

AUTOMATIC CLASSIFICATION OF SEDIMENTARY STRATIGRAPHY

Hyperspectral imaging provides an effective method to digitally store and analyze stratigraphic and structural data. Ragona, D et al. demonstrated this with the use of SPECIM's AISA SWIR instrumentation and neural networks.

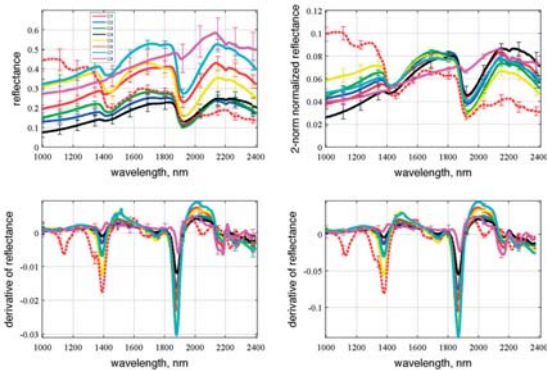
Ground-based hyperspectral imaging enables the study and digitally storing of stratigraphic and structural data from samples in the lab (cut samples, drill cores) or field (outcrops, exposures).

In the study of Ragona et al. a SPECIM AISA Hawk -short-wave infrared hyperspectral imaging device in the range 1000-2400nm- was used for

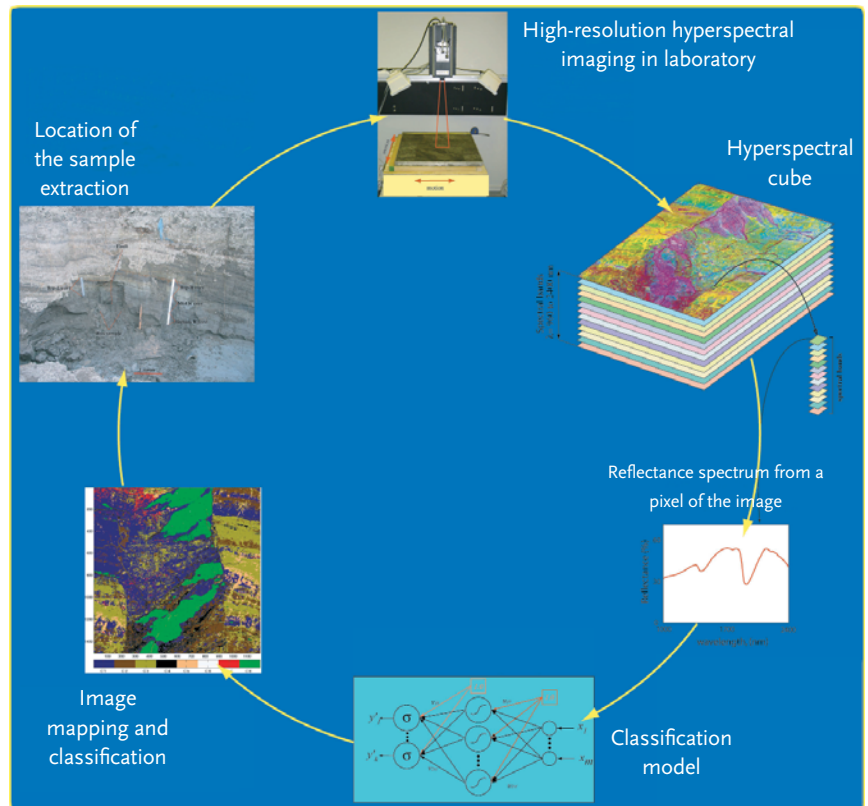
acquisition of spectral information for each pixel of the image as the sample in the laboratory conditions. In the study, both a large sample of 1m x 1m and several drill cores were used to evaluate the work flow and classification results. The reflectance spectrum from the acquired data cubes were processed with neural network methods like Multilayer Perceptron (MLP), that provided fast and objective

method for classification of sediments of very similar compositions and grain sizes at an unprecedented level of detail.

The study presented a work flow for geological studies that can gain valuable information when hyperspectral methods are implemented either in the laboratory or outdoor conditions.



Different example sets to create classification models



Workflow used in the study

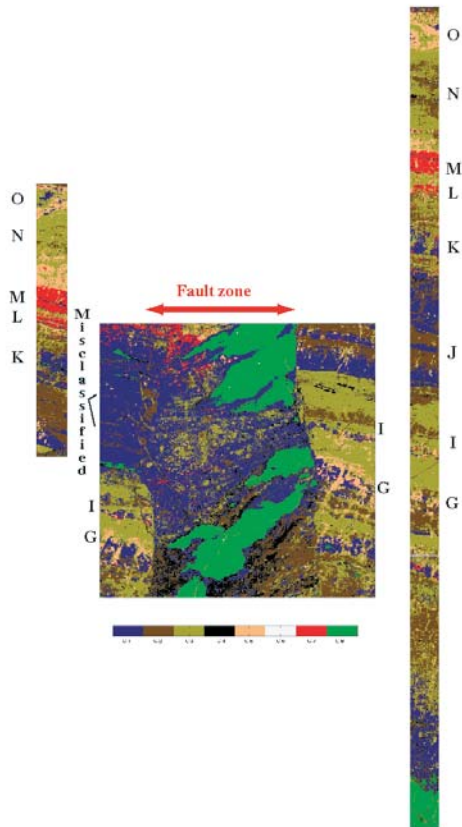


Image classification

CLASS NUMBER	NUMBER OF EXAMPLES	MATERIAL TYPE
Class 1	1430	Sandy-slit
Class 2	2530	Clayey-slit
Class 3	1750	Clayey-slit w/CO ₂
Class 4	85	Organic material
Class 5	332	Carbonate mix
Class 6	95	Wood toothpick
Class 7	316	Sandy-slit w/CO ₂

Classification images from samples obtained by training an MLP with the derivative of the reflectance spectra. The cores and the box stratigraphy can be easily correlated based on the classes C1 to C7 (see table). Letters G to O indicate the layers that can be correlated. The top left area of the square image was not properly classified. Misclassification may be related to over drying the sample. Dehydrated clays were not considered on the original classes

Four classification images of the cores. For each core four classification maps were obtained. The classification images show that the four models obtained similar results.

