EARSeL

Detection of soil contamination by sulphur using field and airborne hyperspectral data

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Test site sulphur mine

Calibration

Piaseczno

Machów

Jeziórko

Hyperspectral data - imaging spectrometers

HPRI-CT-1999-00075: „Hysens – DAIS/ROSIS Imaging Spectrometers at DLR", HS2002-PL4,
„Airborne spectrometry for abandoned mine site classification and
environmental monitoring at the Machów sulphur mine district in Poland"

DAIS: Digital Airborne Imaging Spectrometer

79 kanałów

2,6 m

DAIS 7915 (4 spektrometry):
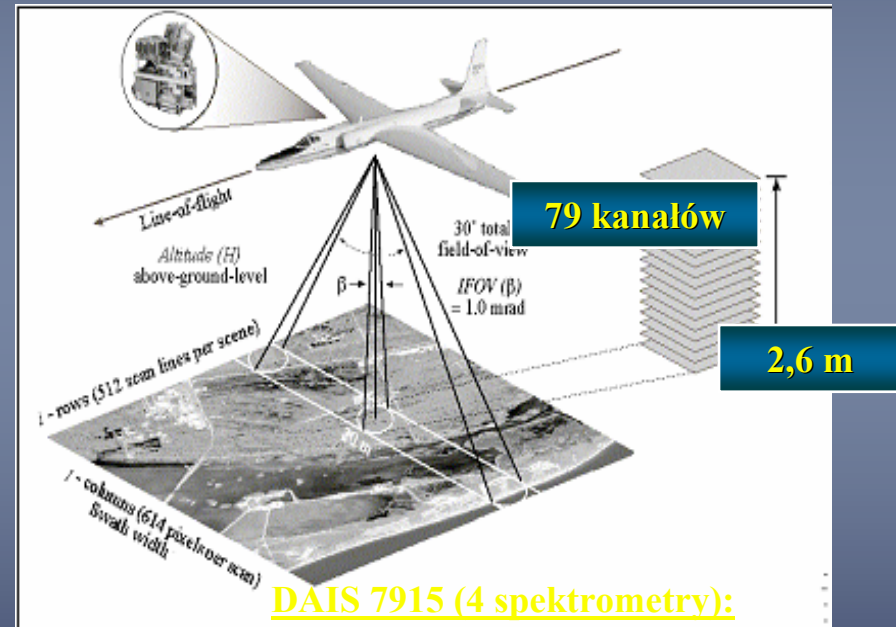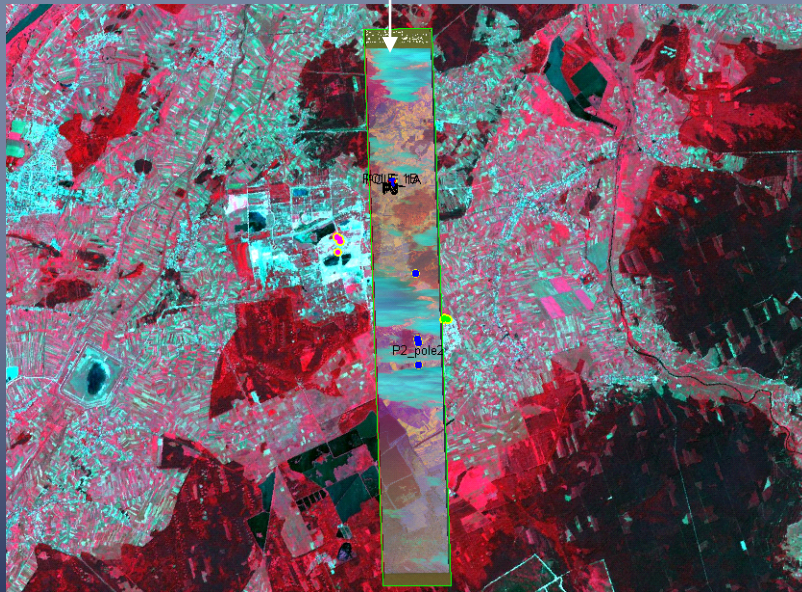
VIS/NIR	32 kanały	(0.5- 1.05 µm)
SWIR	8 kanałów	(1.5- 1.8 µm)
SWIR II	32 kanały	(1.9-2.5 µm)
MIR	1 kanał	(3.0- 5.0 µm)
TIR	4 kanały	(8.7- 12.5 µm)

Image processing methodology

ENVI, PCI

1. **<u>Initial processing</u> –** radiometric calibration, atmospherical effect removing
   VNIR, SWIR

   Flat Field
   IARR (Internal Average Relative Reflectance)
   Emiprical Line

   TIR

   Emissivity Normalization
   Reference Channel

2**.** **Thematic transformation**

   Clasical

   Supervised classification

   SAM

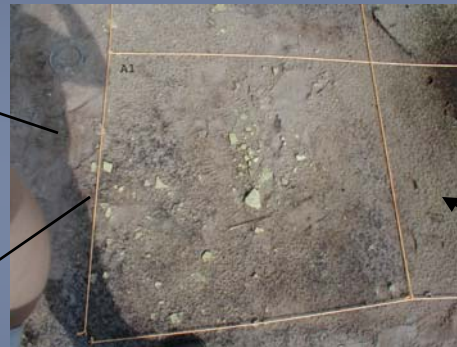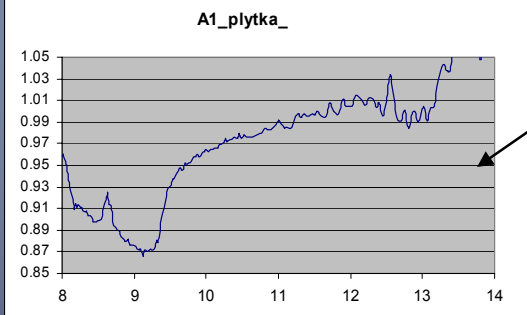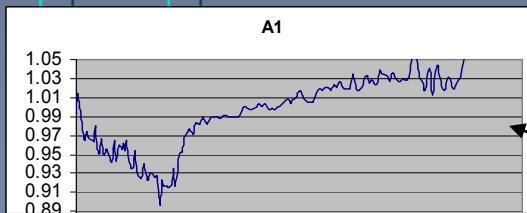   Special

   Spectral Feature Fitting (SFF)
   Spectral Unmixing (SU)
   Spectral Analyst (SA)

Hyperspectral data - non-imaging spectrometers

<u>ASD - Analytical Spectral Devices Inc</u> 0.3-2.5 µm *Boulder, Colorado, USA (TU Clausthal)*

<u>Micro Fourier Transform Interferometer</u> 2-14 µm *Design&Prototypes USA (AGH Kraków)*

Reference – sand/sulphur mixtures

1 - 0% sulphur 100% sand

2 - 100 % sulphur 0% sand

3 - 50 % sulphur 50% sand

4 - 25% sulphur 75% sand

5 - 10 % sulphur 90% sand

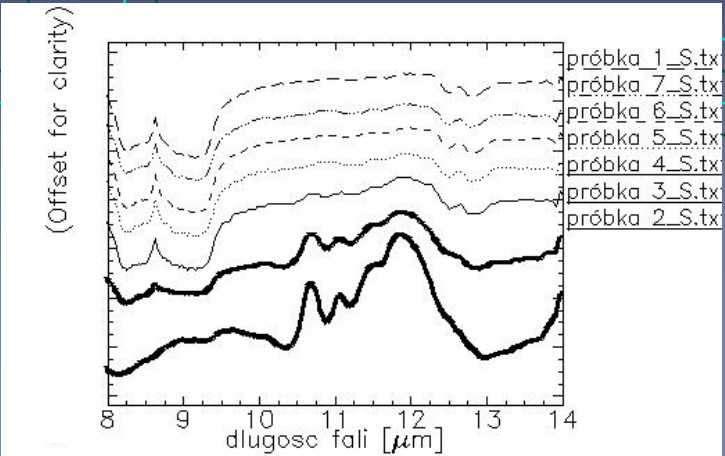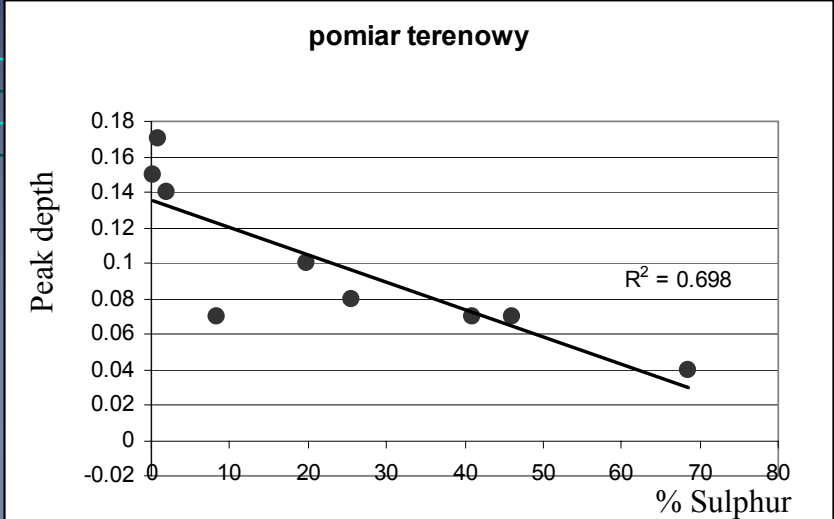6 - 5 % sulphur 95% sand

7 - 2 % sulphur 98% sand
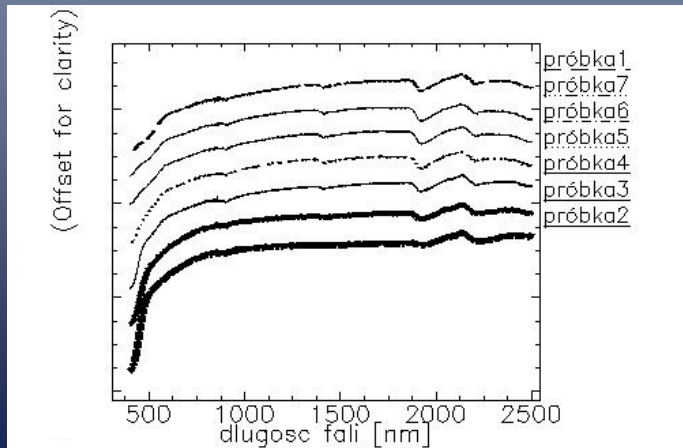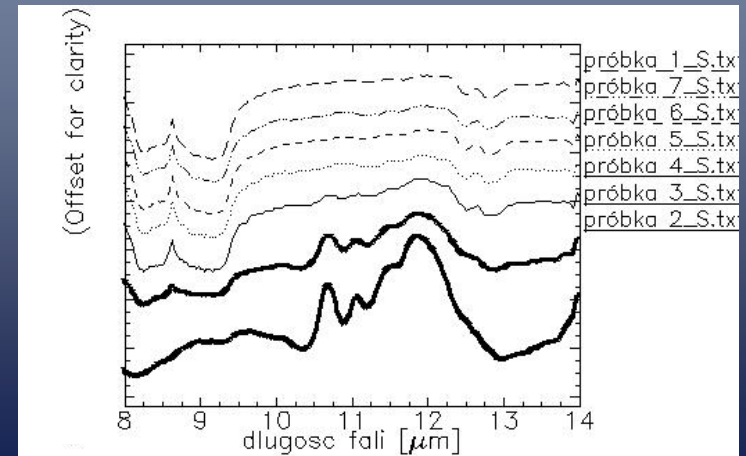
Changes of SiO$_2$ peak depth caused by sulphur

Field measurements
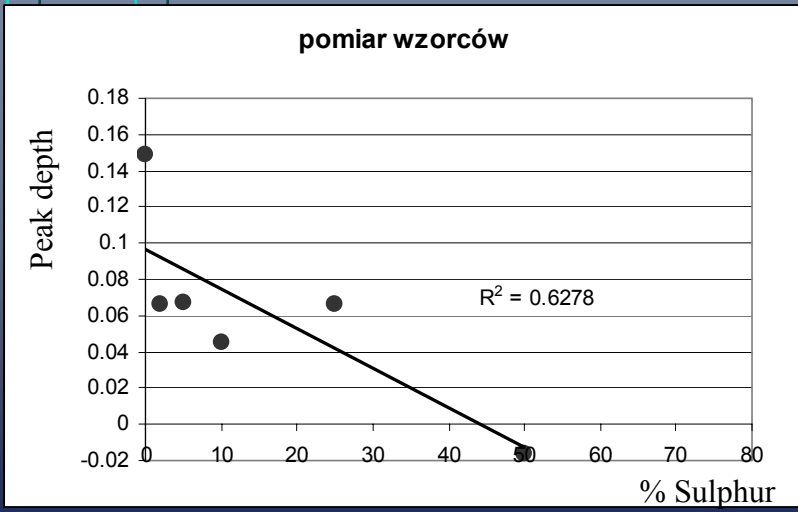
Reference sand/sulphur mixture
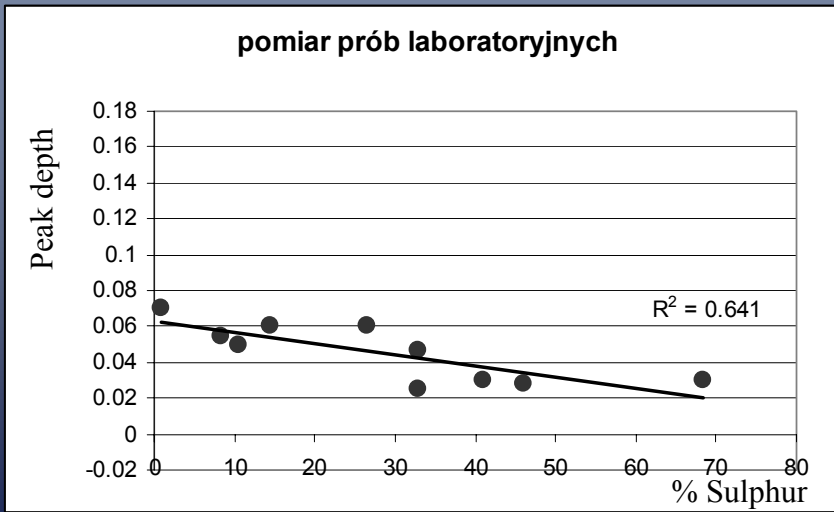
Laboratory measurements of probes

Calibration of DAIS

VNIR i SWIR

water

sand

mine area in Piaseczno

before
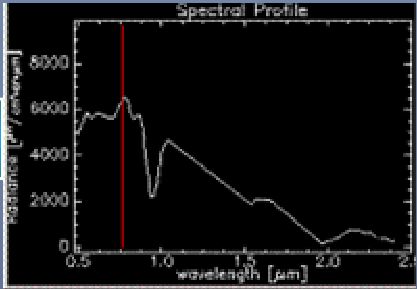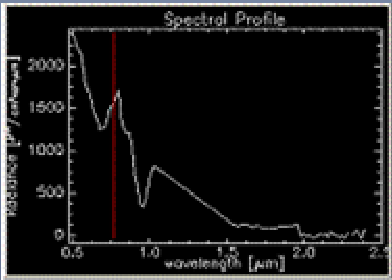
sand   water
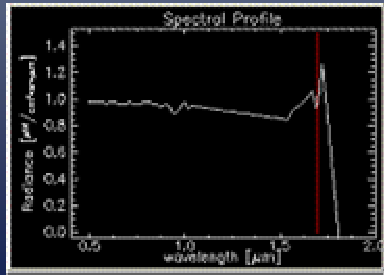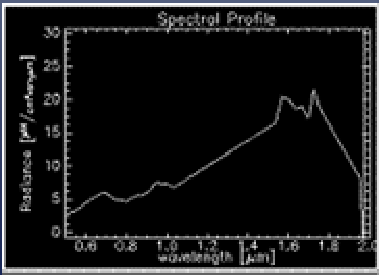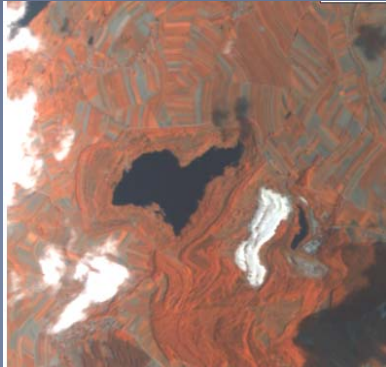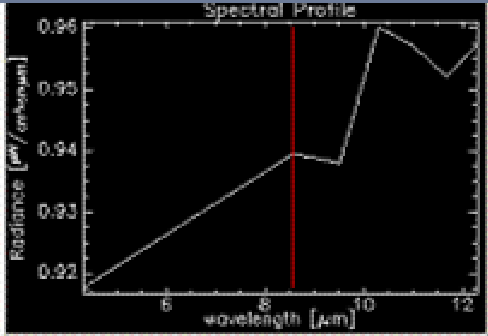
after

Calibration TIR

before
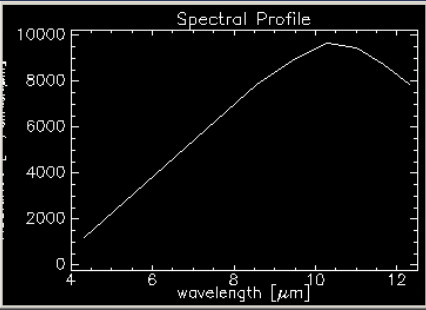
sand
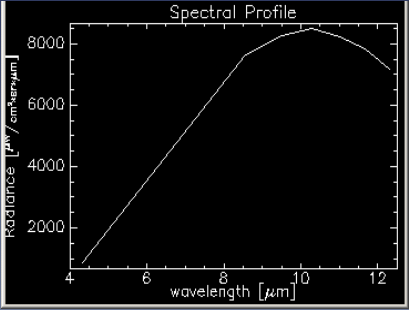
water
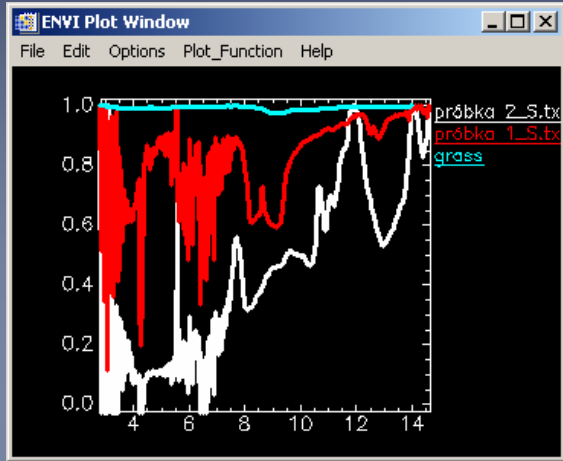
after
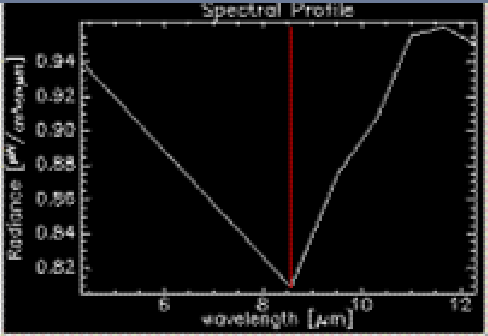
Comparison with

JPL (Jet Propulsion Laboratotry)

Water DAIS
Water JPL

Sand DAIS
Sand JPL
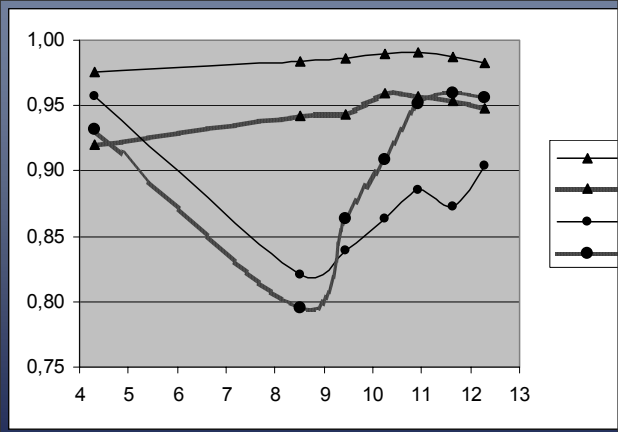
Initial correction accepted

Information extraction – spectral curve analysis

FTIR spectrometer

DAIS averaging

vegetation

sand
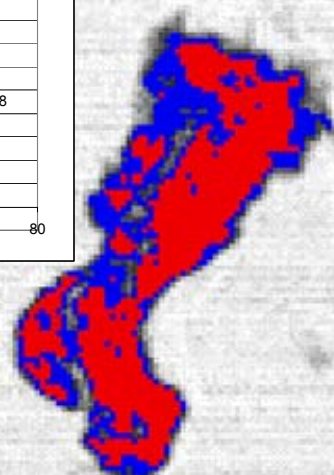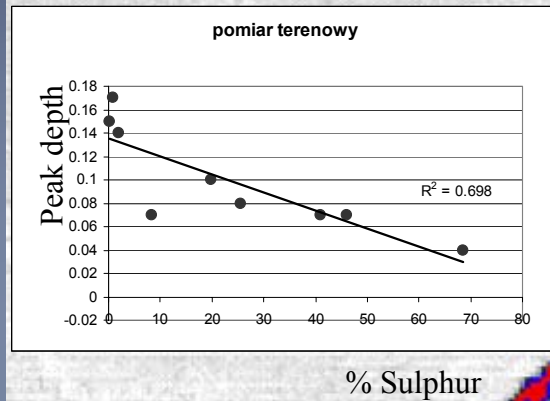
sulphur
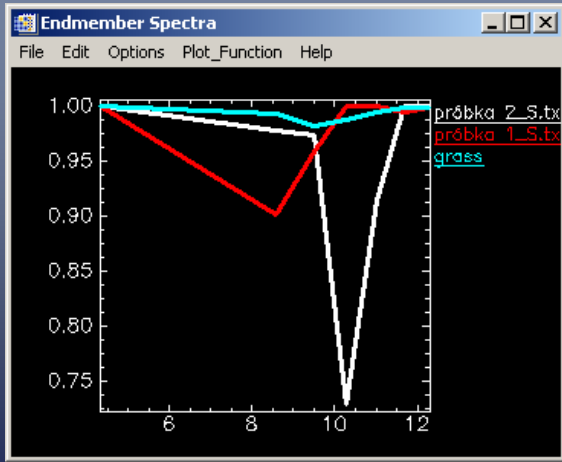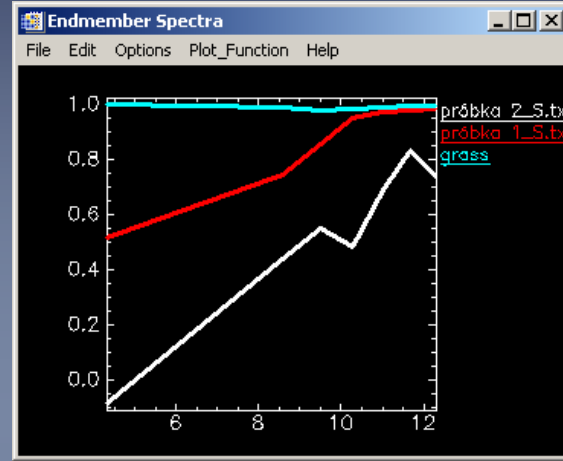
DAIS continuum

Spectral Feature Fitting (SFF)
Spectral Unmixing (SU)
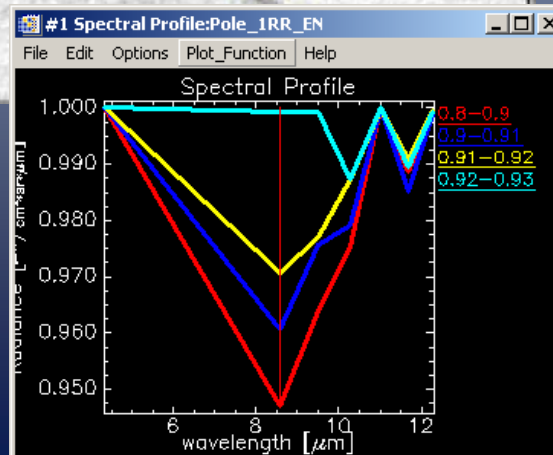*Spectral Analyst (SA)*
Results not satisfactory

Information extraction – spectral curve analysis
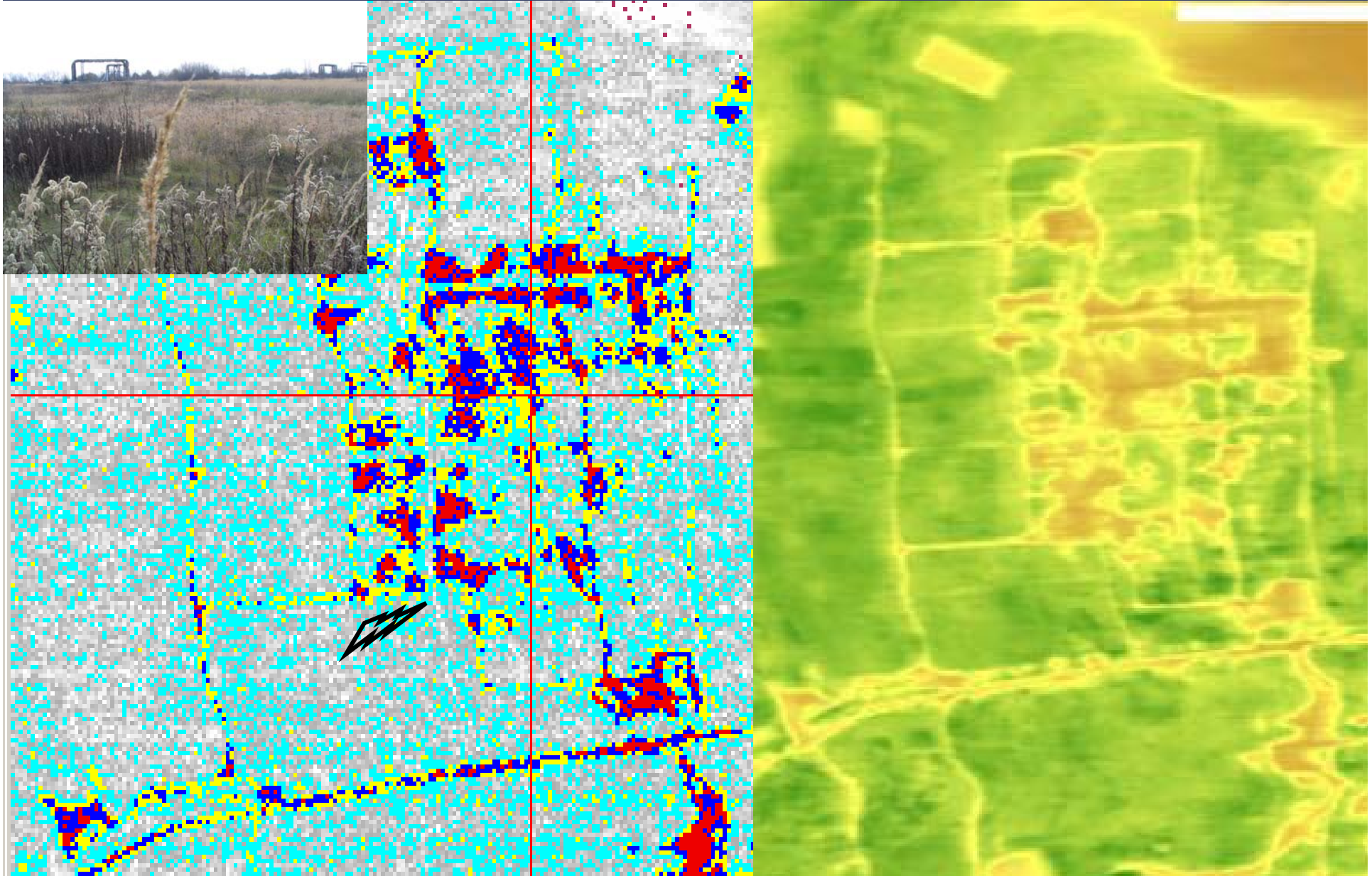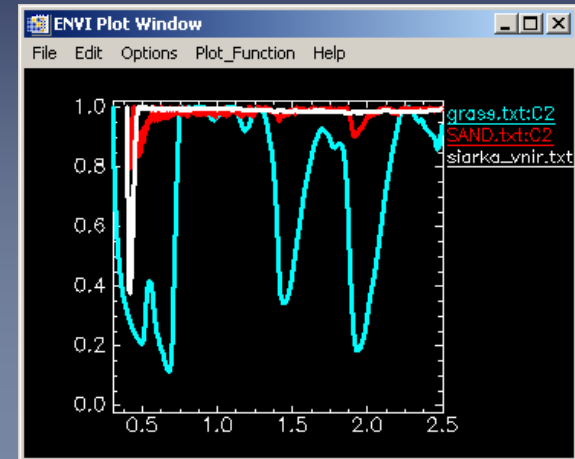Variation of emissiviy coefficient in 74 DAIS channel
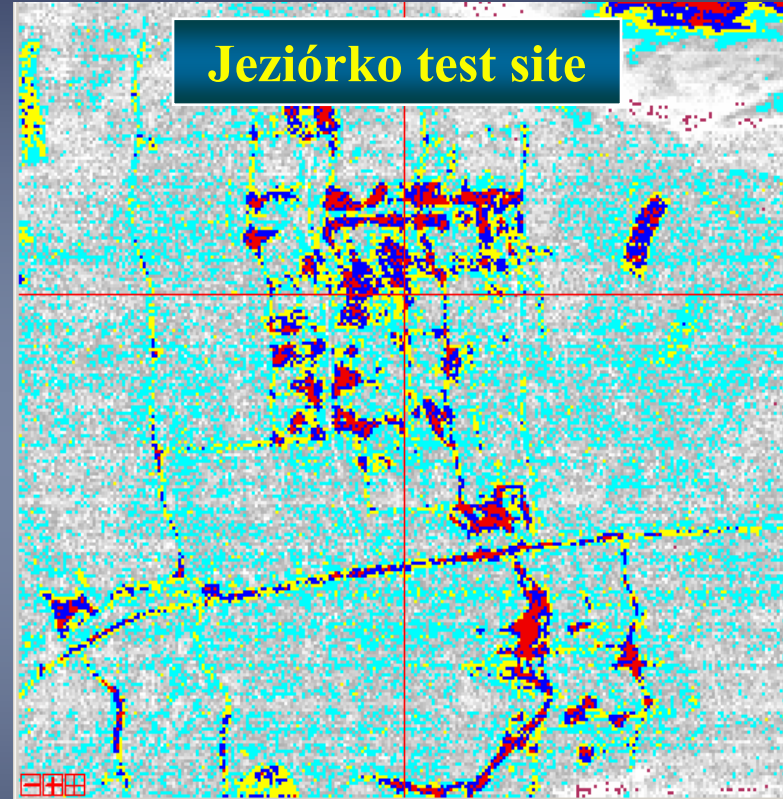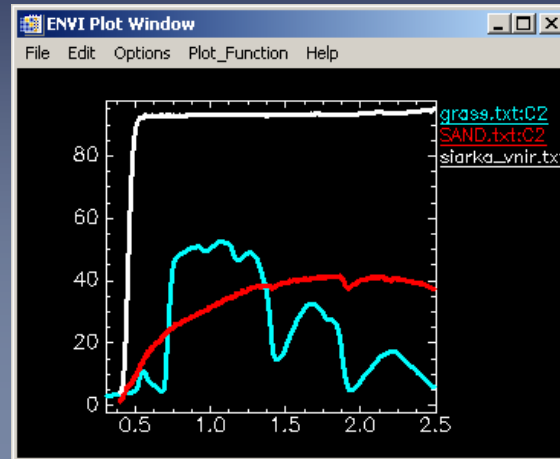
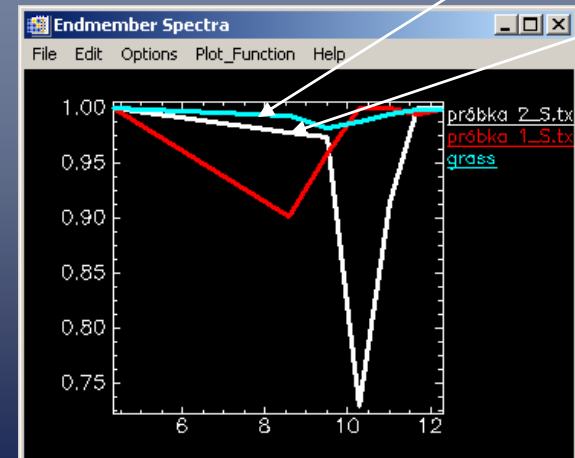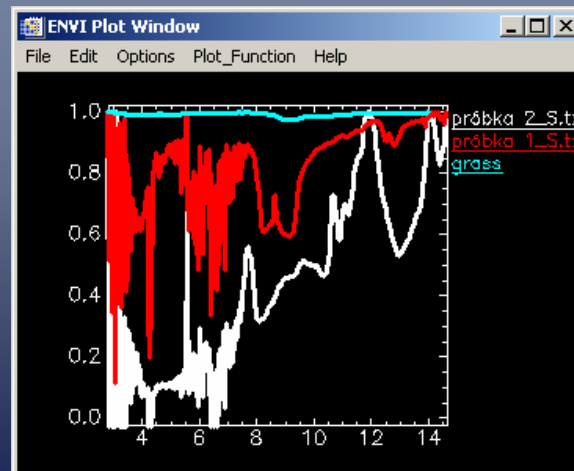Information extraction – vegetation index
NDVI

Summary

vegetation

sand

sulphur

VNIR I SWIR

vegetation

sulphur

TIR