

Copper Distribution Profiles in Soils from a Long-Term Polluted Field

Marcos Paradelo (1,2), Maria Knadel (1), Per Moldrup (3), Martin Holmstrup (4), J. Eugenio López Periago (2), and Lis W. de Jonge (1)



- (1) Dept. of Agroecology, Aarhus University, Blichers Alle 20, P.O. Box 50, DK-8830 Tjele, Denmark.
 (2) Dept. of Plant Biology and Soil Science, University of Vigo, As Lagoas s/n, E-32004 Ourense, Spain.
 (3) Dept. of Civil Engineering, Aalborg University, Sohngaardsholmsvej 57, DK-9000 Aalborg, Denmark.
 (4) Dept. of Bioscience, Aarhus University, Vejløvej 25, DK-8600 Silkeborg, Denmark.



Introduction

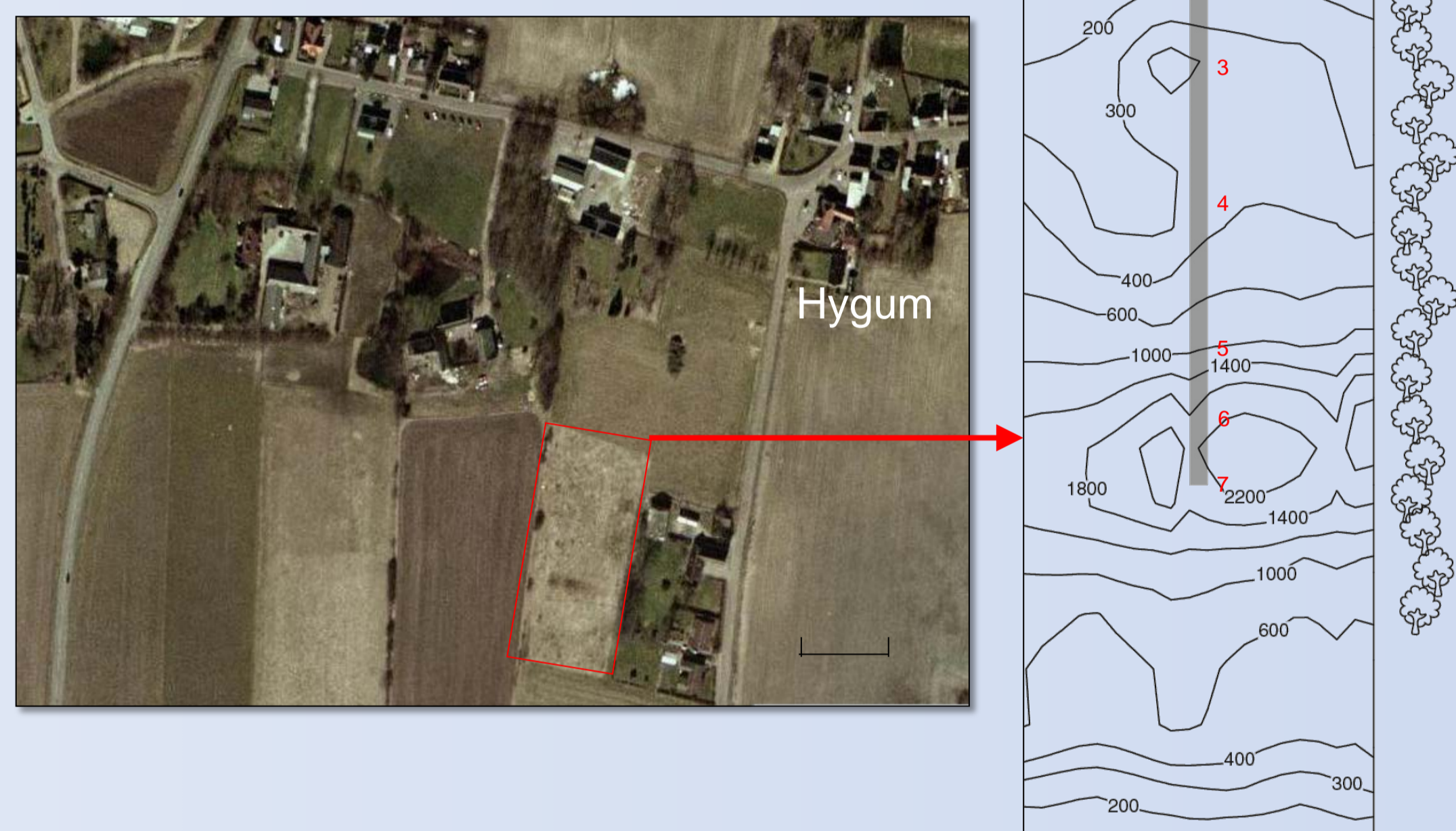
Copper pollution affects soil organisms and ecosystem functions. Depth profiles of Cu concentrations can elucidate the risk of vertical Cu mobility.

Objectives

- To determine the copper concentration profiles on a historical Cu polluted field
- To predict Cu concentration from soil properties.

Methods

Sampling



- Hygum (Denmark). Polluted field with $\text{Cu}_2(\text{SO}_4)$. Gradient in Cu concentration (25 to 3000 mg kg^{-1} on the top soil)
- 7 points along the Cu gradient at 4 depths (0 to 100 cm)



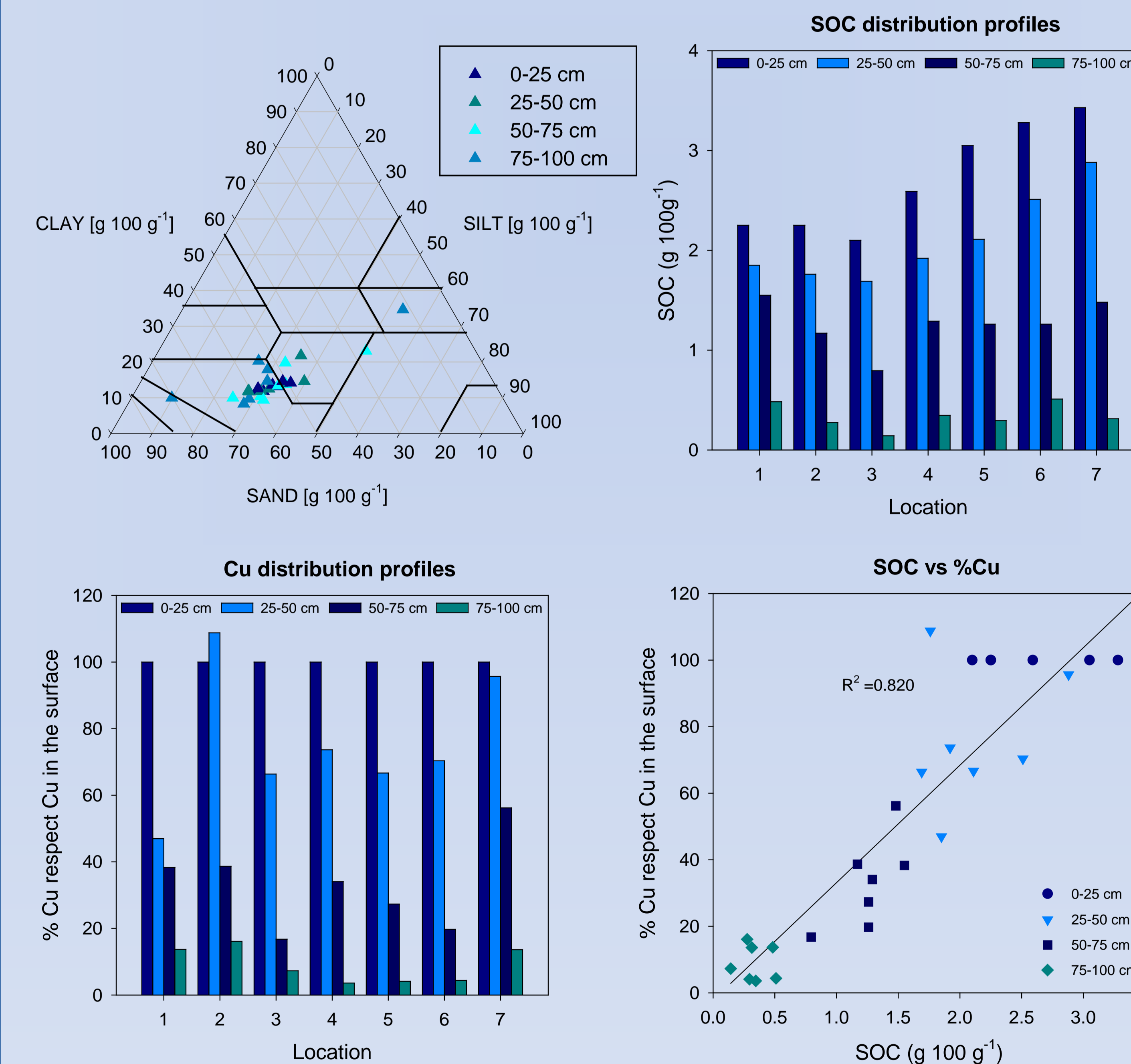
Analyses

- pH, EC, SOC, Texture, Total Cu
- Vis-NIR spectroscopy

Results

Soil properties from the top-soil* (0-25 cm) and the sub-soil# (75-100 cm) along the Hygum field

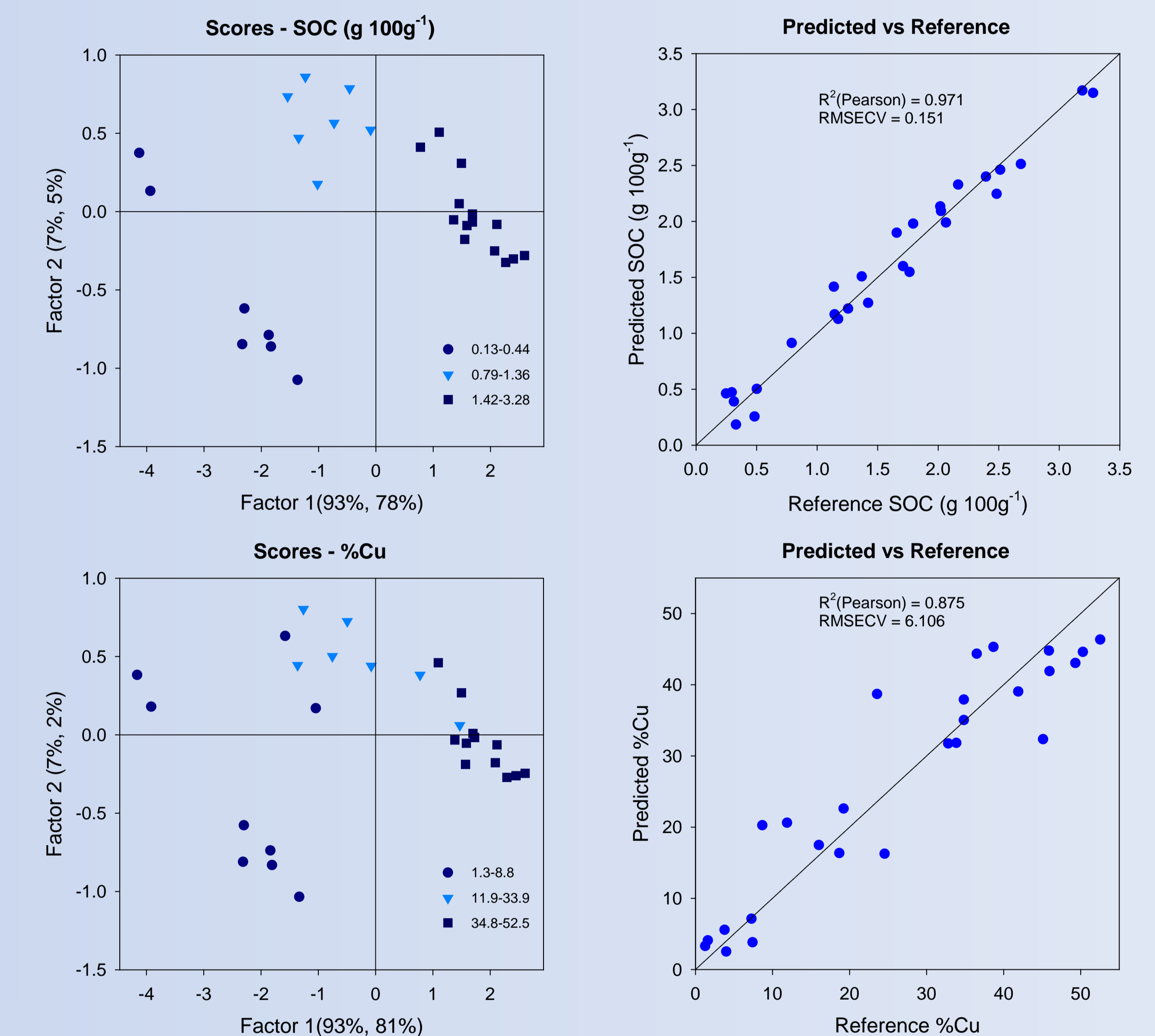
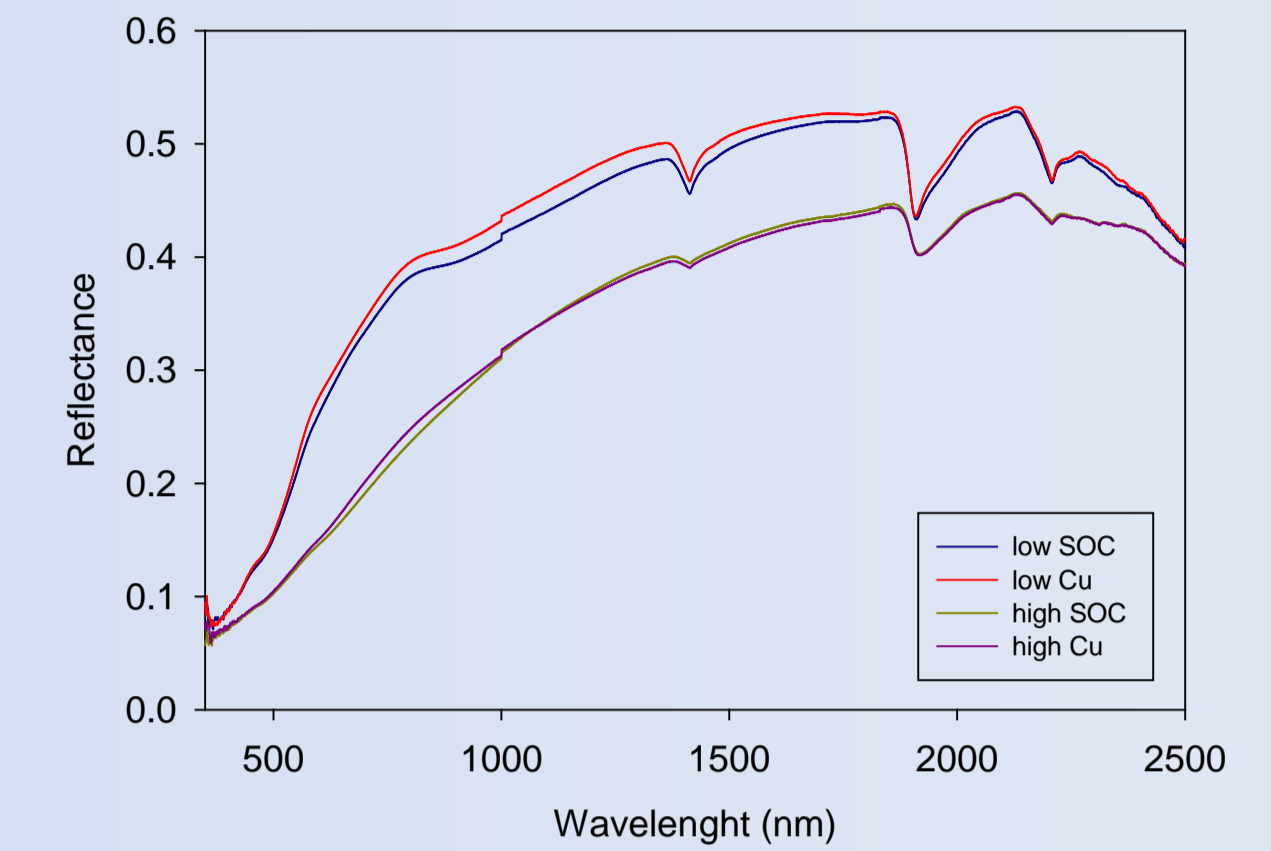
	1	2	3	4	5	6	7
pH	6.65*	6.26	6.01	6.23	6.66	6.39	6.38
	5.97#	6.46	6.14	5.66	5.83	6.64	5.71
EC (mScm^{-1})	50.0	34.4	28.0	37.1	68.0	37.0	28.4
Clay ($\text{g } 100\text{g}^{-1}$)	12	12	13	13	14	14	14
SOC ($\text{g } 100\text{g}^{-1}$)	2.0	2.2	2.0	2.5	2.5	3.2	3.3
Cu (mg kg^{-1})	25	24	57	336	264	1877	3288
	3	4	4	12	11	82	448



- SOC increased with the copper concentration along the gradient and decreased with the depth
- Cu concentration decreased with the depth, less steep in Point 7
- A good correlation ($R^2 > 0.8$) was found between SOC and the % of Cu respect to the concentration in the top soil

Vis-NIRS

- Soil spectra shifted with increasing SOC and Cu content
- Vis-NIRS well predicted the SOC content (RMSECV = 0.151)
- Cu prediction was less accurate (RMSECV = 6.106)



Conclusions and perspectives

- Distribution of Cu in the soil profile was strongly related with SOC
- Vis-NIRS was able to predict SOC and Cu profile distribution
- Further studies will be undertaken to assess the Cu and SOC fractions and their relation with vis-NIR spectra

Acknowledgements

The work was funded by the Soil Infrastructure, Interfaces, and Translocation Processes in Inner Space (Soil-it-is) project from the Danish Research Council for Technology and Production Sciences.