Coordinating and integRating state-of-the-art Earth Observation Activities in the regions of North Africa, Middle East and Balkans and Developing Links with GEO related intiatives toward GEOSS

http://geocradle.eu

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Thematic Areas

linked with the UN SDGs

SUSTAINABLE DEVELOPMENT GOALS

Adaptation to Climate Change (ACC)

13 CLIMATE ACTION

3 GOOD HEALTH AND WELL-BEING

11 SUSTAINABLE CITIES AND COMMUNITIES

15 LIFE ON LAND

Improved Food Security – Water Extremes Management (IFS)

2 ZERO HUNGER

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Access to Raw Materials (ARM)

1 NO POVERTY

2 ZERO HUNGER

Access to Energy (SENSE)

7 AFFORDABLE AND CLEAN ENERGY

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

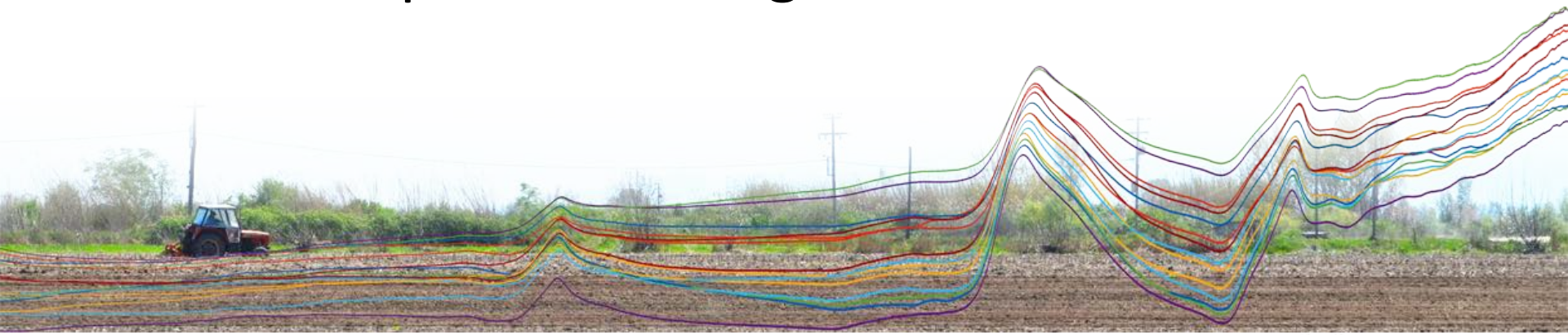
IBEC INTERBALKAN ENVIRONMENT CENTER

European Commission

GEO GROUP ON EARTH OBSERVATIONS

Overview of vis-NIR soil spectroscopy

- "Fast, cost-effective, environmental-friendly, nondestructive, reproducible, and repeatable analytical technique" (Nocita et al. 2015)
- Can be applied in-situ using proximal sensors
- Can be up-scaled using EO data



The need for standardization

- Spectral measurements are affected by:
  - ambient conditions
  - spectrometer
  - operator
- Efforts focus on large laboratory Soil Spectral Libraries
- To ensure standardization, spectral measurements should be calibrated!

(Kopačková and Ben-Dor, 2016)

Current approaches in large SSLs

LUCAS:

+ Stratified
+ Highly detailed
+ Open for research purposes
- Closed for commercial purposes
- No standardization protocol used
- Constrained to EU

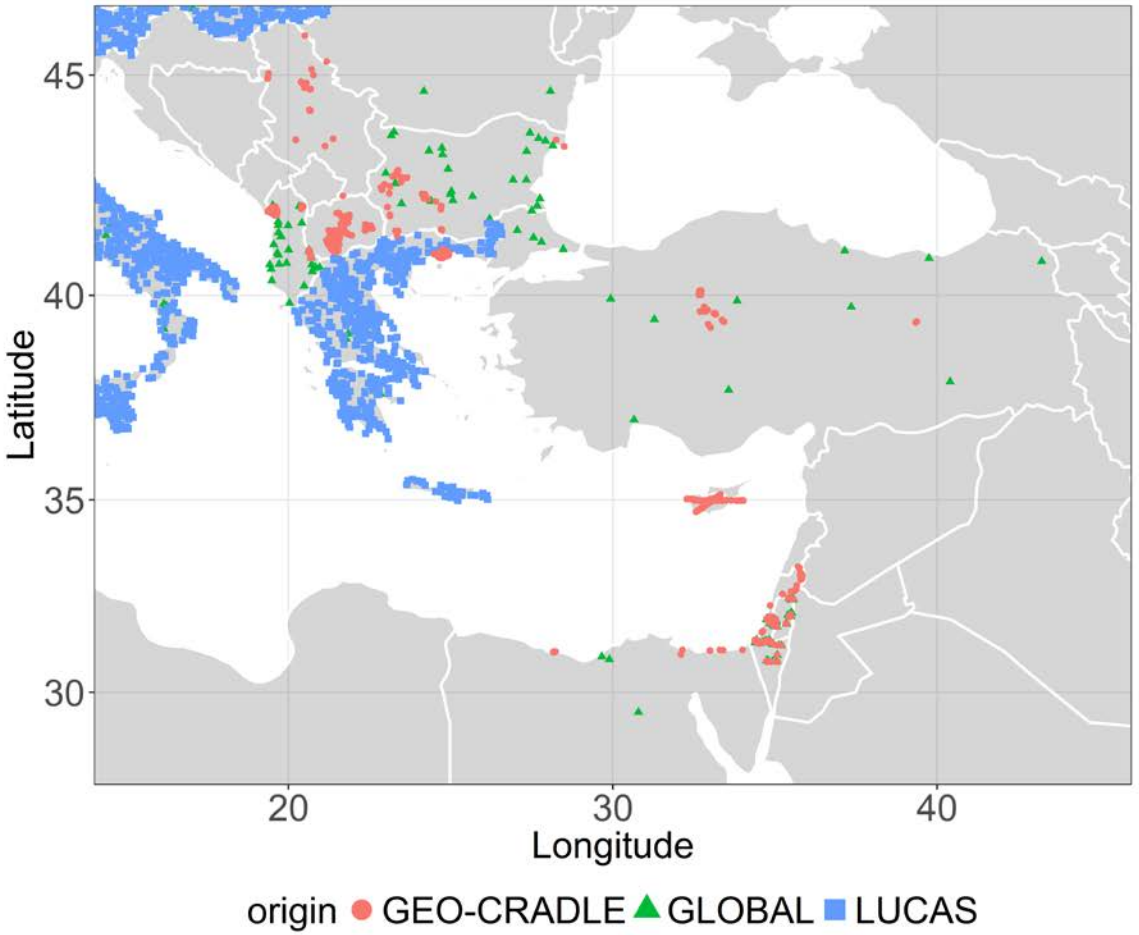
https://esdac.jrc.ec.europa.eu/content/lucas-2009-topsoil-data
DOI: 10.1007/s10661-013-3109-3
10.1111/ejss.12499

Global SSL:

+ Global extent
+ Collaboration of many organizations and institutes
+ Standardized (i.e. expandable)
- Closed / Not available
- Data sparsity
- Underrepresented regions

DOI: 10.1016/j.earscirev.2016.01.012

Efforts before GEO-CRADLE



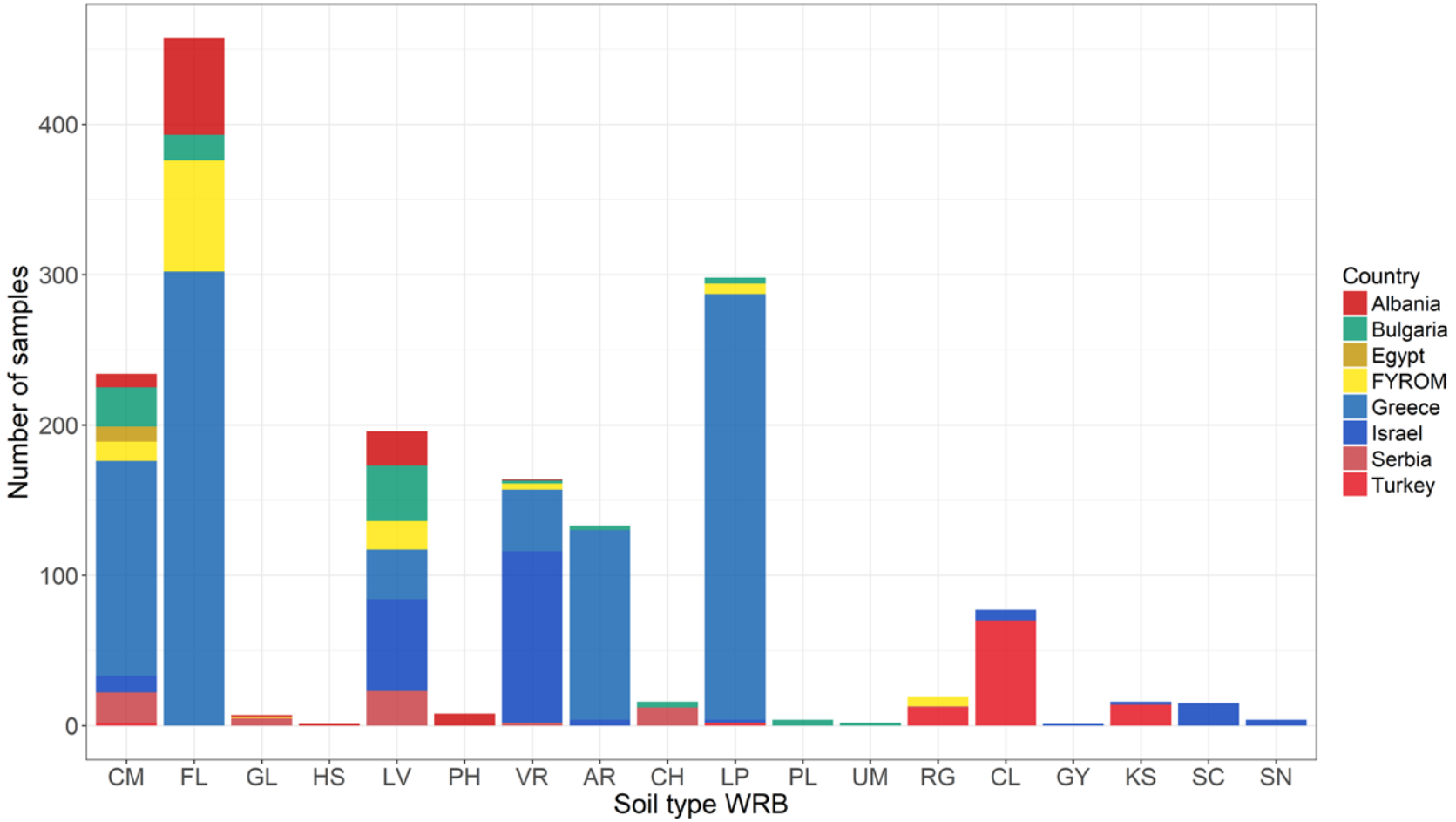
The GEO-CRADLE SSL (I)

- Open, regional, expandable vis-NIR SSL, adhering to the state-of-the art standards
- Compatible with the Global SSL
- Complementary to the LUCAS SSL

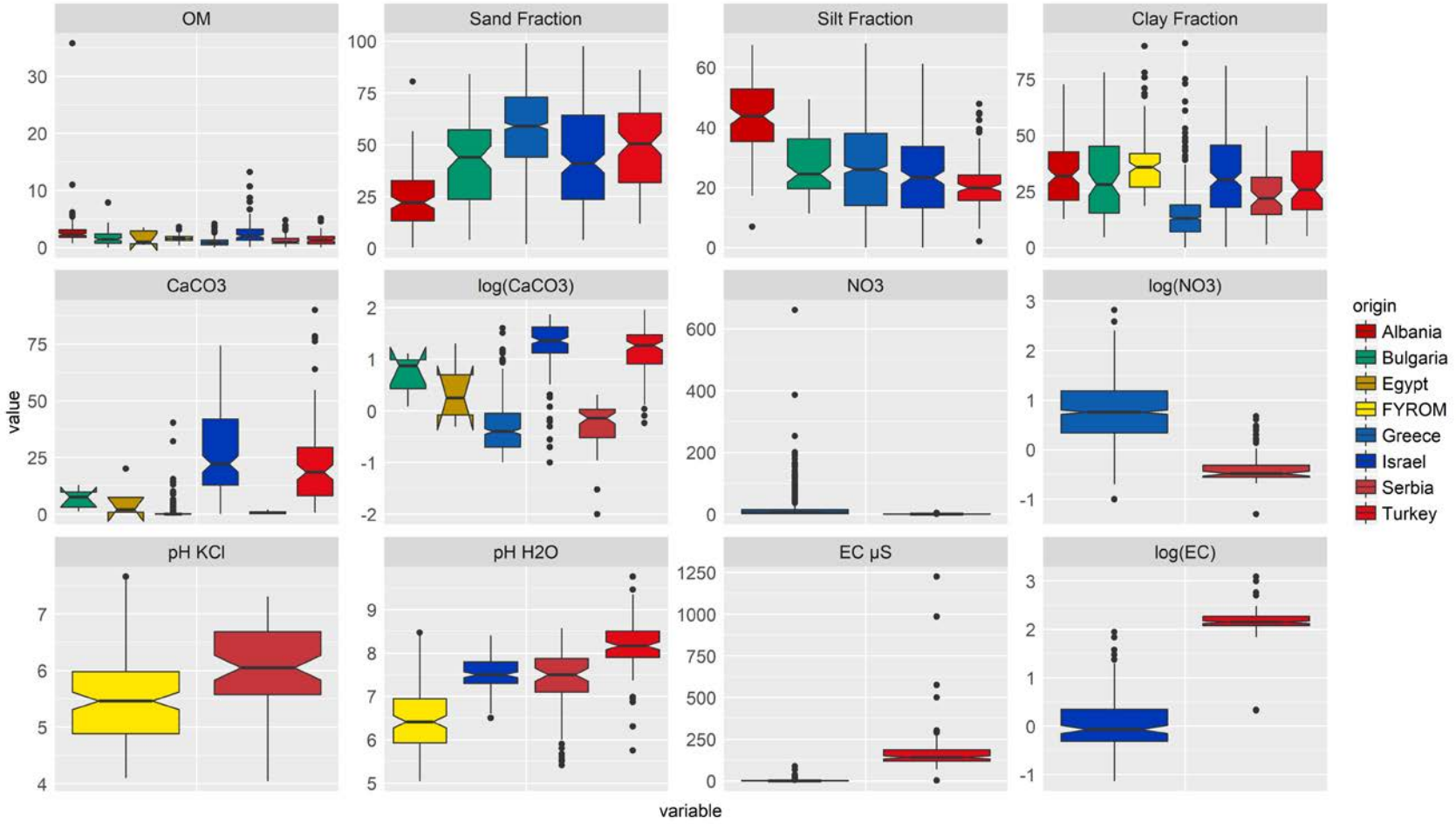
Significant contribution to the Copernicus in-situ component

http://datahub.geocradle.eu/dataset/regional-soil-spectral-library

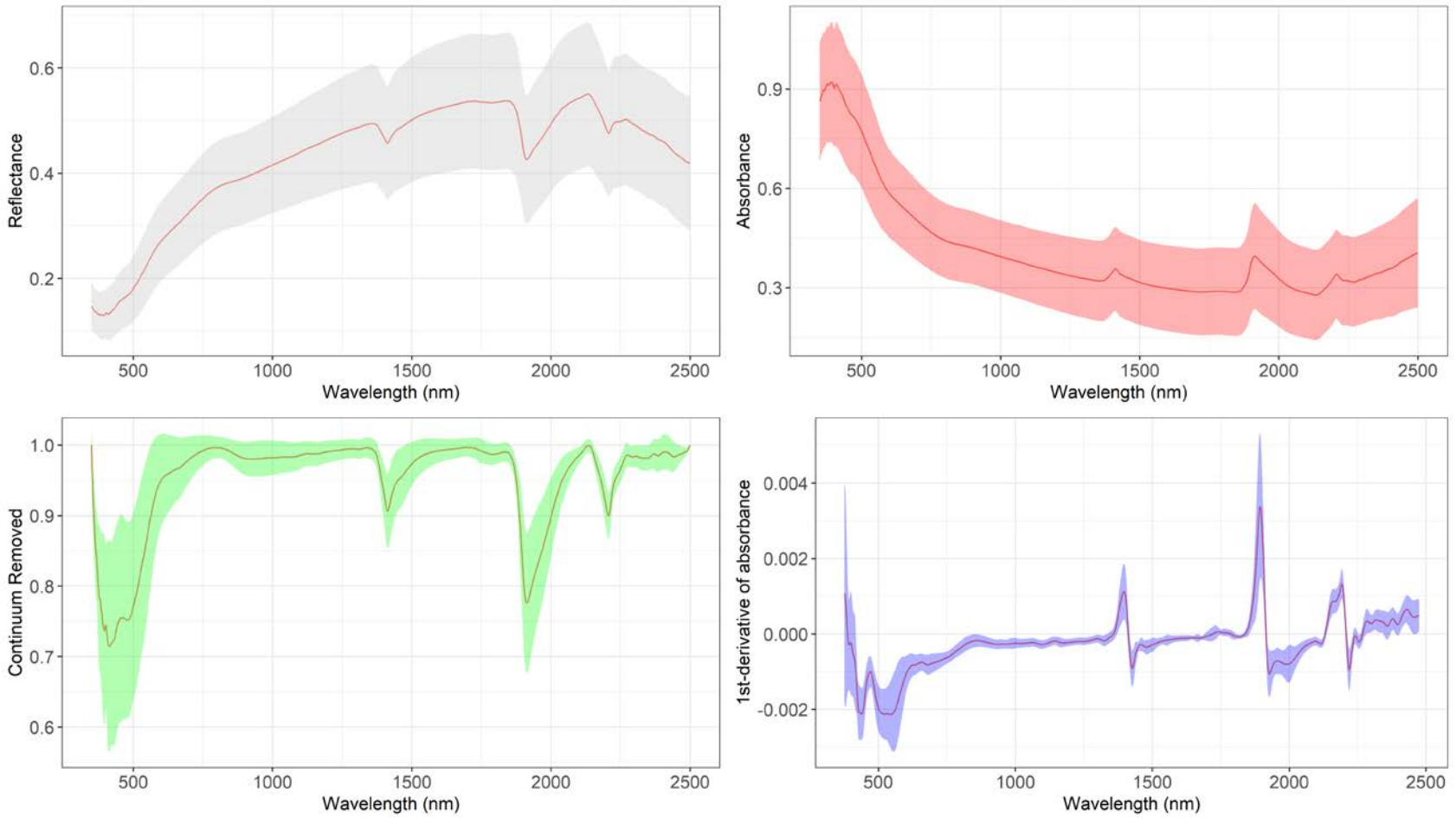
The GEO-CRADLE SSL (II)



The GEO-CRADLE SSL (III)

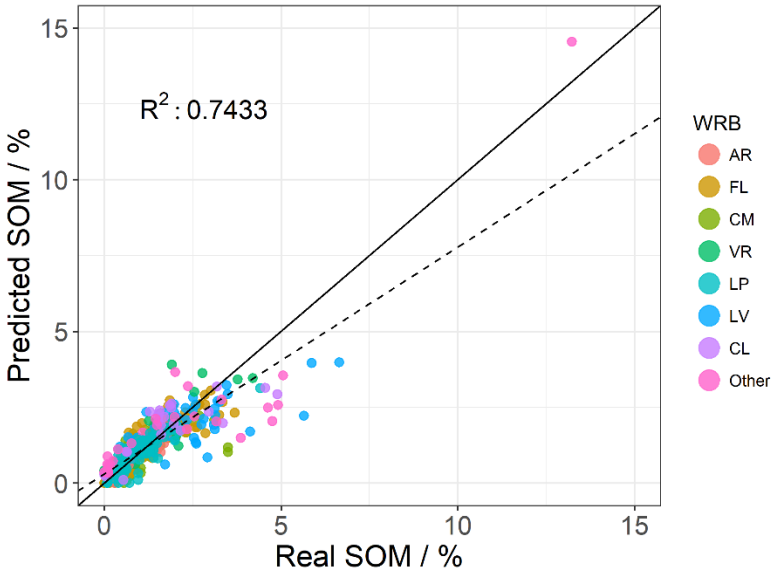


The GEO-CRADLE SSL (IV)

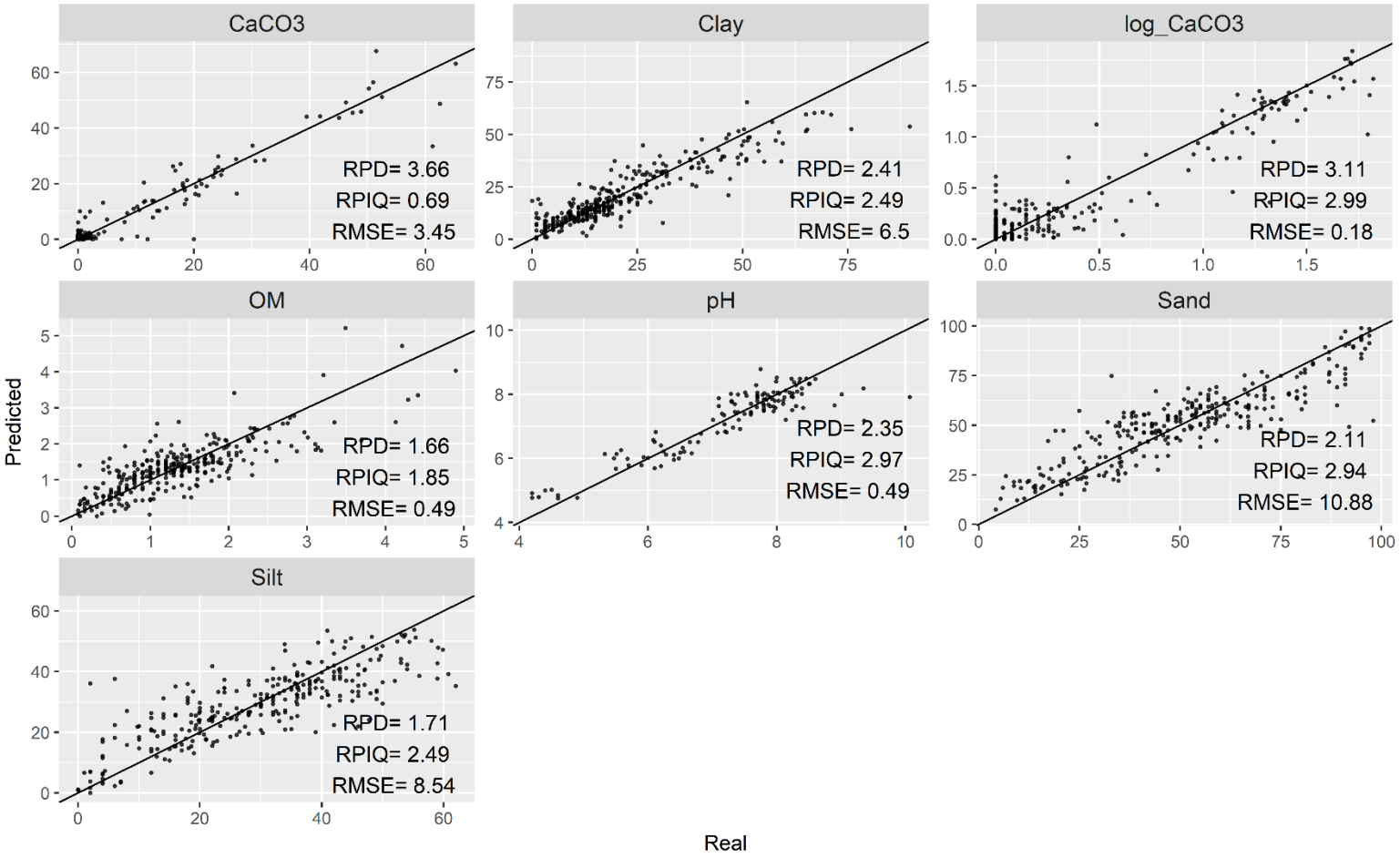


Modeling Results (I)

- Machine learning algorithms (PLS, SVM, …)
- Global models VS Local models
- Soil Spectroscopy is not panacea



Modeling Results (II)



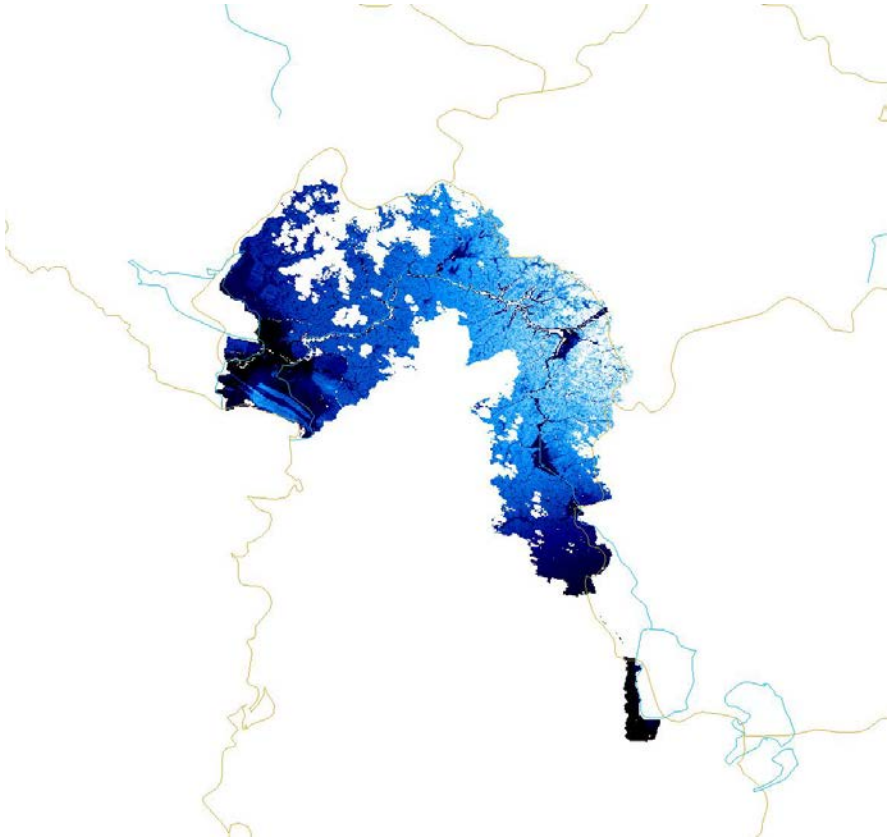
Addressing regional challenges (I)

- Soils in Tunisia (and N. Africa) are fragile and sensitive due to urbanization, erosion, drought, and salinity
- NAP-CD / LADA-Tunisia / UNCCD
- SSL assists to address these challenges through soil monitoring (e.g. static maps and timeseries of SOM, EC, texture)
- Enhanced knowledge can lead to better decision making, improved management of the soil, monitoring the effect and impact of steps to taken to address the challenges, etc.

Addressing regional challenges (II)

- Similar models and results can be derived in N. Africa
- Of particular importance are soil texture (sand / silt / clay), OM, EC, and nutrients

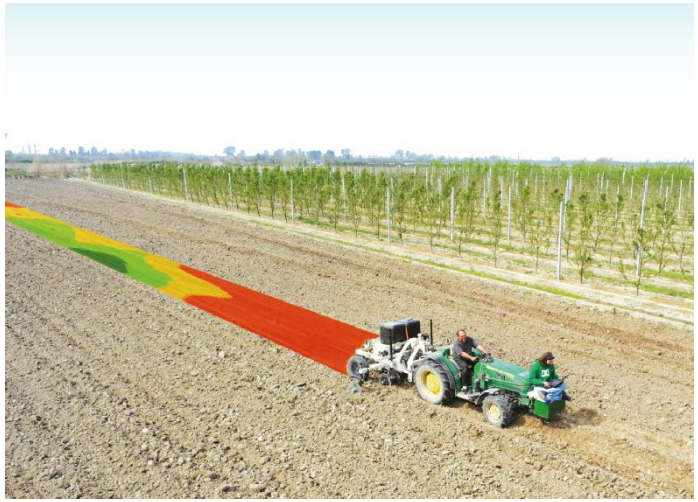
Applying the SSL to Copernicus

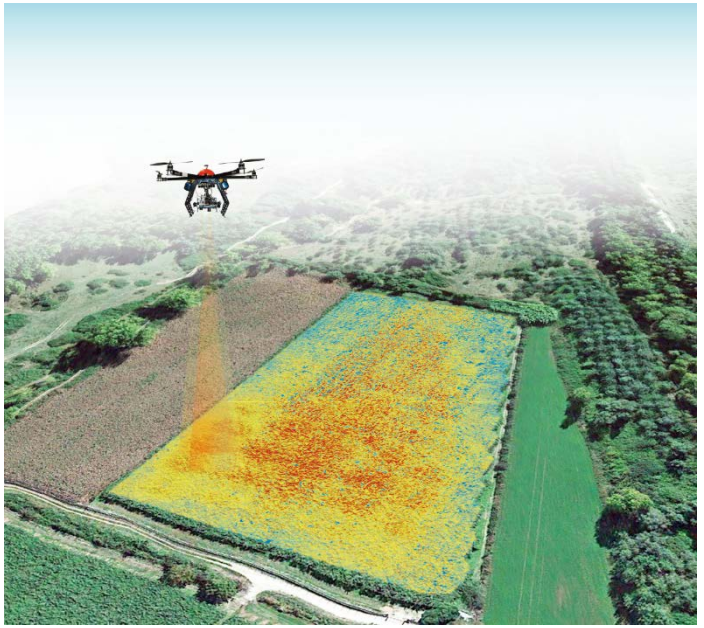


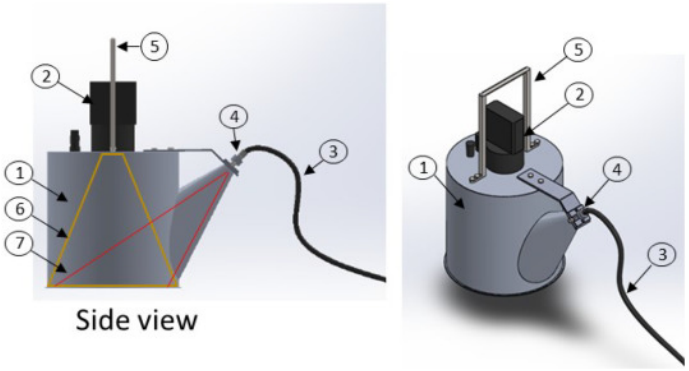
- The soil spectra data were re-sampled to match the spectral configuration of Sentinel-2
- Models were developed using only these spectral wavelengths
- The models were applied to the Drin River basin of N. Albania to create a map of Clay %
- These data can serve as input to hydrological models of the region

Clay Content in the Drin River basin, Northern Albania

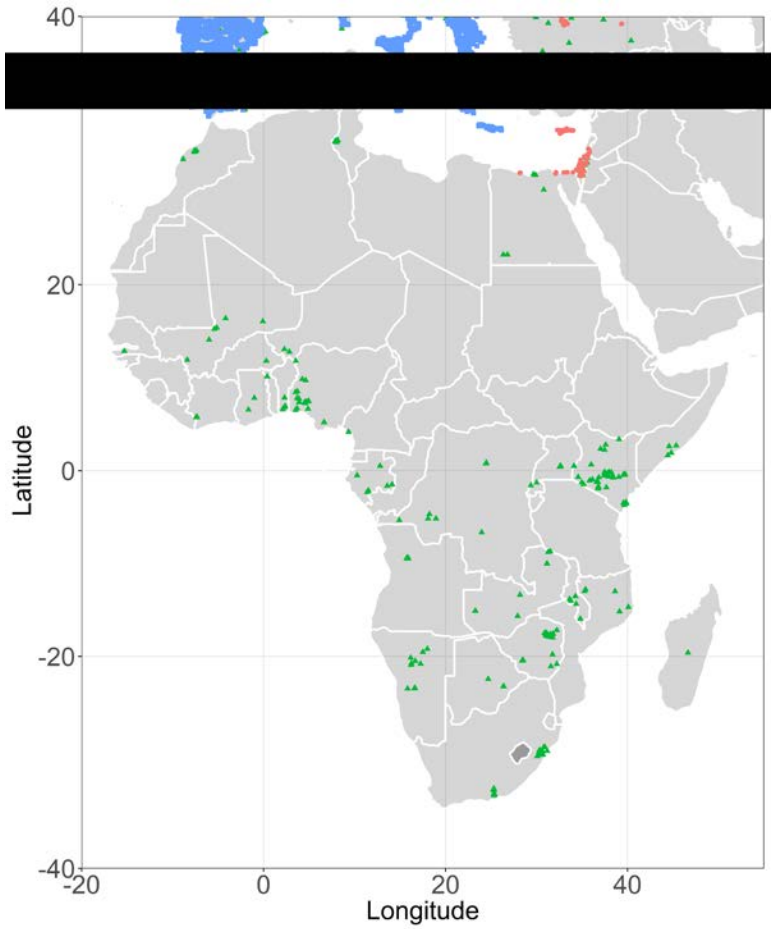
Applying the SSL for agriculture







Extending the SSL in North Africa



- Soil samples in the existing Global-SSL are mostly from KE, NG, ZA
- You can partake in this endeavor by using existing soil libraries or through new soil surveys to enrich the African SSL
- To ensure standardization we can assist you in a number of ways (e.g. training / measurements)
- Reach out to us! **info@i-bec.org**

References

- M. Nocita, A. Stevens, et al., “Soil Spectroscopy: An Alternative to Wet Chemistry for Soil Monitoring,” no. September, 2015, pp. 139–159.
- V. Kopačková and E. Ben-Dor, “Normalizing reflectance from different spectrometers and protocols with an internal soil standard,” *Int. J. Remote Sens.*, vol. 37, no. 6, pp. 1276–1290, 2016.
- Orgiazzi, C. Ballabio, P. Panagos, A. Jones, and O. Fernández-Ugalde, “LUCAS Soil, the largest expandable soil dataset for Europe: a review,” Eur. J. Soil Sci., Nov. 2017.
- R. A. Viscarra Rossel, T. Behrens, et al., “A global spectral library to characterize the world’s soil,” Earth-Science Rev., vol. 155, no. February, pp. 198–230, Apr. 2016.

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thank you!

For more information

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