Mapping soil organic carbon content in two contrasted pedoclimatic regions by combining time series of Sentinel-2 and Sentinel-1 with Vis-NIR laboratory spectra

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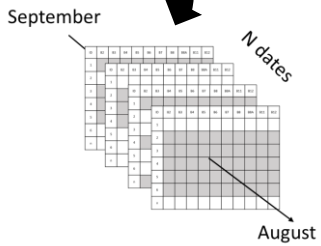
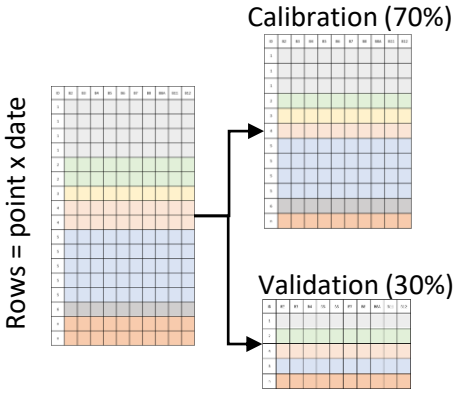
Methodology :

Sentinel-2



3 random draws



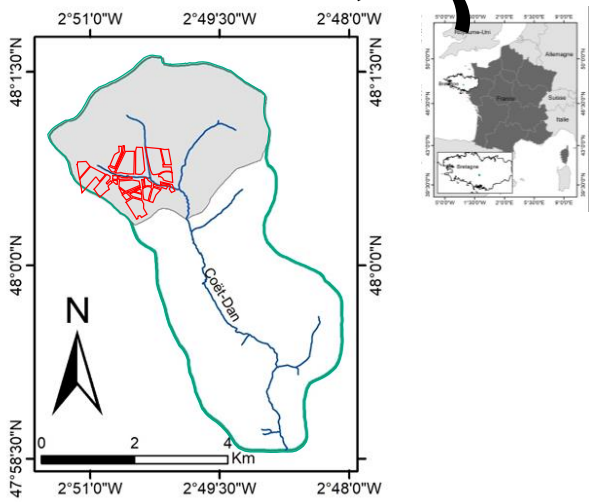
4 approaches

- S2-Bands ❶
- S2-Bands + 12 S2-indices ❷ ← MFA ← 40 S2-indices
- S2-Bands + S1-SM ❸ ← S1-SM ← **Sentinel-1**
- S2-Bands + 1-5 lab-spectra indices ❹ ← Vis-NIR laboratory spectra

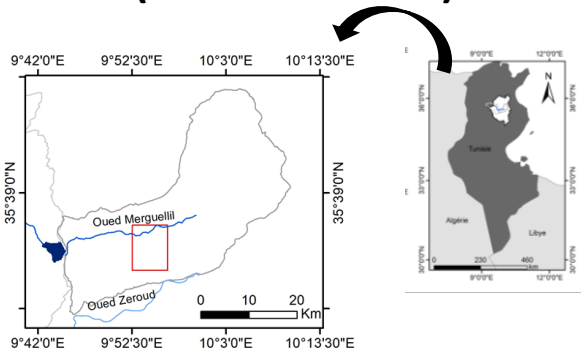
DNN models (R^2, RMSE, RPD, RPIQ) → Spatialisation and **map** production

Study areas

Site 1 (Brittany, Western France)

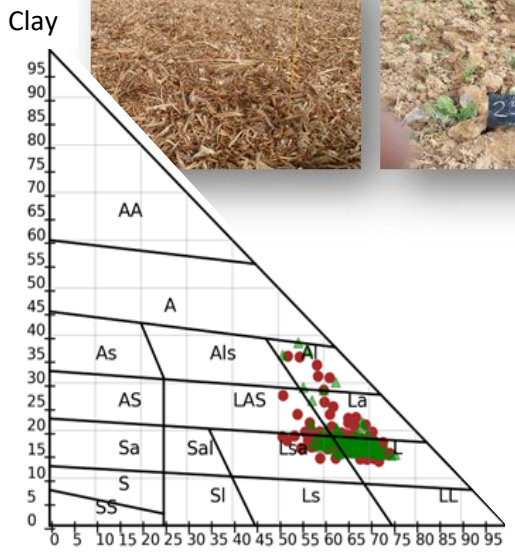


Site 2 (Central Tunisia)

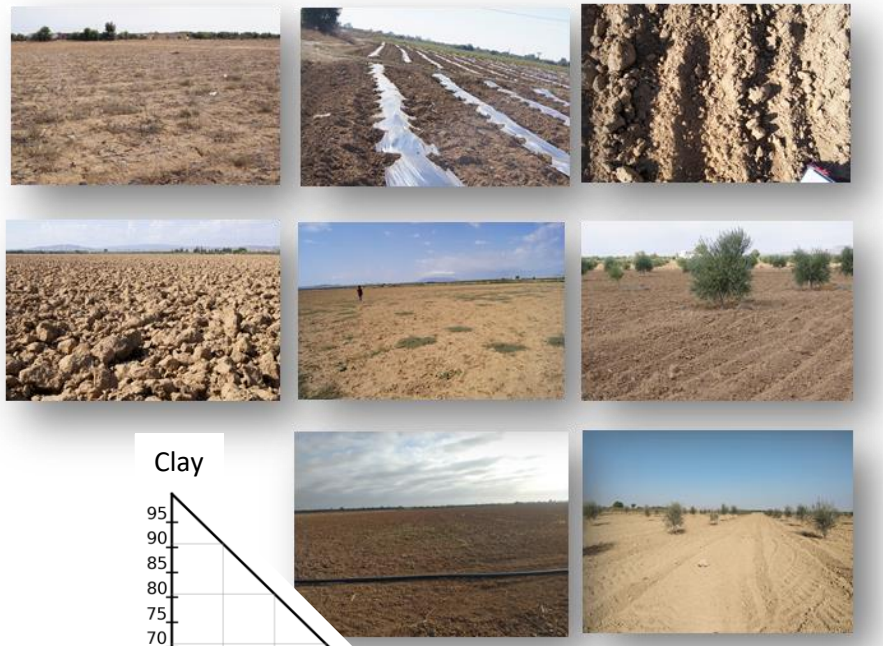


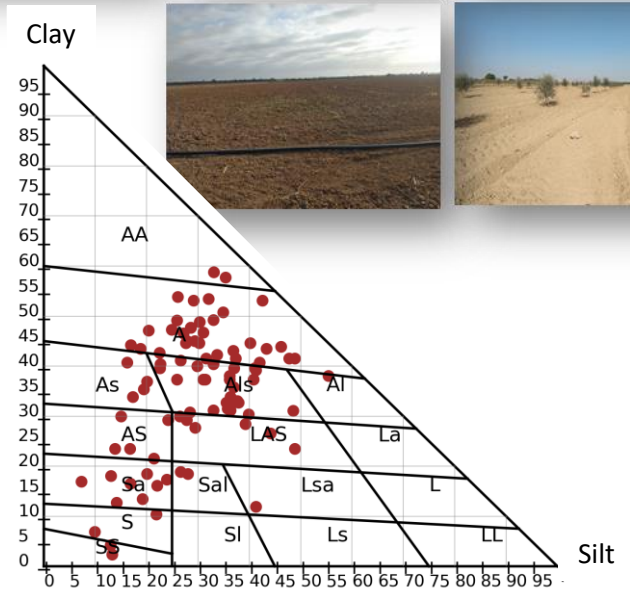
Methodology :

Site 1 (Brittany, Western France)



Site 2 (Central Tunisia)

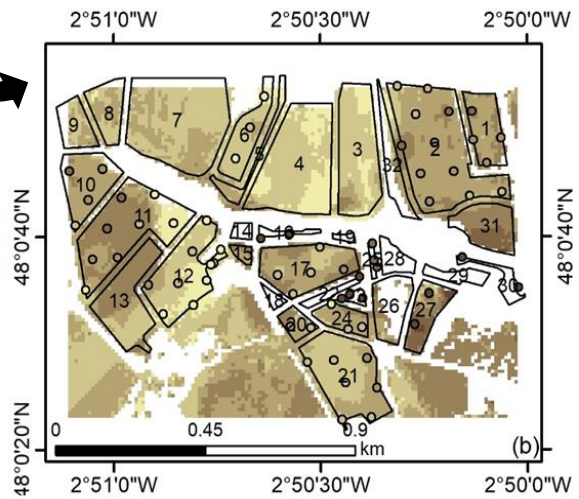




	Site 1	Site 2
Clay(%)	13,5 – 35,6	5 – 55
pH	6	8
SOC (g/kg)	**14,6 – 204**	**4,1 – 11,9**

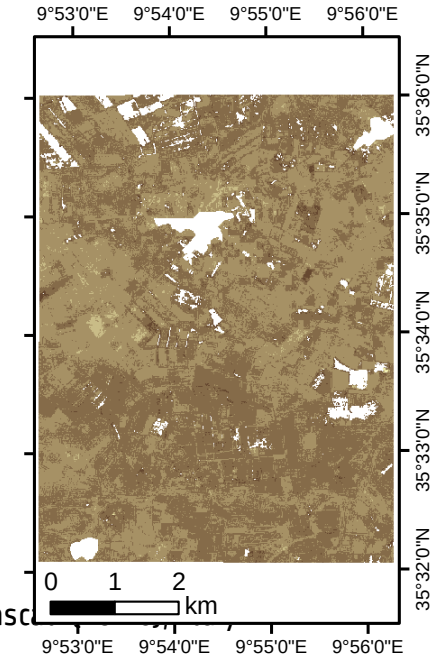
Results :

	Site 1 (France)		Site 2 (Tunisia)	
Approach	RMSEv (g.kg^{-1})	RPIQ	RMSEv (g.kg^{-1})	RPIQ
S2-bands ❶	2.33 (±0.6)	1.33 (±0.1)	0.93 (±)	1.95 (±0.03)
S2-Bands + 12 S2-indices ❷	2.60 (±0.5)	1.17 (±0.2)	0.91 (±)	1.96 (±0.1)
S2-Bands + S1-SM ❸	2.41 (±0.6)	1.29 (±0.1)	**0.90 (±)**	**2.09 (±0.2)**
S2-Bands + 1-5 lab-spectra indices ❹	**2.42 (±0.6) – 1.03 (±0.9)**	**1.78 (±0.2) – 3.1 (±0.6)**	-	-



70 % of the studied area

SOC (g/kg)
15.3 - 20
20.1 - 23
23.1 - 25
25.1 - 35
35.1 - 58



97 % of the studied area

SOC (g/kg)
4.1 - 5
5.1 - 6
6.1 - 7
7.1 - 8
> 8

Conclusion :

- Our methodology allowed predicting soil organic carbon content in two different pedoclimatic conditions
- Using time series of Sentinel-2 and Sentinel-1 data with DNN algorithms improved the accuracy of SOC content prediction
  - ➢ It can be an alternative to the mosaic approach
- Using lab-indices as co-variables in the calibration phase improved the prediction performance of SOC content
- For both sites produced SOC maps were consistent with land use


Thank you for your attention
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