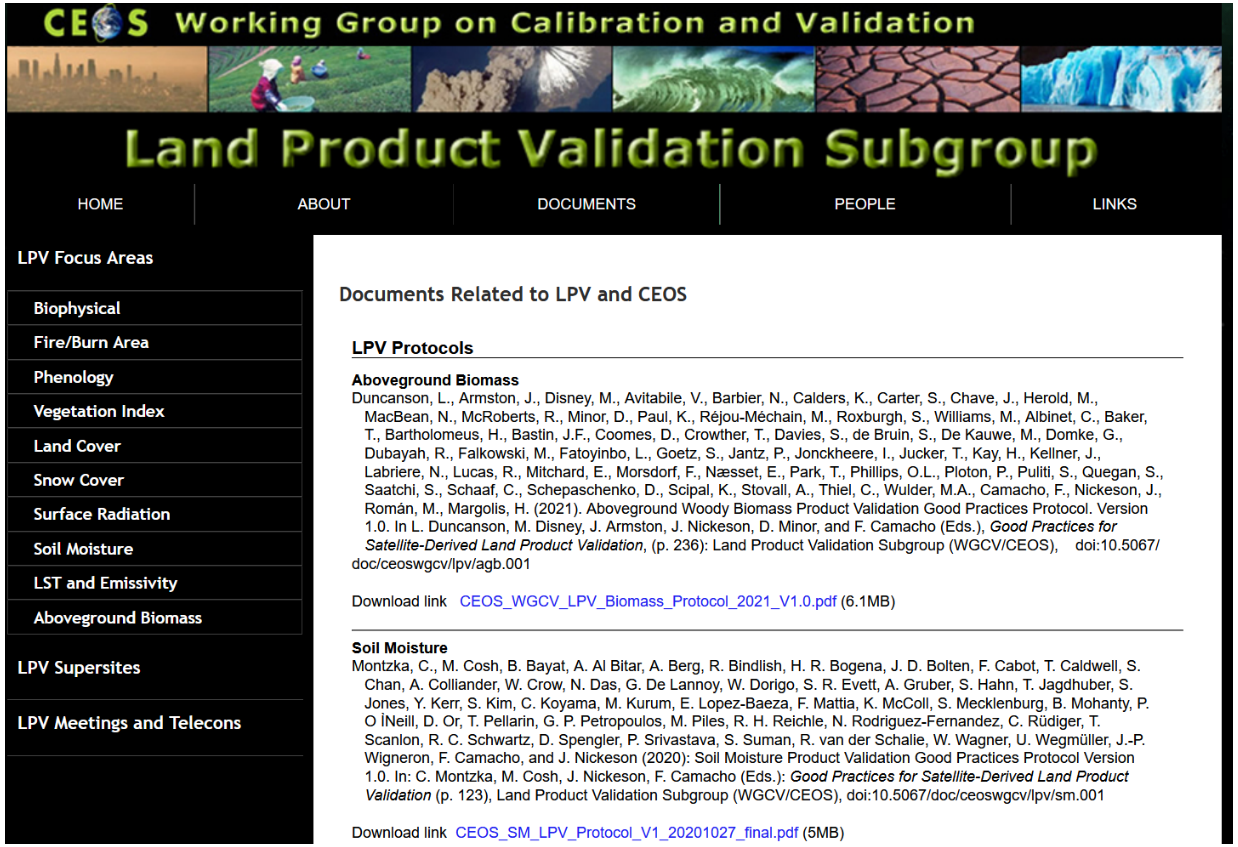
EO data synergy: is there scope for data synergy and if so which EO missions/sensors are required?

- LST at higher spatio-temporal resolution, synergies of operational missions with third party missions (e.g. constellr) and perspective for future missions (LSTM)
- Synergies exist, but are well handled, synergy mapping (gap-filling, complementarity)

Seed questions: Science & Application
Sustainable Agriculture

Validation : Have the necessary validation data been collected and shared?

- Validation works quite individual at the moment, contribute to community-driven data repositories
- Recommendation to check CEOS LPV (https://lpvs.gsfc.nasa.gov)
- Could be requirement for Dragon projects to use CEOS good practice protocols



Seed questions: New EO Mission Exploitation
Sustainable Agriculture

What are the new domains where further research is needed?

- Data synergy
- Provide Analysis Ready Data
- Look for links to existing programmes like COST action PANGEOS (Pan-European Network of Green Deal Agriculture and Forestry Earth Observation Science)
- Combine retrieval of individual variables in models to estimate variables not observable by RS, get the full picture of the agricultural system

What are the synergy between Europe and China new missions to be exploited?

- Check for CEOS information

Seed questions: New EO Mission Exploitation

Sustainable Agriculture

What complementarity in the operational use of the current / future missions (planning, observations, etc.) could be improved to allow better data exploitation?

- Complementarity check at CEOS level or as a Dragon initiative
- Operational readiness in agricultural domain relatively low, need to learn from meteorology

Scientific Recommendations
Sustainable Agriculture

- Technical recommendation:
  - Permanent working groups for exploiting specific sensor types (multispectral, SAR, hyperspectral),cross-cutting (hot) topics, also during symposia, incl. workshop format,
  - Strategic synergy mapping of EO missions (e.g. by CEOS, GEO)

- Scientific recommendations:
  - Setting stage for precision and standards for agricultural variables, include error maps with parameters
  - Align with targets like SDGs
  - Publish or share your data!