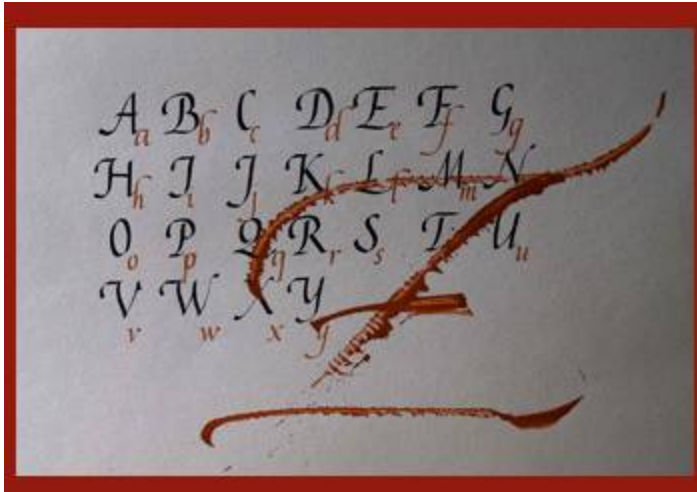# Hyperspectral mapping

The power of instantaneous mineral mapping

Octobre 20th 2009

Powerful tool !

Moving from manual writing to machine printing

The origins of Photonic Knowledge

2002: Spin-off

Creation

2009: Spin-off

Creation

Mining, oil and gas industries

2004 : Development of monochromatic filter
2007 : Development of a biomedical hyperspectral imager
2008 : Prize *Fondation Armand-Frappier*, emergent business
Photon d'or, best photonic innovation in France

The team behind the technology of Photonic Knowledge

- Astrophysicist
- Optic Physicist
- Engineers
  - Electrical
  - Mecanical
  - Software
- Programers
- Machinists
- Geologists
- Entrepreneur specialized in R&D
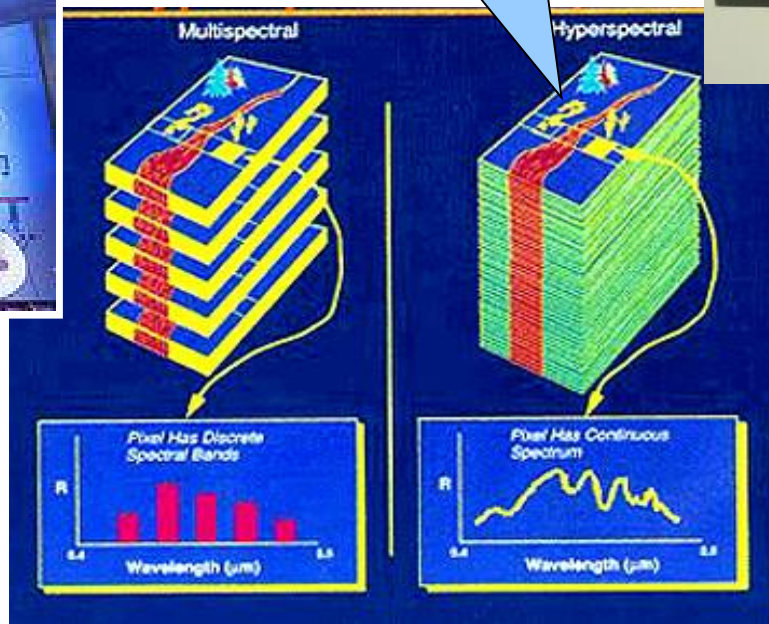
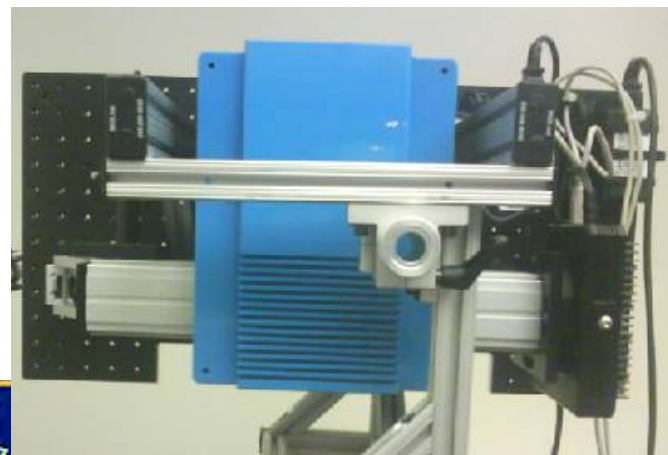# What is Hyperspectral Imaging?

Multispectral imaging

Hyperspectral imaging

Hyperspectral cube (aka., hypercube)

VIS Camera of Photonic Knowledge (400-1000nm)

Landsat 7

Bands (discrete signal)

Continuous signal

Characteristics of our Instrument

Base
•Robust
•Modular

Monochromatic filter
•Presently 10 nm
•Soon 2nm

Digital sensor (CCD)
•1536x1024
•400-1000 nm

Input (scene)

Lens
•Interchangeable
•Telephoto
•Wide-angle
•Macro
•Affordable

Output Hypercube Format .fits

Photonic Knowledge
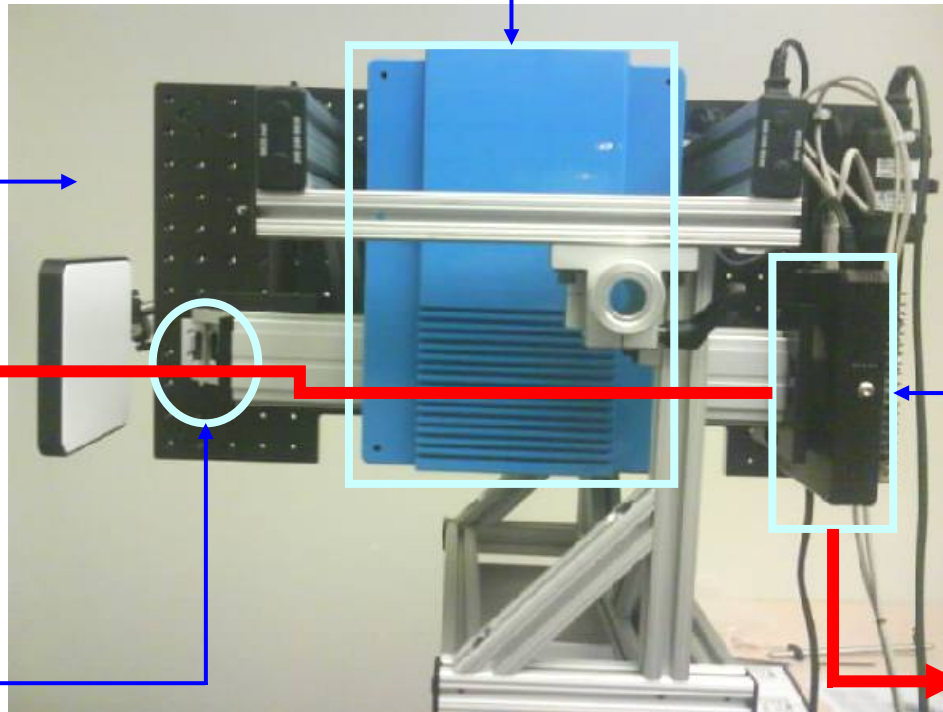
An example in gold exploration

Grayscale & false color monochromatic images
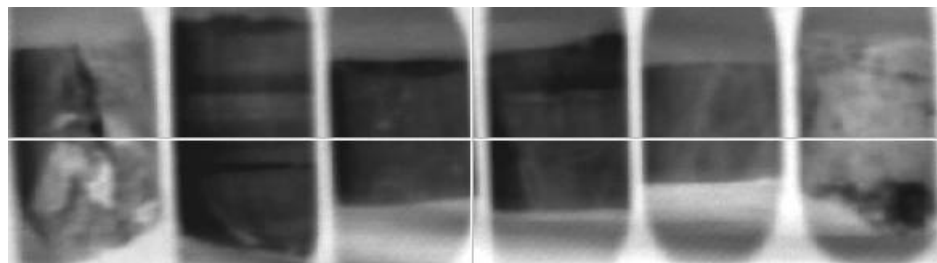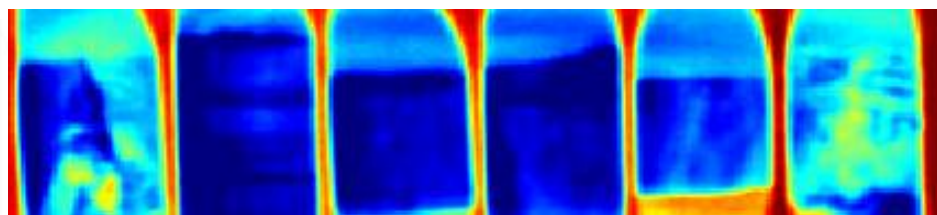
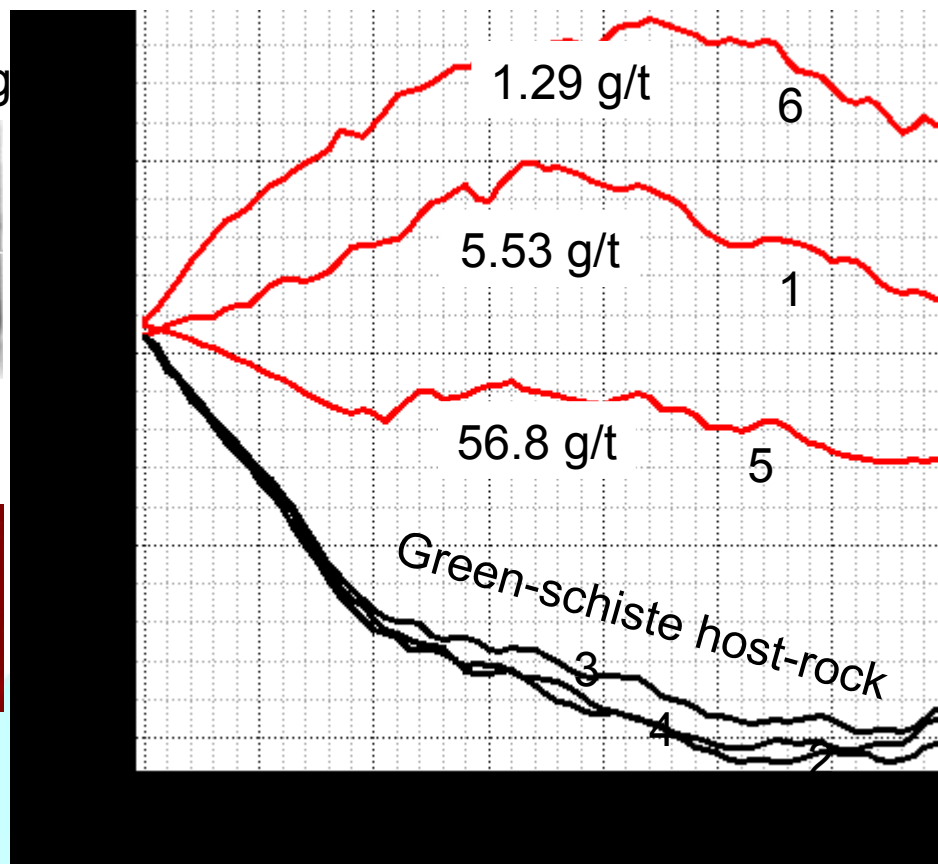| 1	2	3	4	5	6
5.53	0.02	0.01	<0.005	56.8	1.29

ppm Au

1.29 g/t   6
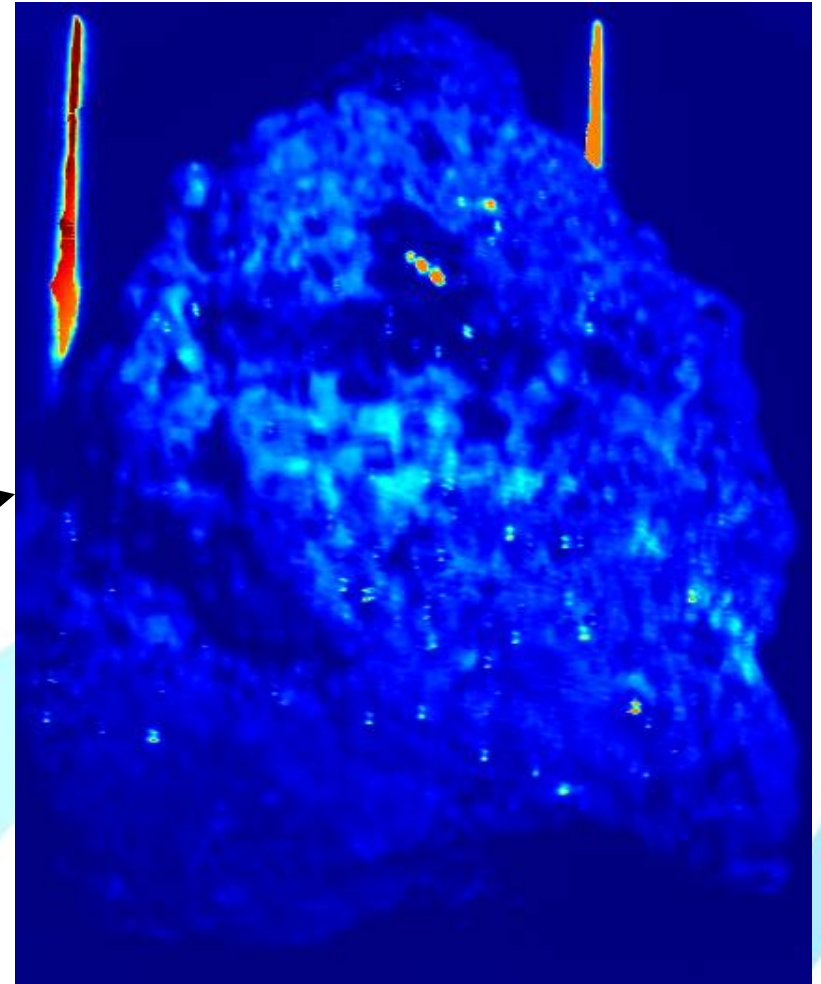
5.53 g/t   1

56.8 g/t   5

Green-schiste host-rock
3
4

Mean spectra of samples

Potential applications in the in the oil and gas industry
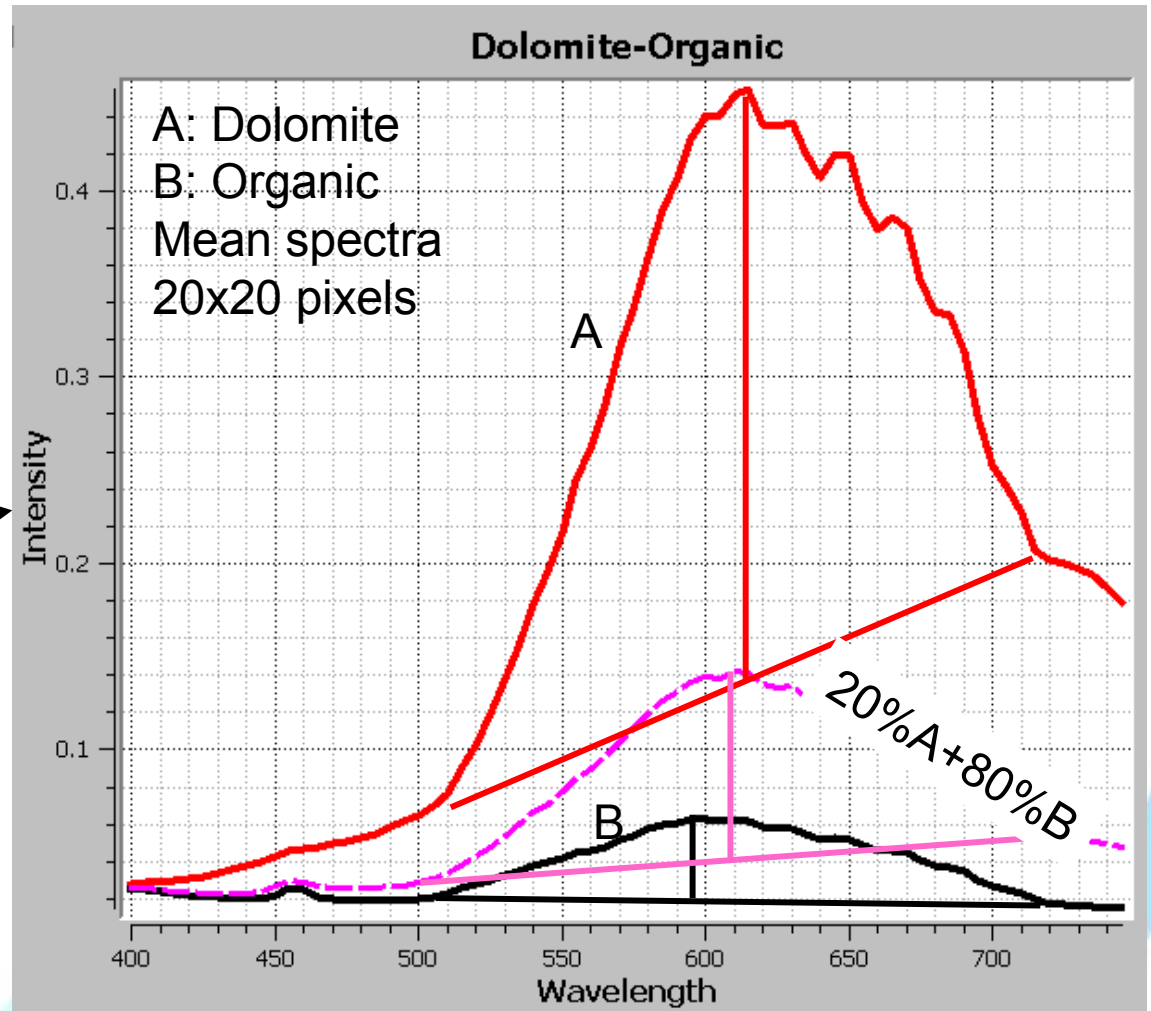
Mohawk Valley, New York
Analog for dolomitic Reservoir

False color monochromatic image (630nm)

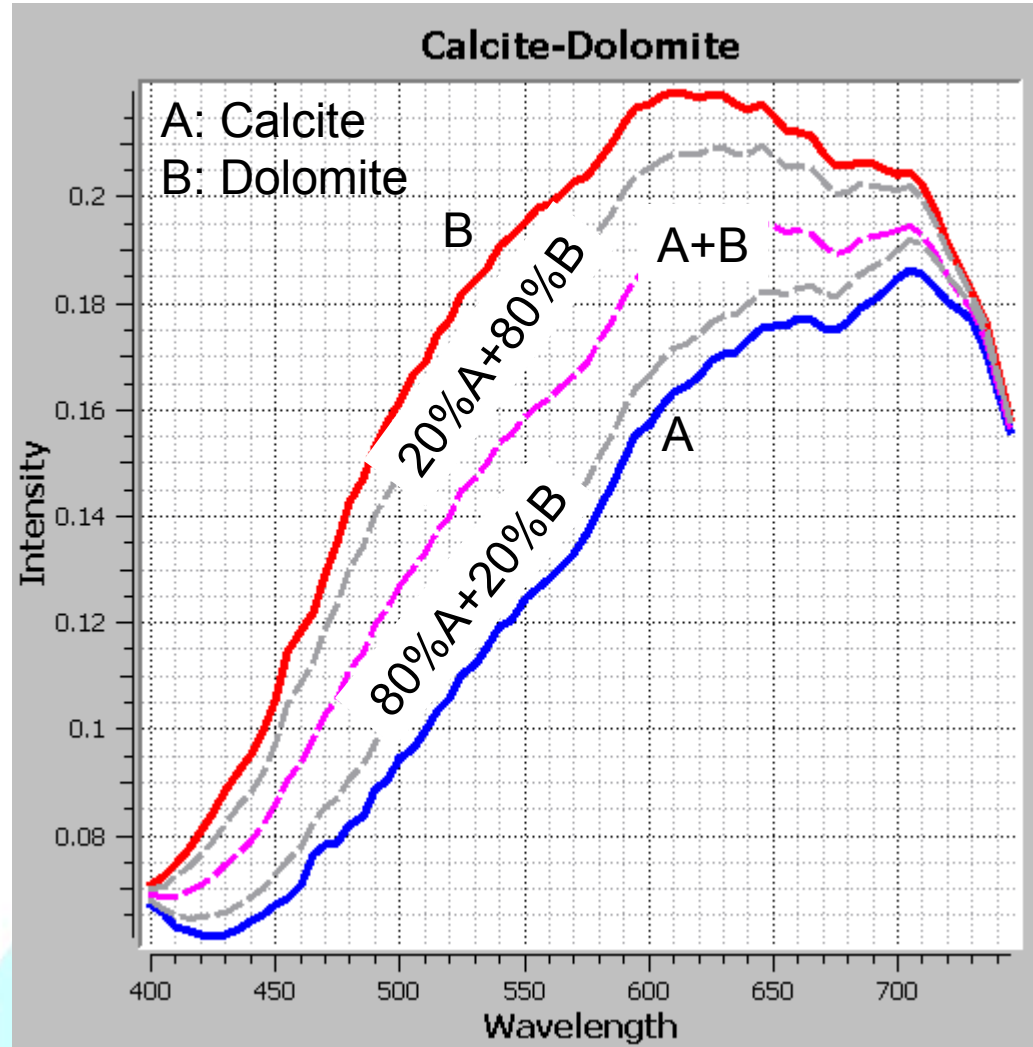# Evaluation of organic material in dolomitic reservoir

Porosity in dolomite reservoirs
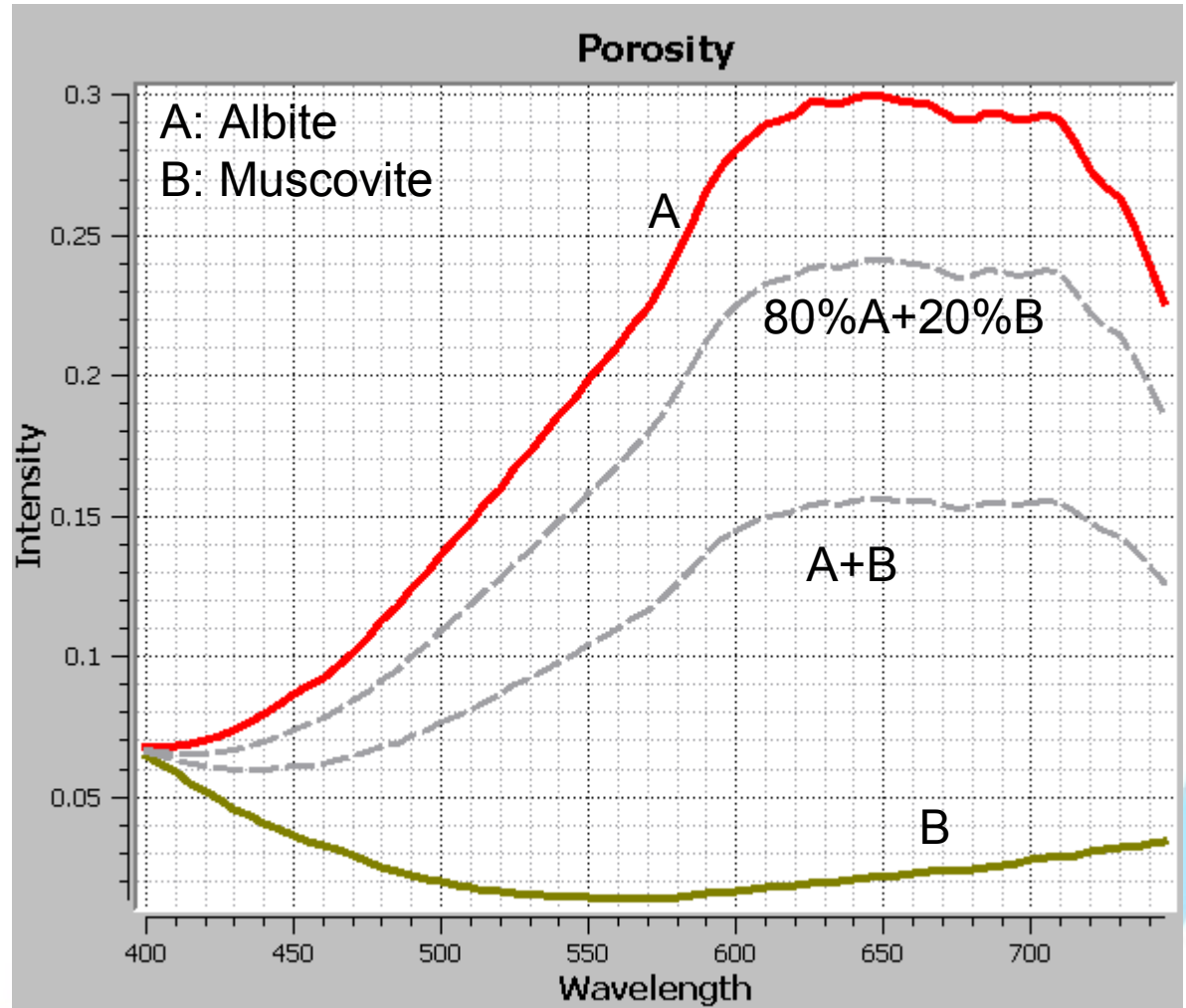
SEM Standards

Calcite   Dolomite

Calcite-Dolomite

A: Calcite
B: Dolomite

B

A+B

20%A+80%B

80%A+20%B

A

Intensity

Wavelength

Porosity in sandstone reservoirs

SEM Standards

Albite   Muscovite

Porosity

A: Albite
B: Muscovite

A

80%A+20%B

A+B

B

Intensity

Wavelength

Planned improvements

- Data processing algorithms
  - Scale transfer from µm^2 to cm^2
  - Mineral mapping, qualitative to quantitative analysis
- Increase software user-friendliness
- Client-specific spectral libraries
- Assemble data into useful format for drill chips, core logging and oil sand mapping
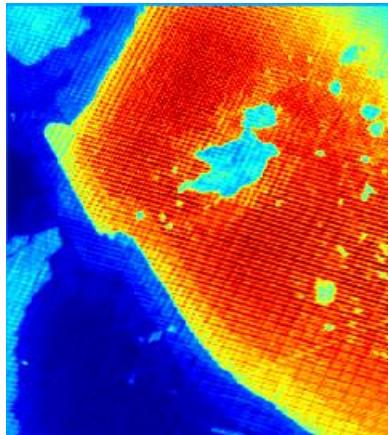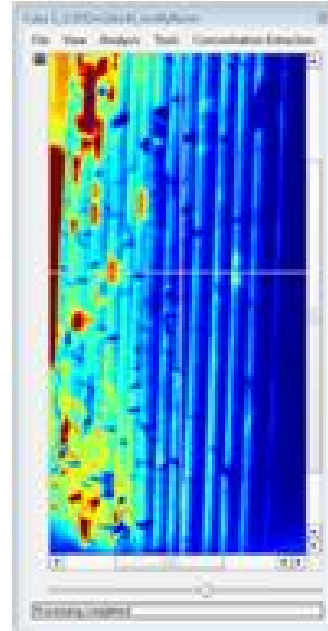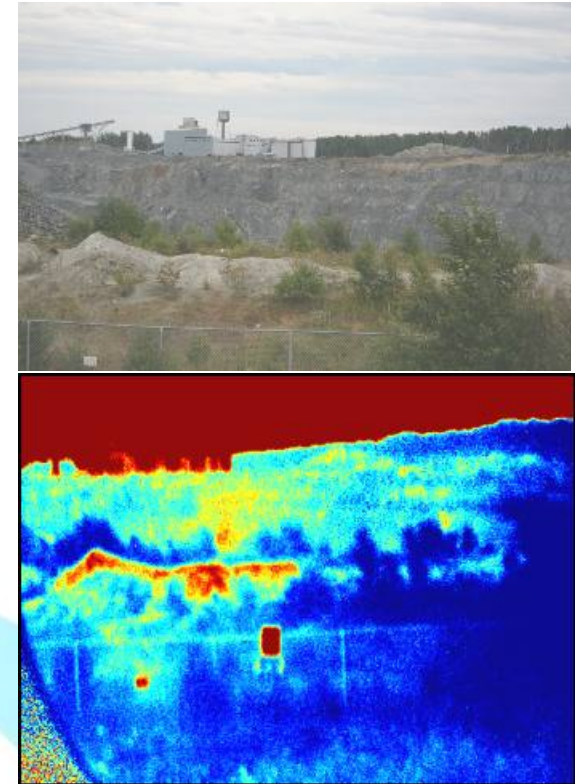
Physpec example
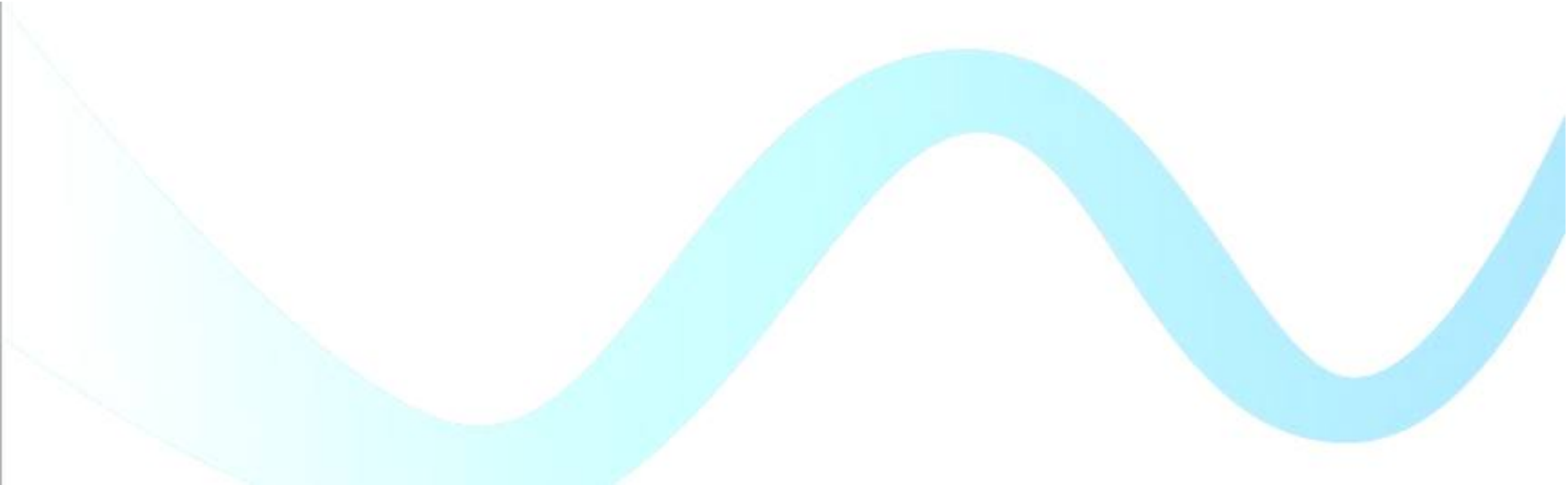
Flexible Field of View

Thin section

(5cm distance)

Core logging

(1m distance)

Face mapping

(800m distance)

Any questions?