Using Proximal VisNIR to Characterize Soil Properties

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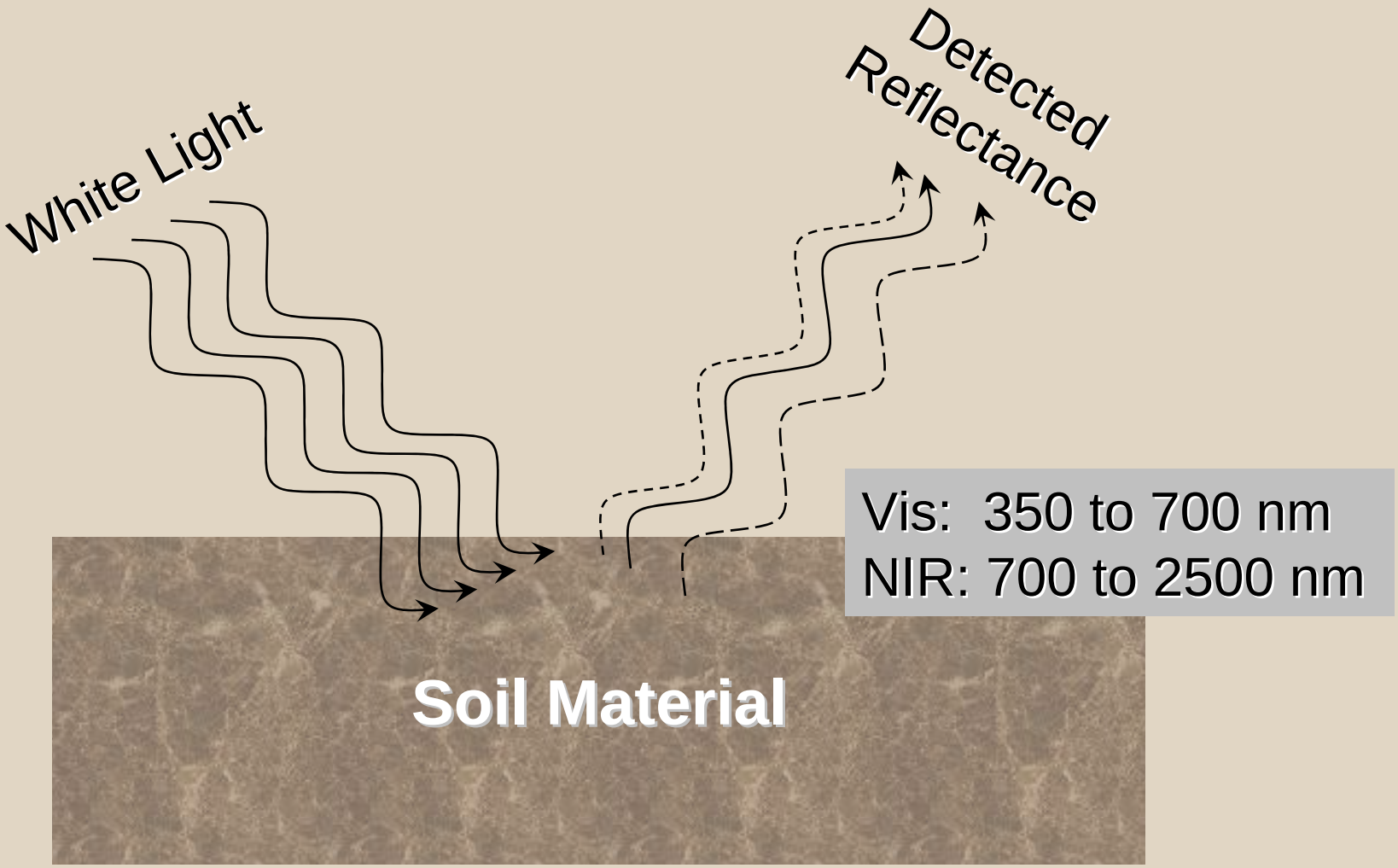
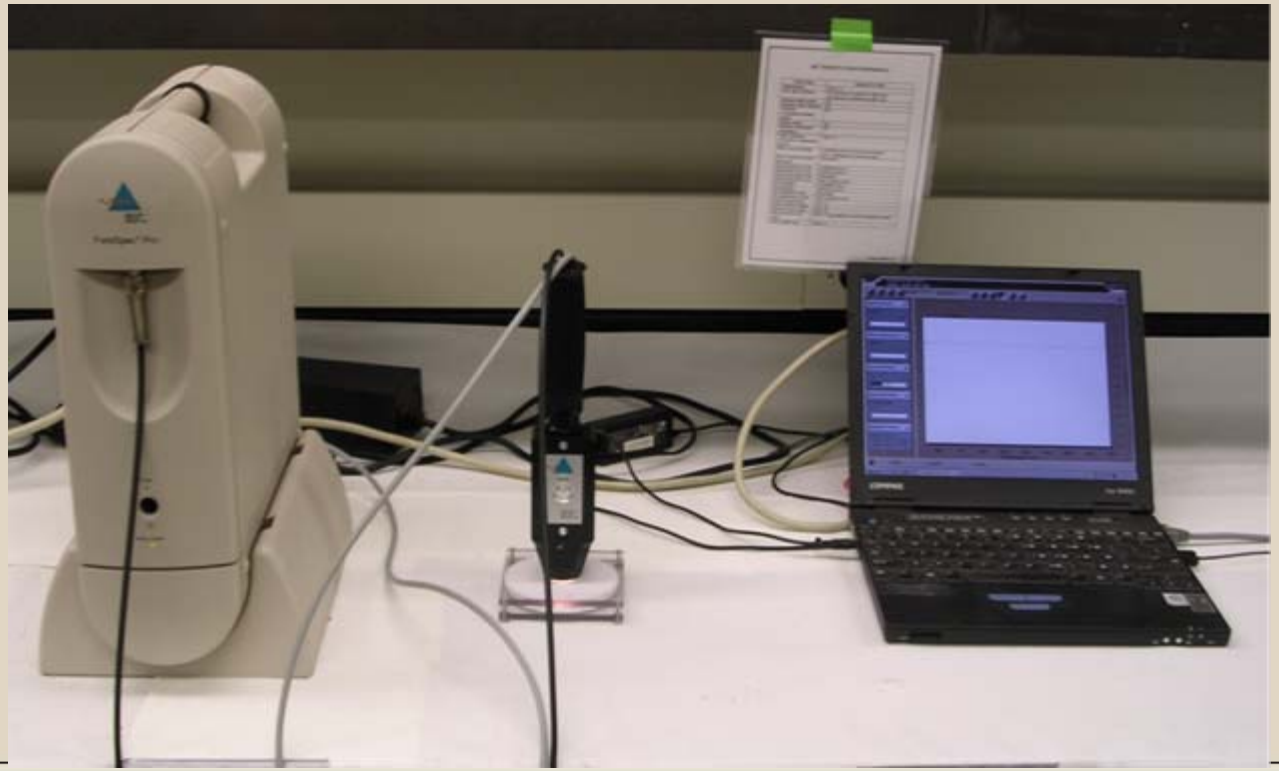
How Diffuse Reflectance Works



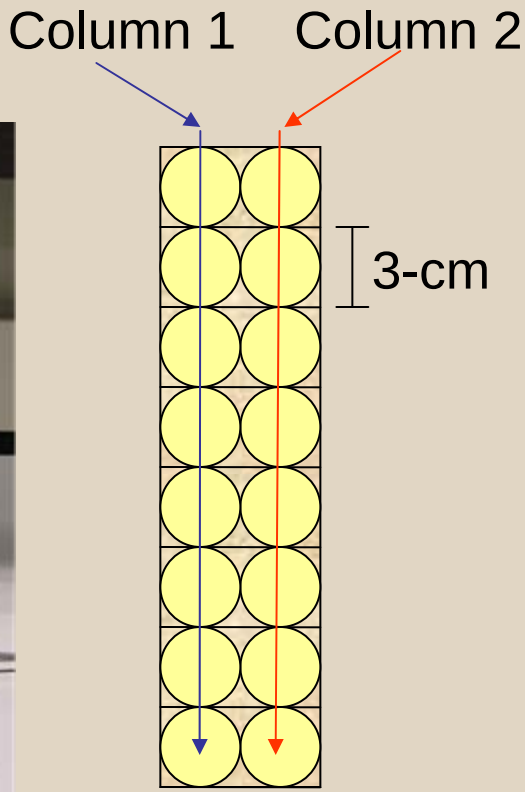
Scanning Soils: ground, 2mm

Scanning soils: intact cores

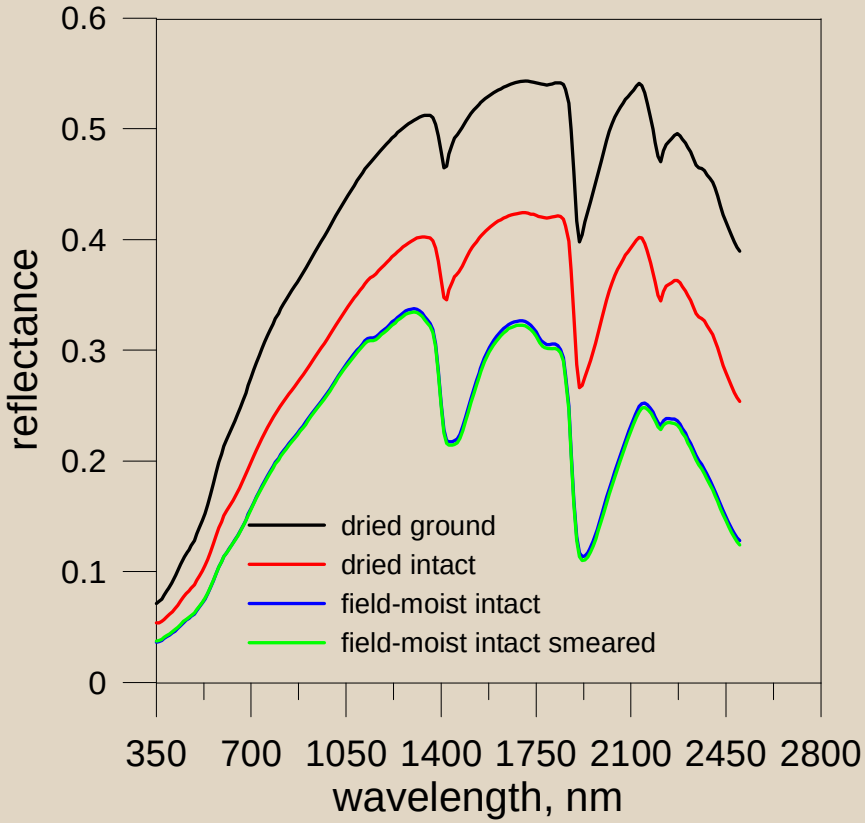
FieldSpec® Pro FR Analytical Spectral Devices, Inc.).

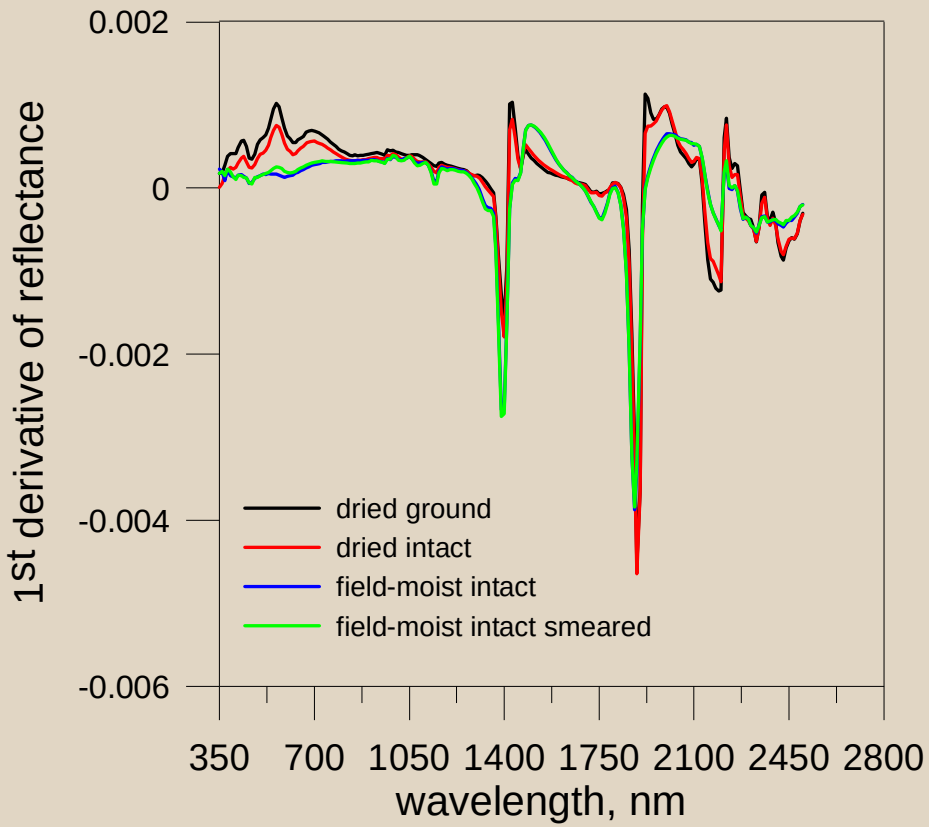


Schematic of scanned soil core



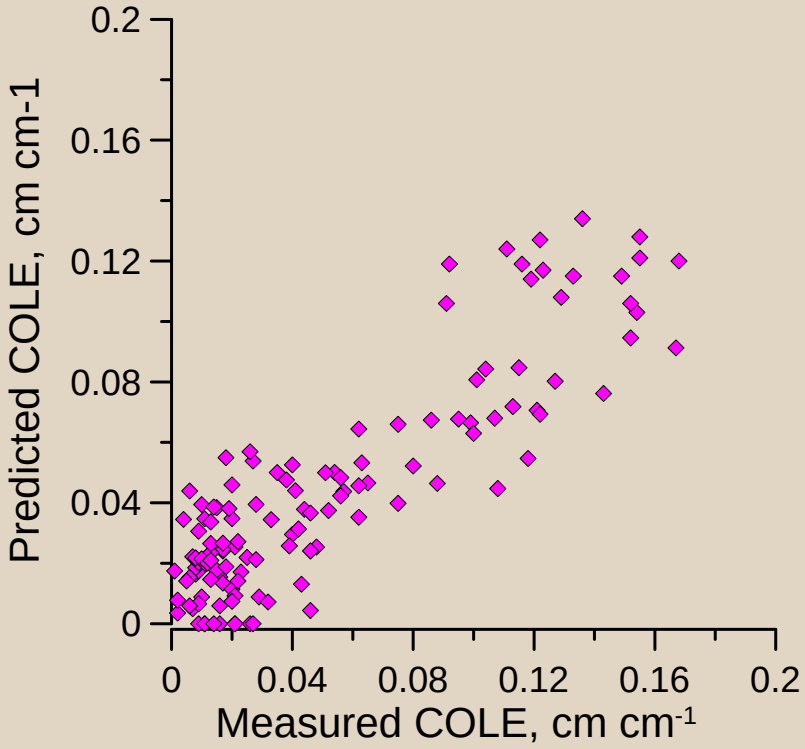
Spectra


0.6
0.5
0.4
0.3
0.2
0.1
0
reflectance
dried ground
dried intact
field-moist intact
field-moist intact smeared
350
700
1050
1400
1750
2100
2450
2800
wavelength, nm


0.002
0
-0.002
-0.004
-0.006
1st derivative of reflectance
dried ground
dried intact
field-moist intact
field-moist intact smeared
350
700
1050
1400
1750
2100
2450
2800
wavelength, nm

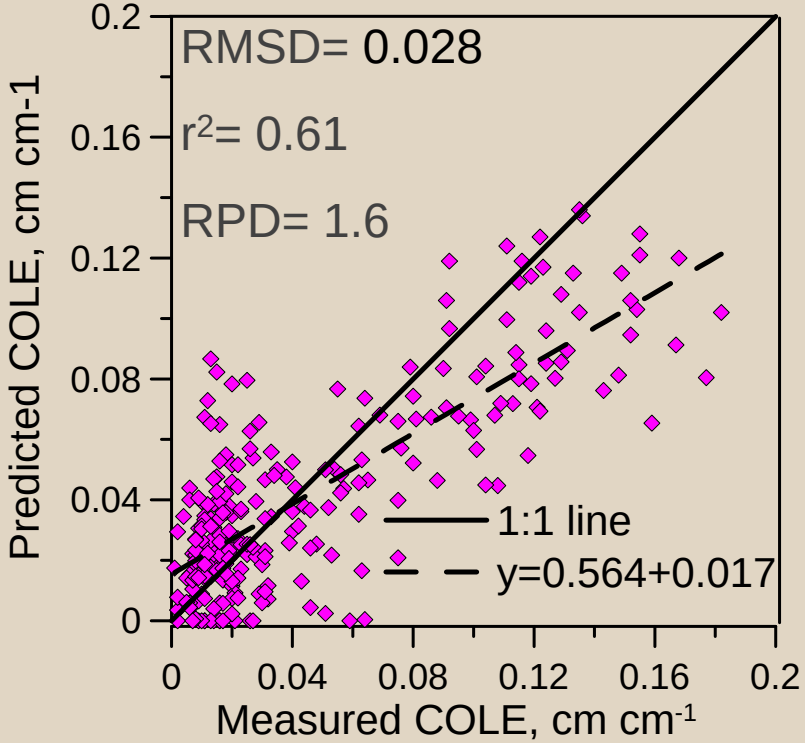
Dried ground soil preparation

Pedotransfer*

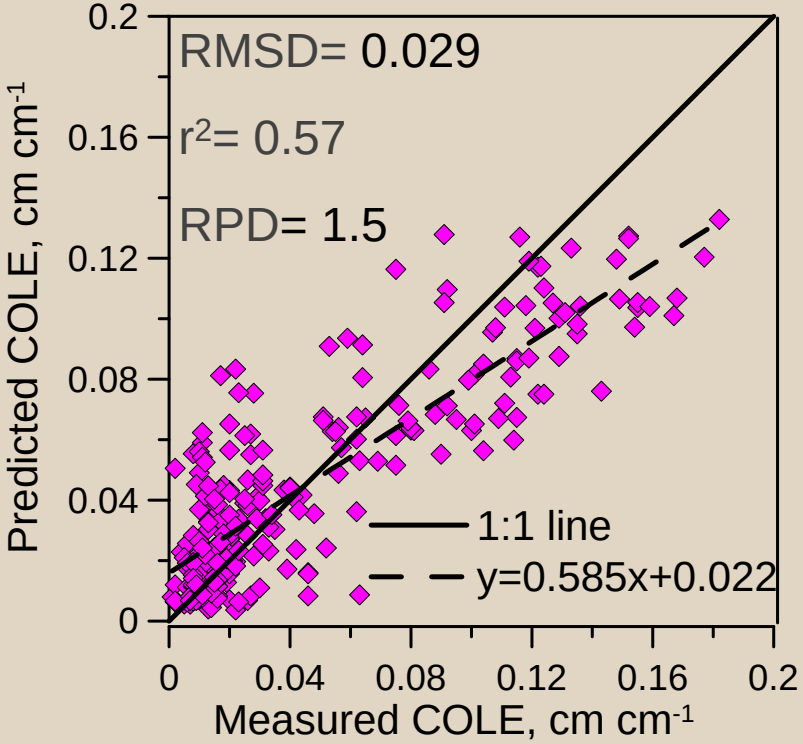


Spectroscopy vs. pedotransfer

Spectroscopy

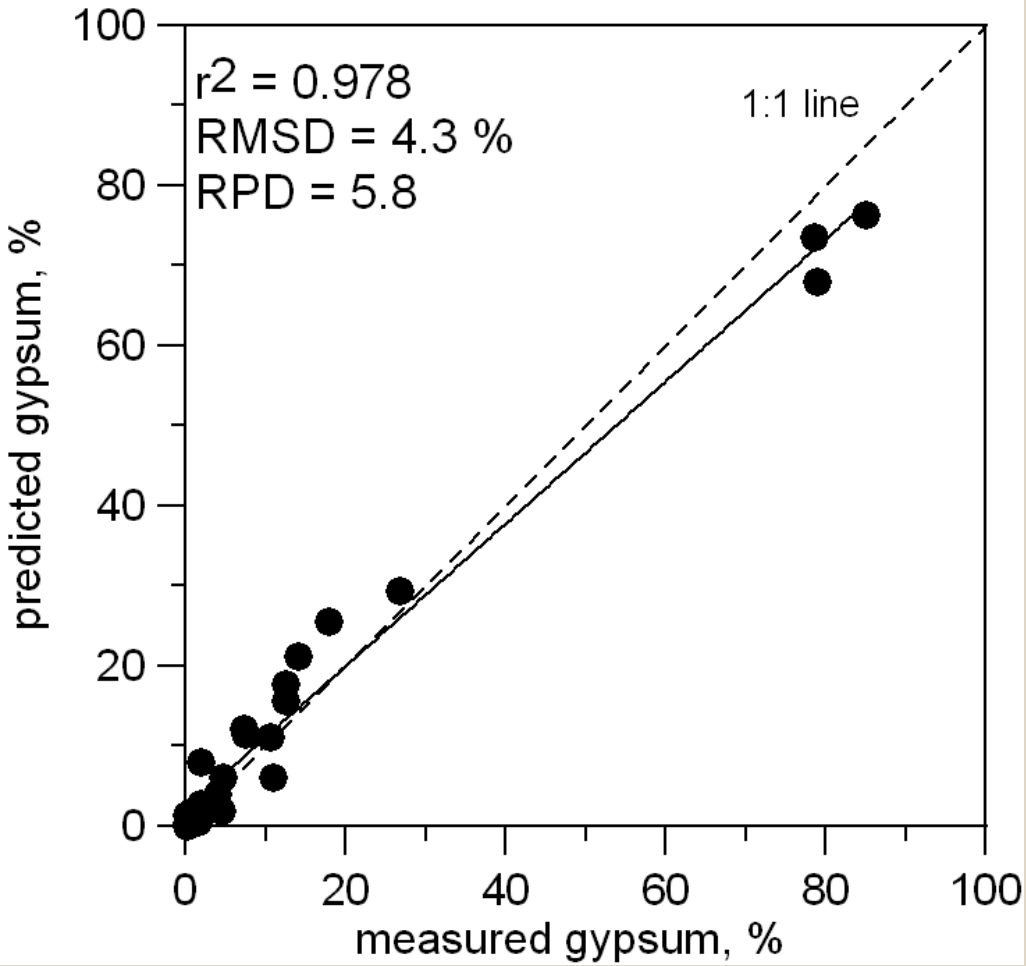


Pedotransfer*



* clay content + CEC

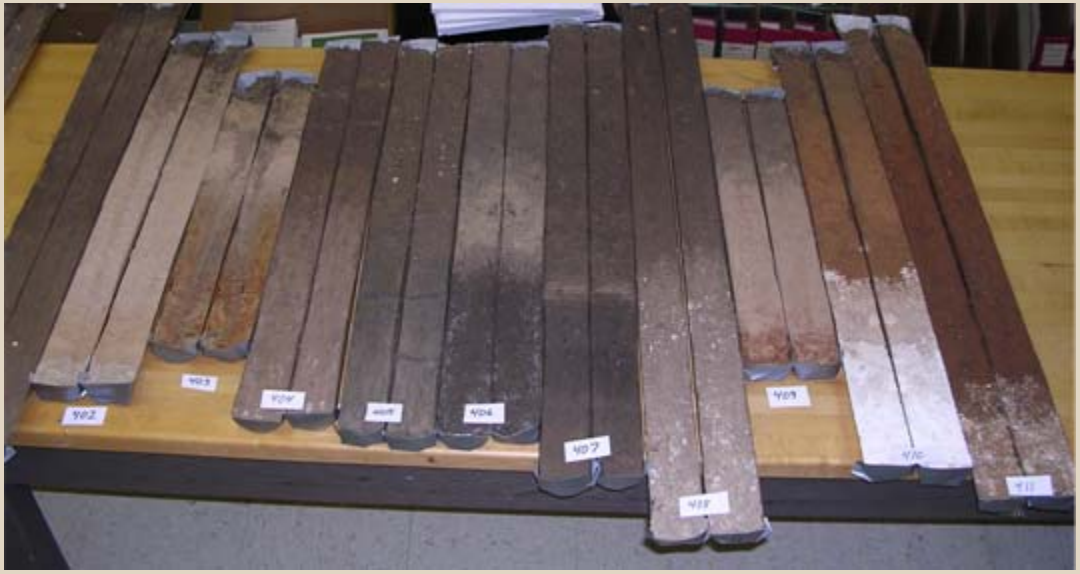
Texas VisNIR Library: Gypsum

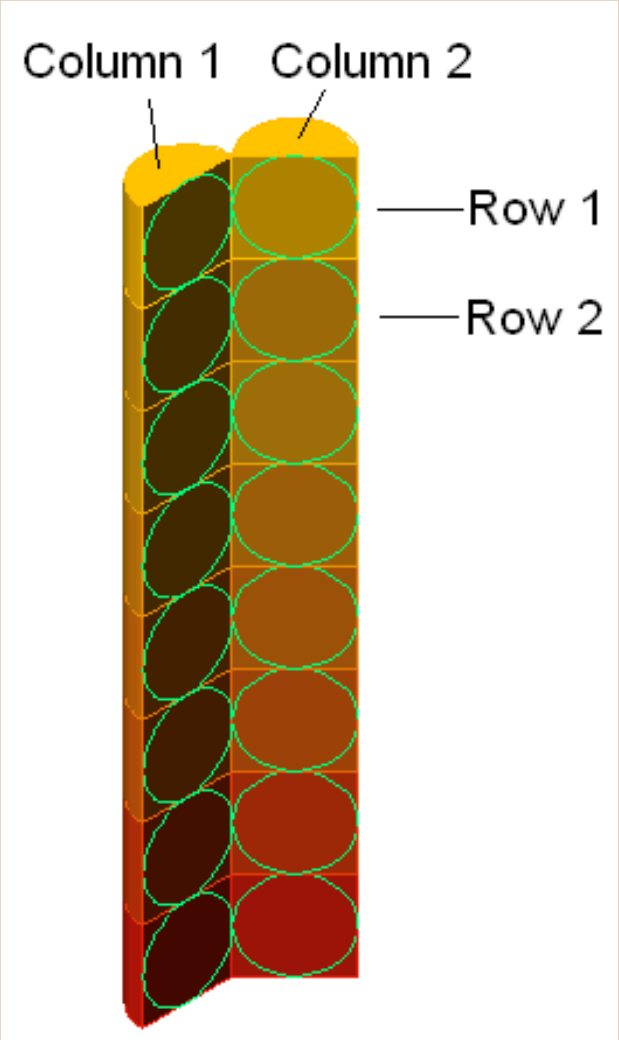


Dried ground soils

TX spectral library

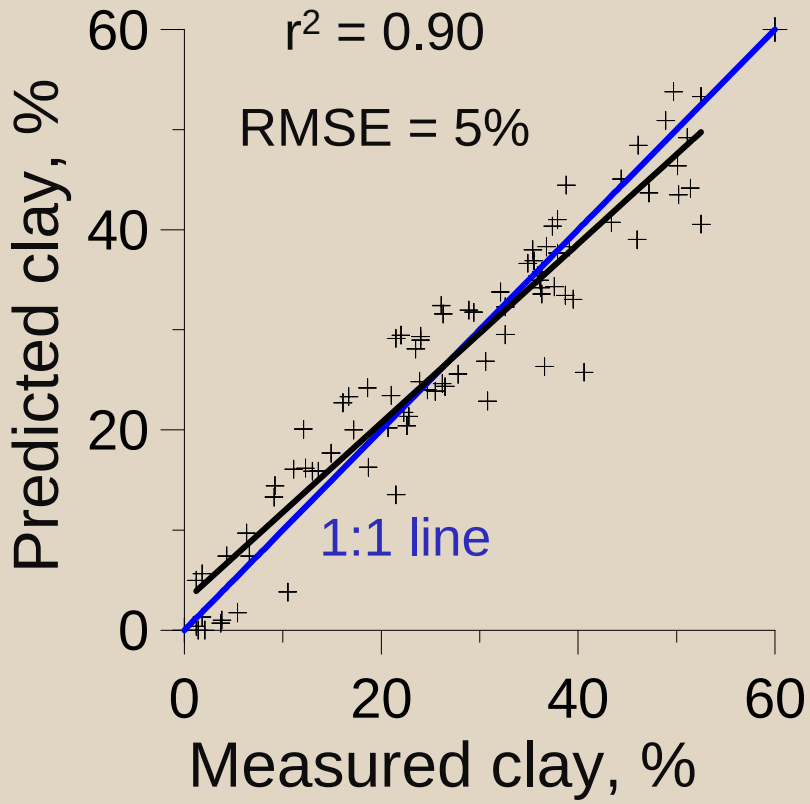
Intact soil cores



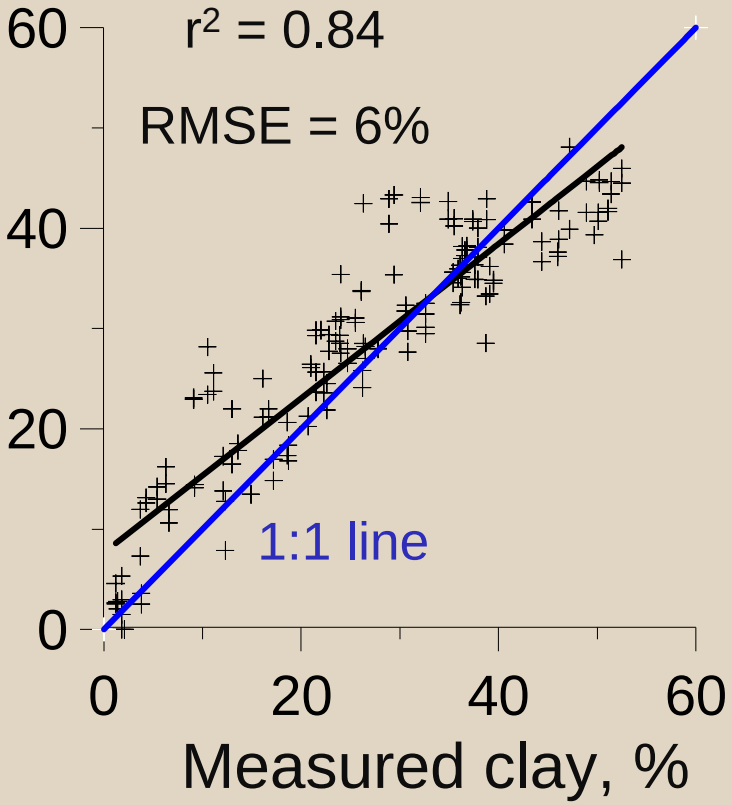


Ground vs Core VisNIR Scans

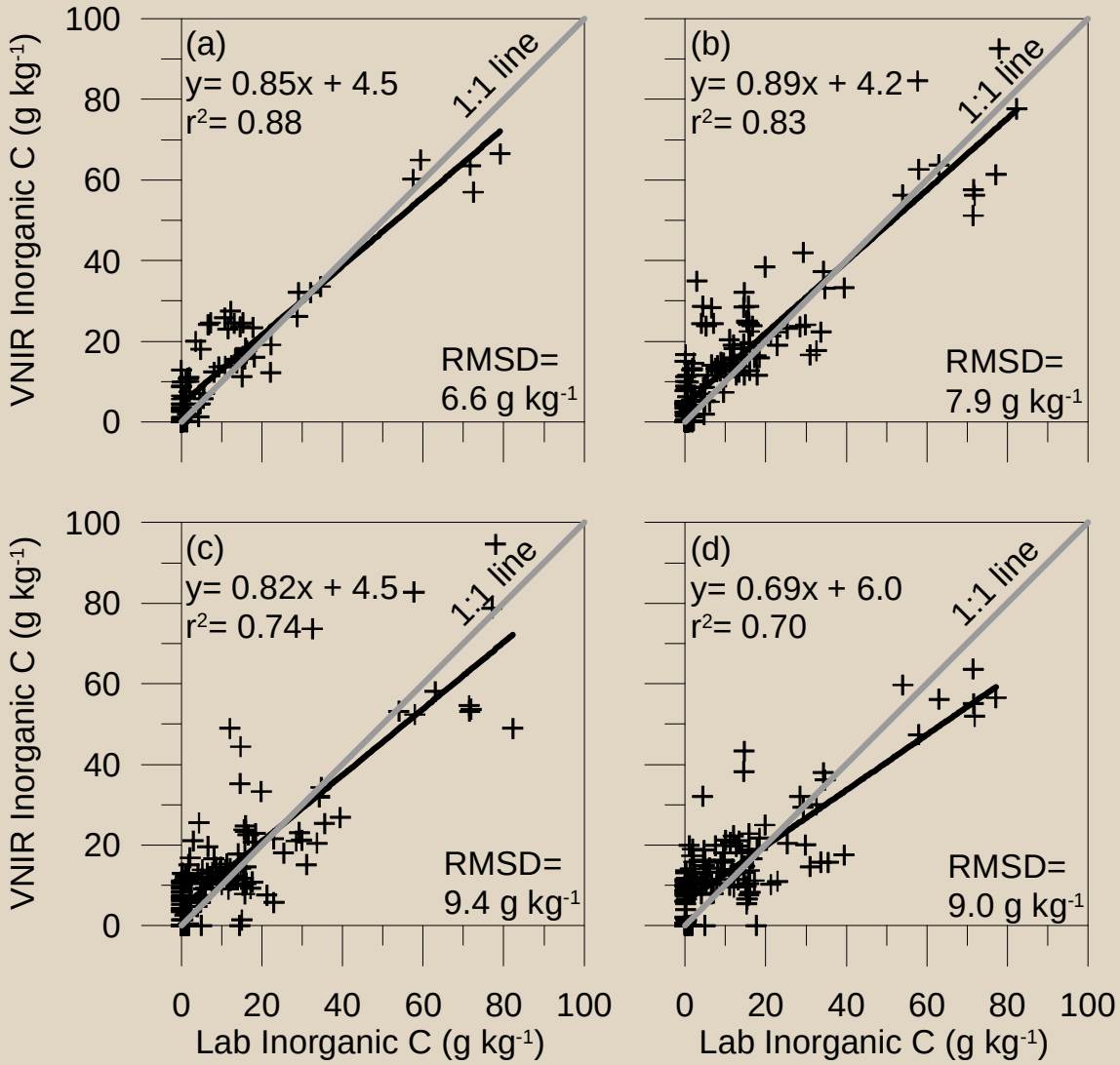
Air-dried ground soil



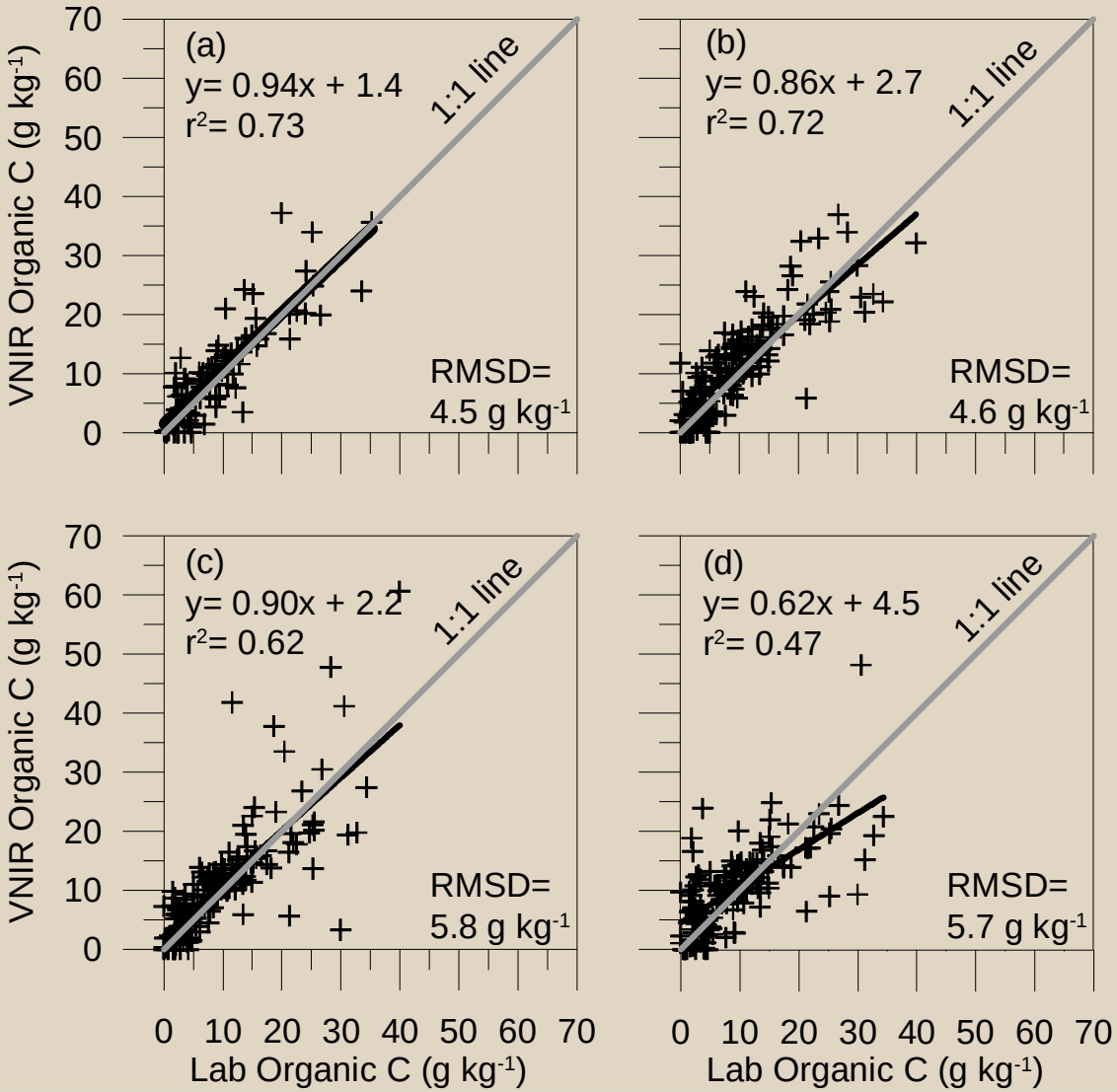
Moist *in situ* soil



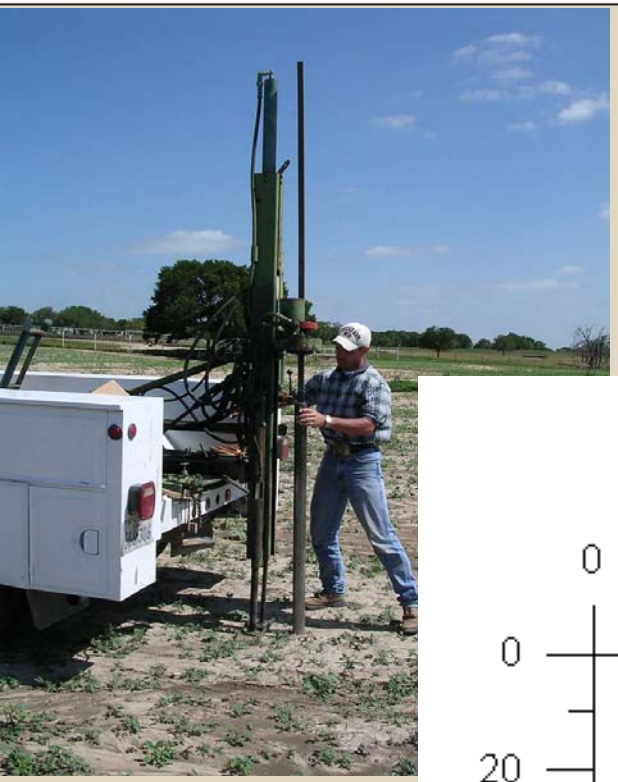
Inorganic Carbon

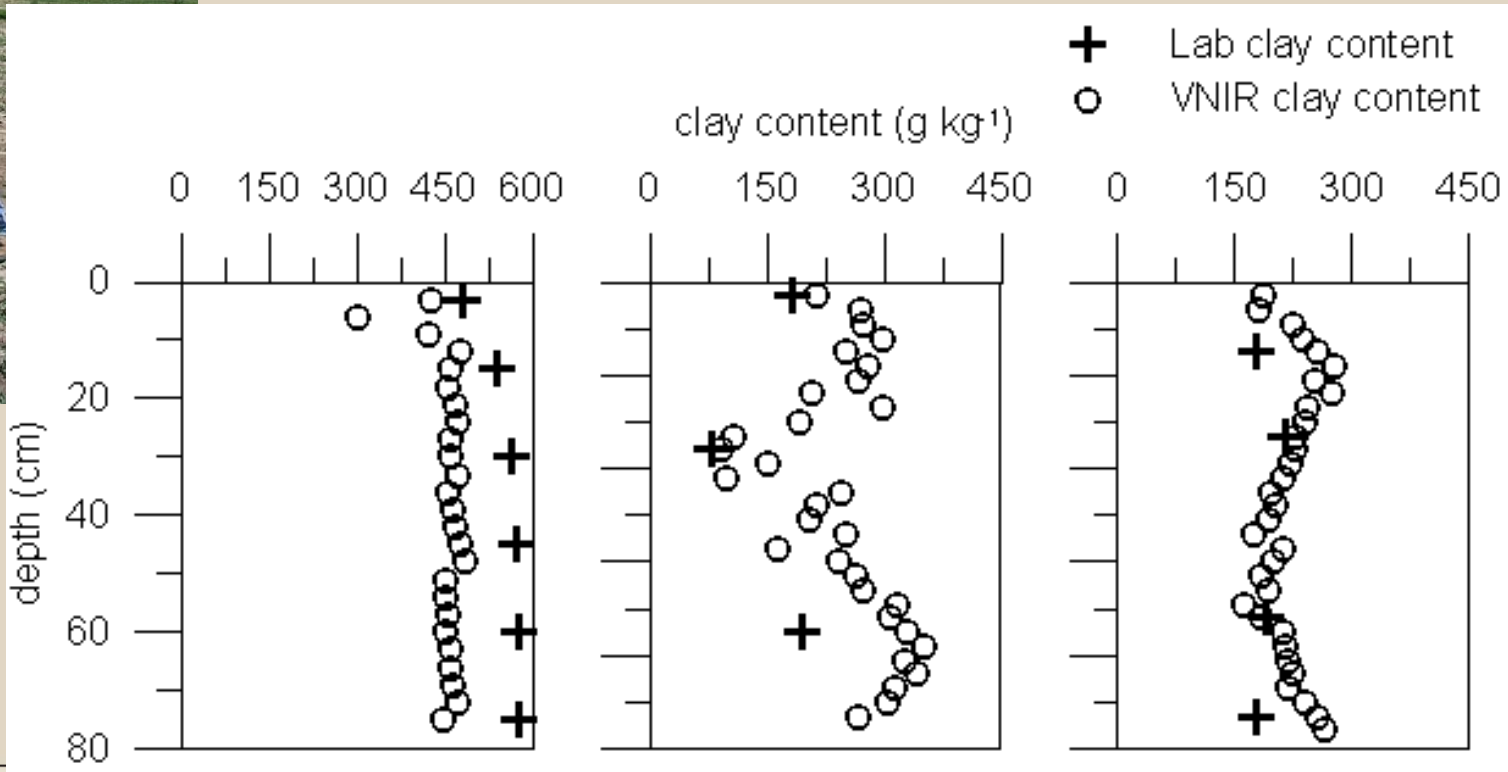


Organic Carbon



Scanning Soil Profiles





Summary

- Spectroscopy provides a trade-off between precision and rapidly and inexpensive quantification of soil properties

- Spectroscopy on dried ground soils is reliable and ready to use in practice

- VisNIR Spectroscopy is useful for quantifying
  - Mineralogy
  - Clay content
  - Gypsum
  - Inorganic carbon
  - Organic carbon
  - CEC, COLE, hydraulic properties, ...

Future Work

- ü Develop VisNIR spectroscopy for field application
- ü Define opportunities and limitations for field spectroscopy
- ü Develop reliable methodologies for using spectral libraries