



Predicting soil physico-chemical parameters from a mosaic of Sentinel 2 imagery in a semi-arid Mediterranean area of south-eastern Spain



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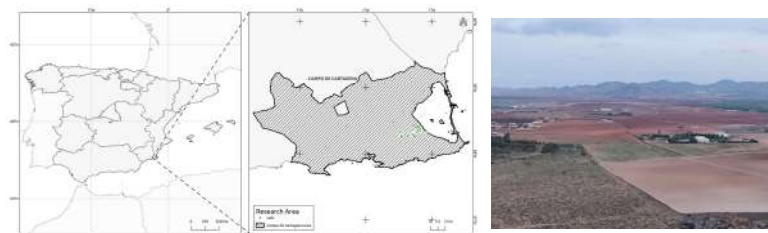
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Soil health indicators mainly rely on lab-based analytical determinations from point samples. We explore the potential relationship between analytical physico-chemical parameters of samples from agricultural plots in a semi-arid Mediterranean region in south-eastern Spain with bands from a mosaic of remote sensing images generated during the period of bare soil. This work has been conducted within the STEROPES of EJP SOIL.

Research area

Agricultural area of Campo de Cartagena, located at the south east Spain, in the Autonomous Community of Murcia and with semi-arid conditions.



Materials

- 128 soil samples from 0 to 10 cm taken by cores.
- Sentinel 2 images from 2019 to 2020.

Bare soil mosaic from Sentinel 2 images generated with **Google Earth Engine**.



Results

Parameters vs band



Direct relationship (Spearman correlation) between bands and EC as well as particle size parameters: clay and sand. It was potentially facilitated by the bare soil mosaic.

Moreover, SOC was mostly correlated to Red, NIR and SWIR bands, although there

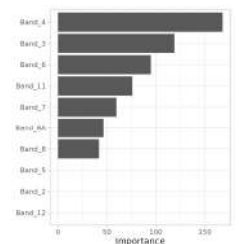
| | Band_2 | Band_3 | Band_4 | Band_5 | Band_6 | Band_7 | Band_8 | Band_8A | Band_11 | Band_12 |
|------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|
| pH | 0 | 0.38 | 0.02 | 0.62 | -0.26 | 0.01 | 0.18 | | | |
| EC | 0.06 | 0.34 | 0.07 | 0.61 | -0.15 | -0.01 | 0.06 | | | |
| Sand | 0.12 | 0.34 | 0.29 | 0.31 | 0.26 | -0.12 | -0.35 | | | |
| Clay | 0.1 | 0.17 | 0.26 | 0.44 | 0.26 | 0.16 | 0.32 | | | |
| Silt | 0.12 | 0.18 | 0.22 | 0.4 | 0.13 | -0.2 | -0.38 | | | |
| MO | 0.09 | 0.25 | 0.19 | 0.36 | 0.17 | -0.21 | -0.2 | | | |
| SOC | 0.06 | 0.32 | 0.15 | 0.38 | 0.09 | -0.2 | -0.11 | | | |
| | 0.03 | 0.35 | 0.16 | 0.37 | 0.04 | -0.19 | -0.06 | | | |
| | 0 | 0.2 | -0.27 | -0.08 | 0.02 | -0.24 | 0.1 | | | |
| | 0.15 | 0.12 | 0.34 | -0.32 | 0.1 | -0.17 | -0.01 | | | |

Prediction

SOC prediction based on remote sensing imagery is a main goal of the EJP STEROPES project.

Our first approach in the area used random forest (R) on bands from the bare soil mosaic. Metrics with CV:

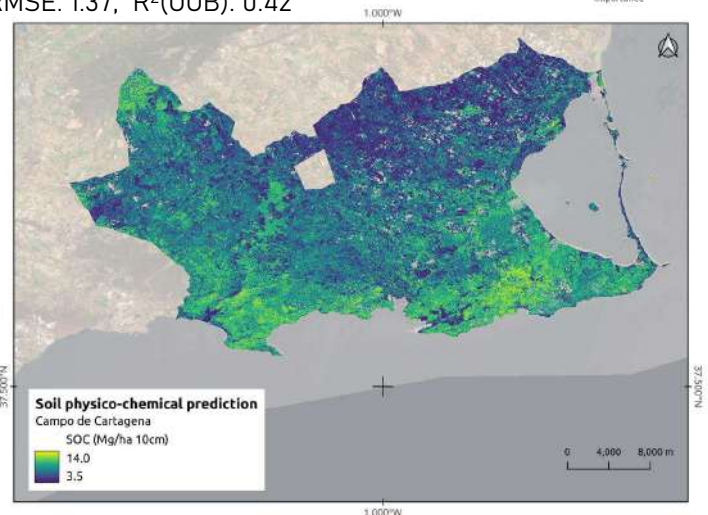
RMSE: 1.37; R²(OOB): 0.42



Future actions

Further research to improve the predictive power of the models could involve:

- the introduction of **new complementary remote sensing data sources** (gamma-ray)
- **extending the survey** to areas of the region with greater variability.



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