HYPERSPECTRAL AIRBORNE DATA FOR CARBONATE GEOLOGICAL MAPPING IN A VEGETATED MOUNTAINOUS AREA: AN ATMOSPHERIC CORRECTION APPROACH

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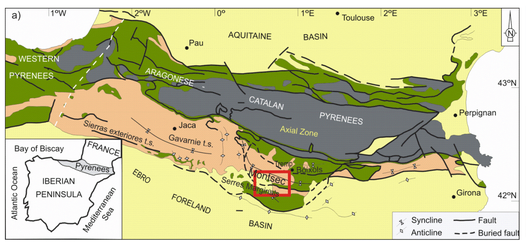
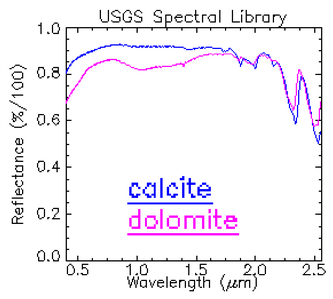
ABSTRACT

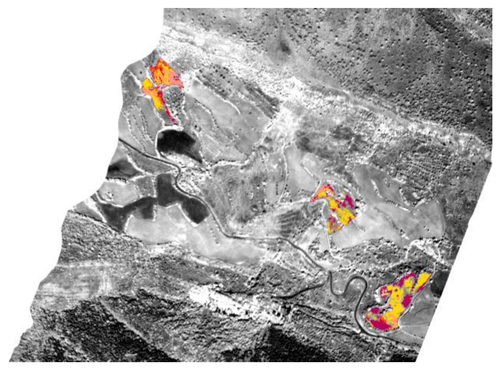
Carbonate are typical targets for oil exploration, outcropping often in large areas with minimum spectral differences between geological units. The typical carbonate spectral absorptions in 2.2 µm and 2.3 µm, are excluded from the wavelength range of AISA Eagle II. AISA Eagle II hyperspectral data are processed in flight lines of 1024 swath pixels in the visible to near-infrared wavelength range (0.40 to 0.97 µm). The spatial resolution is 1m and a total of 128 channels with a spectral resolution of 4.8 nm.

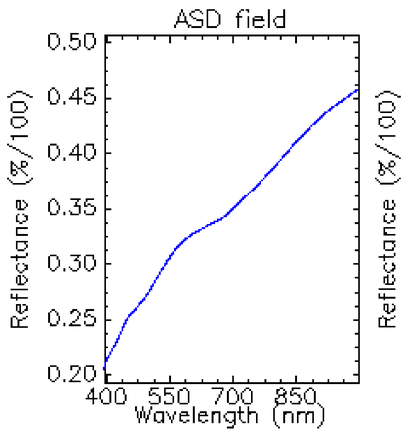
Trying to enhance spectral differences in the visible wavelength range among carbonate geological units, an atmospheric correction using field spectra from geologically selected targets in a limestone quarry was performed. This way, it was possible to map apart lithologically similar detrital units dominated by carbonate in a river plain. The limy river bottom displays spectra with a straight line in the visible wavelength range due to abundant organic matter and small grain size. The spectra of the upper terraces record absorption features related to iron oxide contents similar to the rock outcrops in ridges on mountain areas.

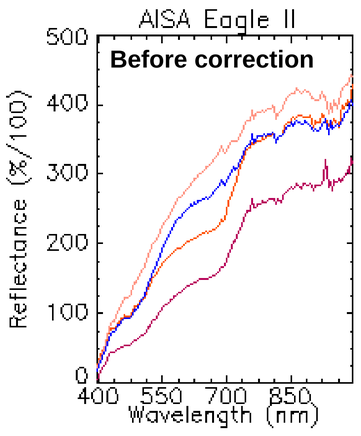
The use of field spectra in geologically selected targets improves the mapping capability of hyperspectral imagery in areas with geological units with a homogeneous spectral response. The spectral response of iron oxide coatings on the weathered rock surface in the visible wavelength range acts as a spectrally distinguishing parameter in wavelength ranges where the spectral diagnostic features of carbonate are absent.

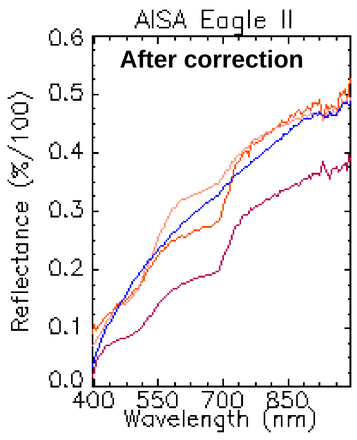








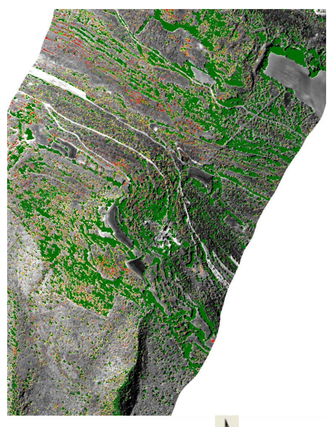


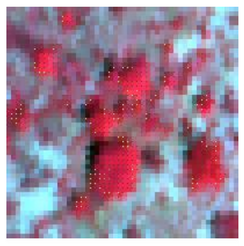


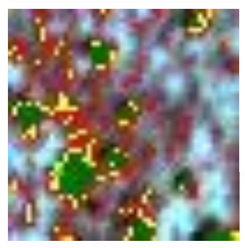
limestone

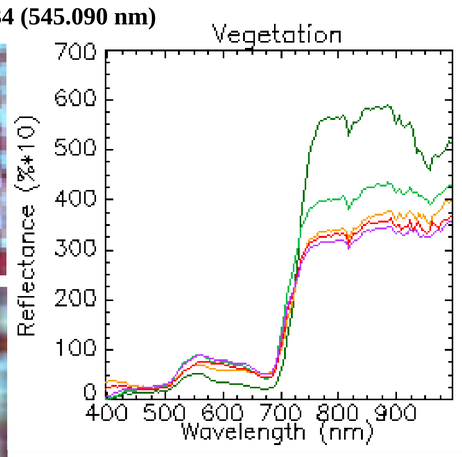
intense iron oxide
medium iron oxide
weak iron oxide
soil

FC 79 (759.055 nm), 63 (682.095 nm), 34 (545.090 nm)



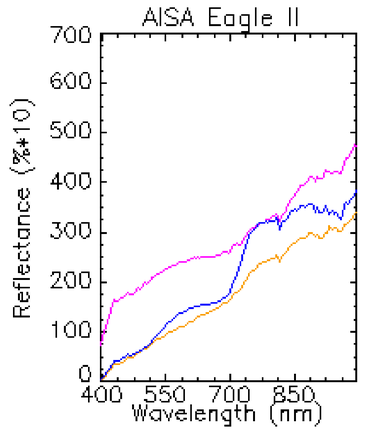


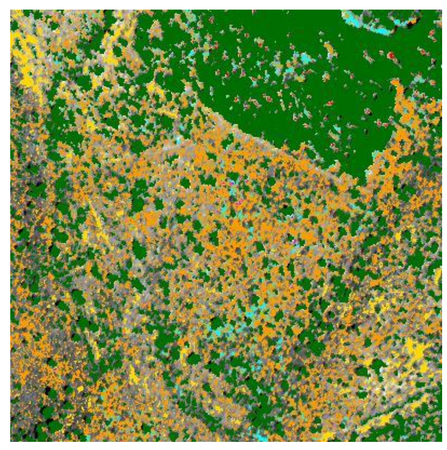




tree tops
border tree tops
outer border tree tops
bush outer border
dry vegetation

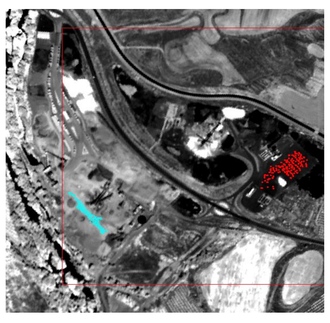
tree tops
border tree tops
outer border tree tops
bush outer border
dry vegetation

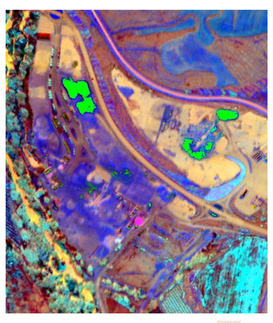




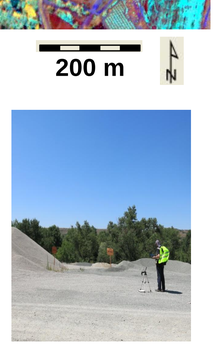
Background soil
Cretaceous soil
Limestone outcrops

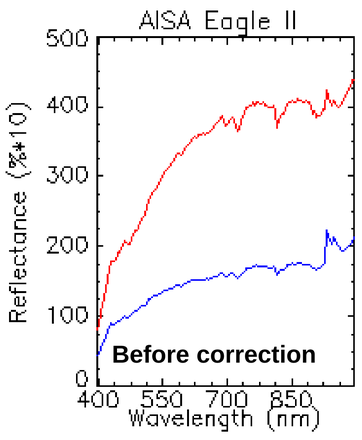
background soil
Cretaceous soil
limestone outcrops

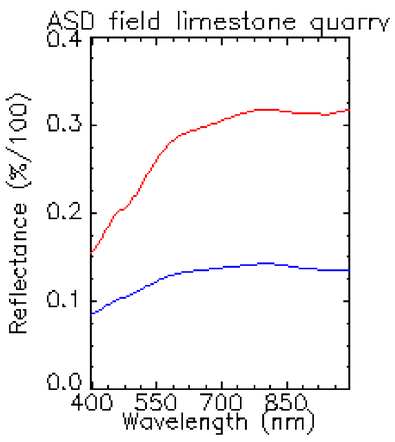




light limestone dust
dark limestone gravel

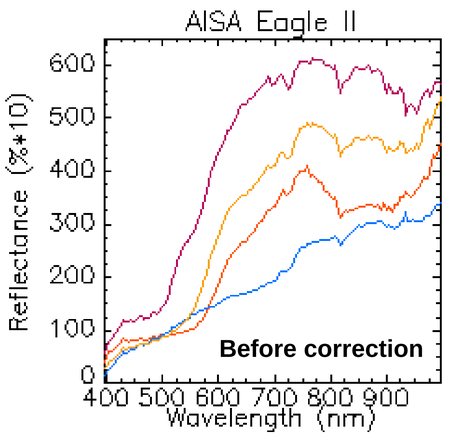


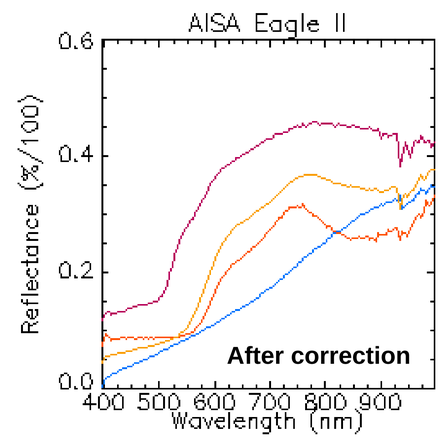




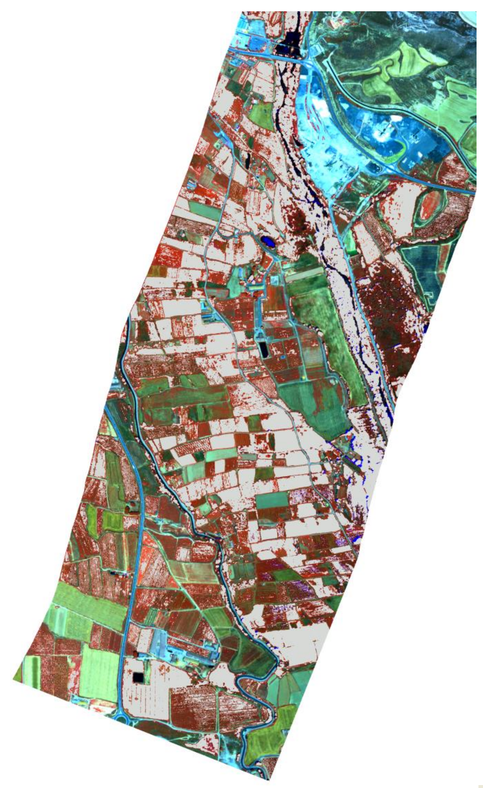
light limestone dust
dark limestone gravel

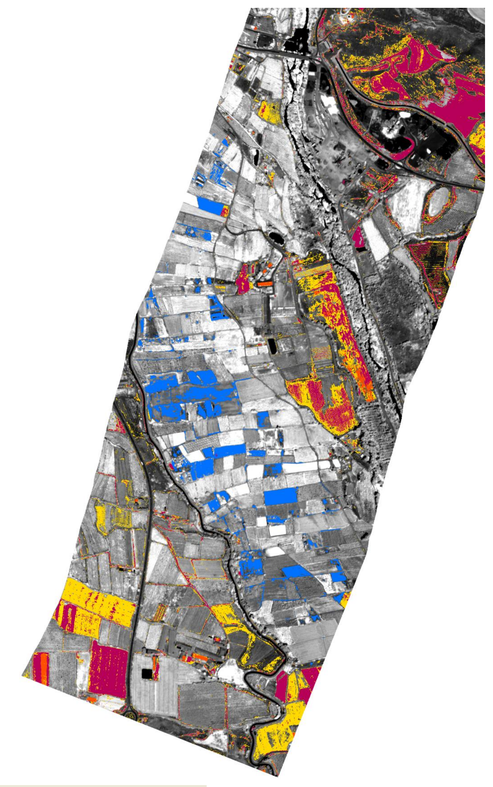
FC 97 (846.230 nm), 52 (629.675 nm), 4 (408.690 nm)





upper terrace
lower terrace
flood plain
background soil





upper terrace
lower terrace
flod plain
background soil