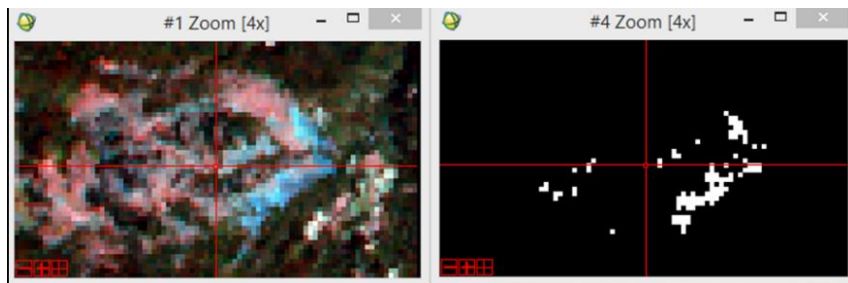# Correction of effects due to the ground/atmosphere interactions

Correzione degli effetti dovuti alle interazioni terra/atmosfera
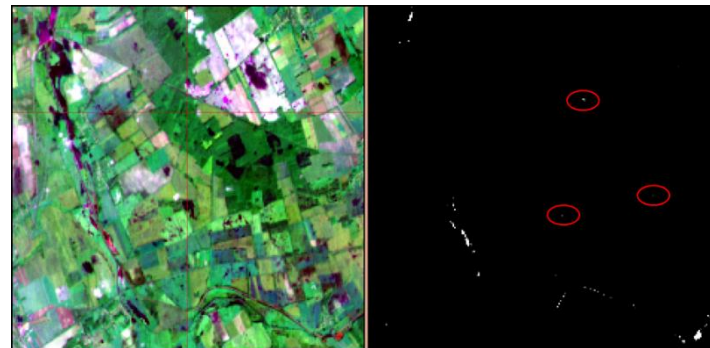
Federico Santini
Angelo Palombo
IMAA-CNR

SAP4PRISMA - ASI

- Depth study of issues related to the atmospheric correction
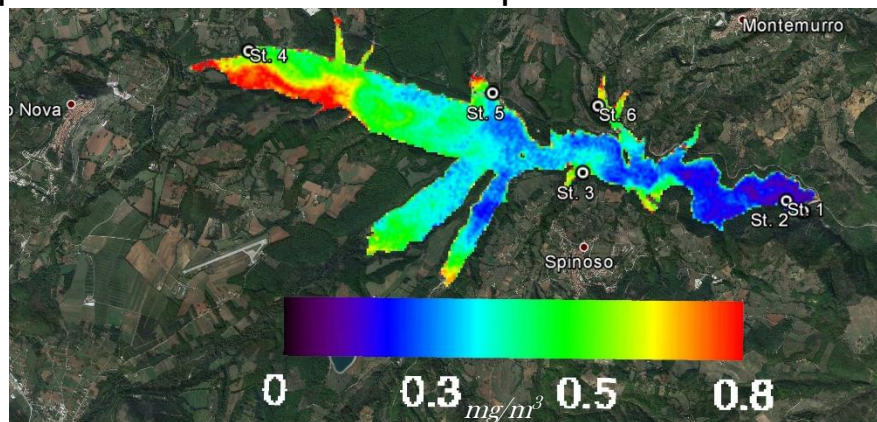- Improvement of SAP4PRISMA Products

Hyperion natural asbestos map – Pollino park, Italy

Hyperion Red dust map – Ajka, Hungary

SIMBA - Appennino Lucano Park authority
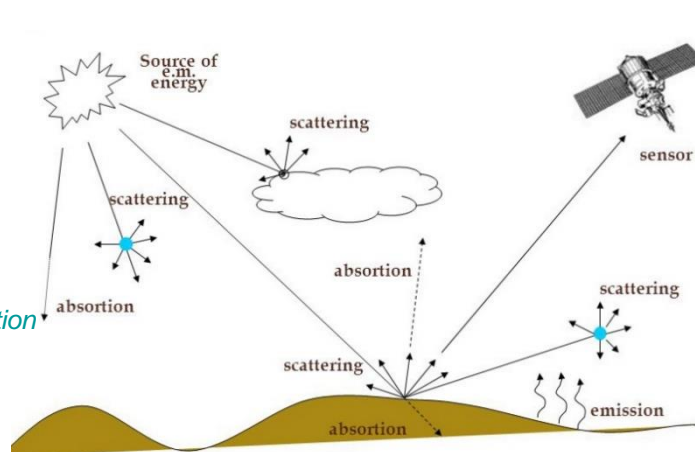
- Improvement of inland water products

Landsat 8 Chl map - Pertusillo lake, Basilicata, Italy

$0 \quad 0.3_{mg/m^3} \quad 0.5 \quad 0.8$

Includes multiple soil/atmosphere interaction

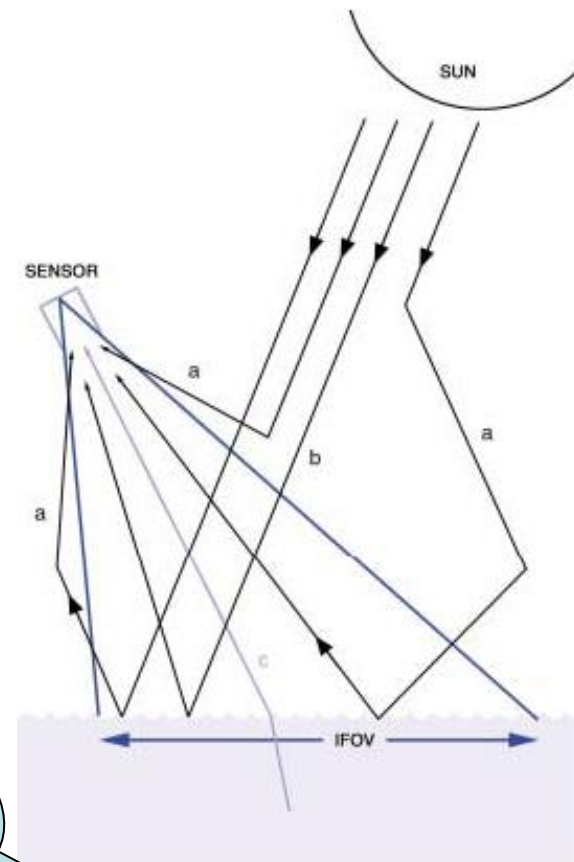$$L = \frac{A\rho}{1 - \rho S} + L_a$$

Preliminary Model

Includes adjacency effects

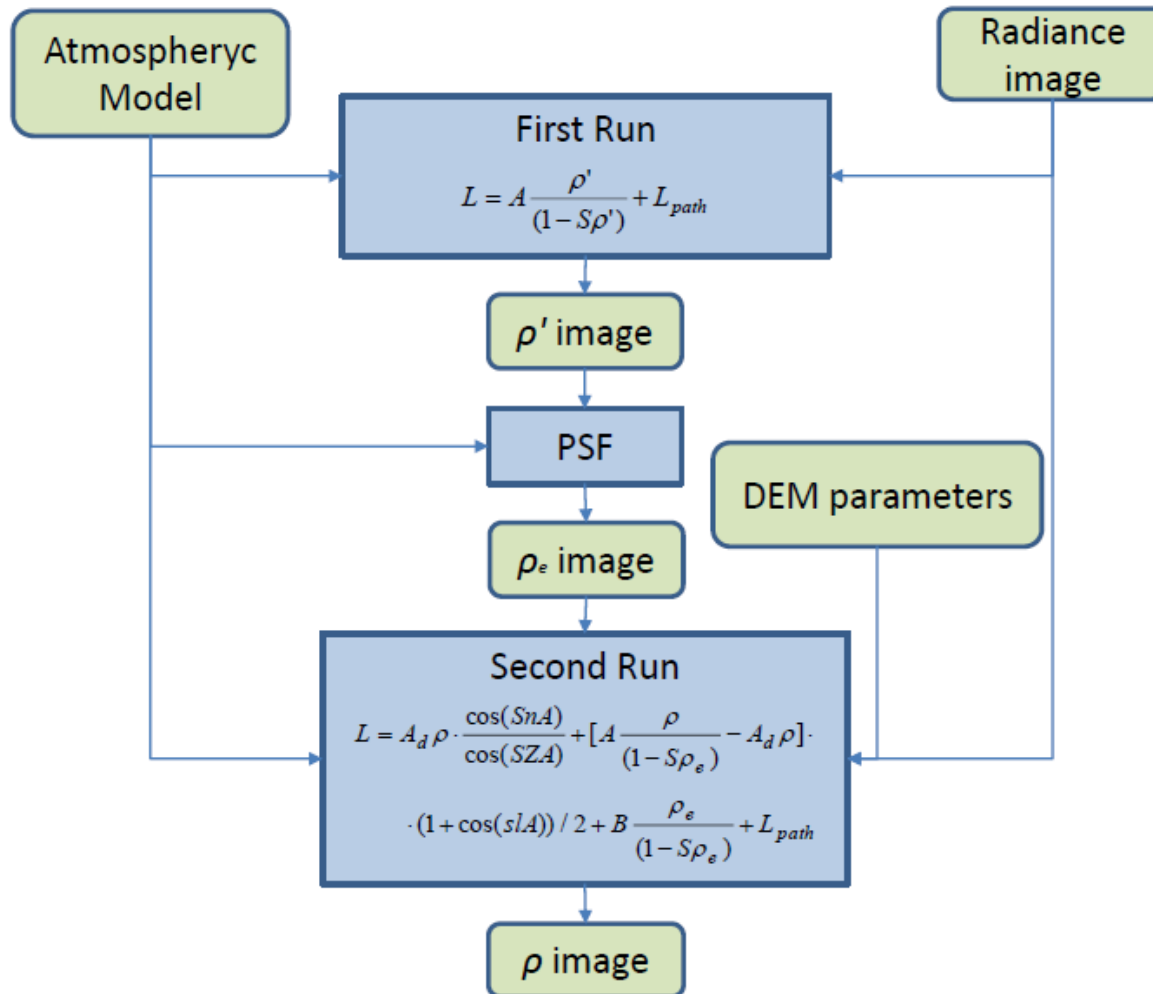$$L = \frac{A\rho}{1 - \rho_e S} + \frac{B\rho_e}{1 - \rho_e S} + L_a$$

Intermediate Model

Advanced Model

$$L = A_d \rho \cdot \frac{\cos(SnA)}{\cos(SZA)} + [A \frac{\rho}{(1 - S\rho_e)} - A_d \rho] \cdot (1 + \cos(slA)) / 2 + B \frac{\rho_e}{(1 - S\rho_e)} + L_{path}$$

Includes adjacency effects, DEM, …

Model
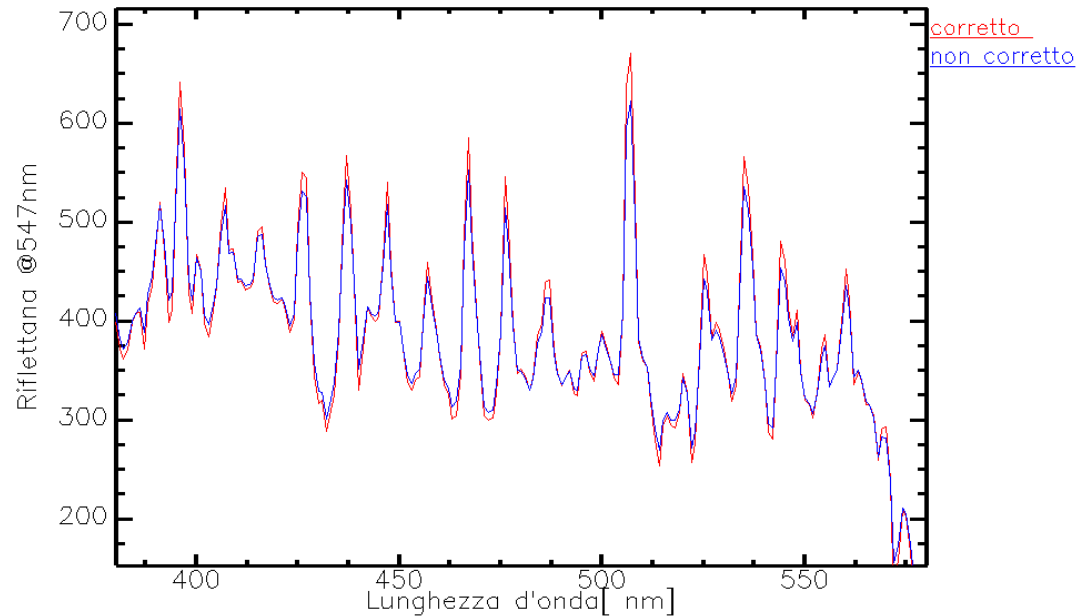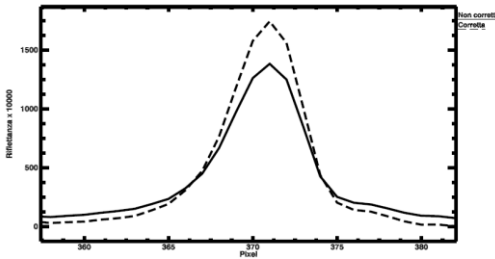
Process flow

First Run:
$$L = A \frac{\rho'}{(1 - S\rho')} + L_{path}$$

Second Run:
$$L = A_d \rho \cdot \frac{\cos(SnA)}{\cos(SZA)} + [A \frac{\rho}{(1 - S\rho_e)} - A_d \rho] \cdot$$
$$\cdot (1 + \cos(slA)) / 2 + B \frac{\rho_e}{(1 - S\rho_e)} + L_{path}$$

Boxes: Atmospheryc Model, Radiance image, ρ' image, PSF, ρ_e image, DEM parameters, ρ image

CASI 1500 - Metaponto, Italy

CASI images have been used to highlight correction effects on particular targets
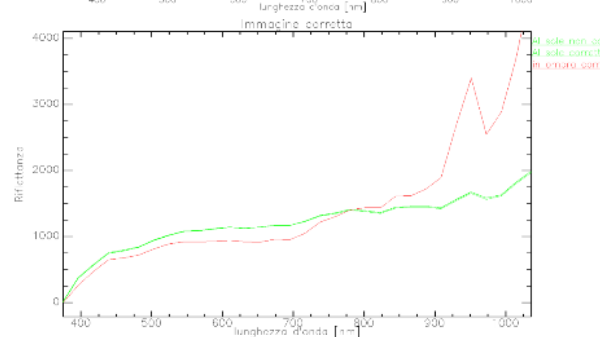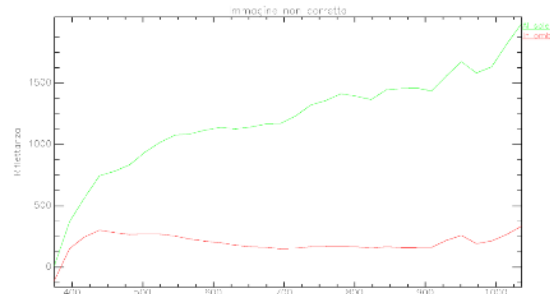

White road

Rows

Comparisons of horizontal profiles on a reflectance images before and after adjacency correction highlight the contrast increment of the spatial features.

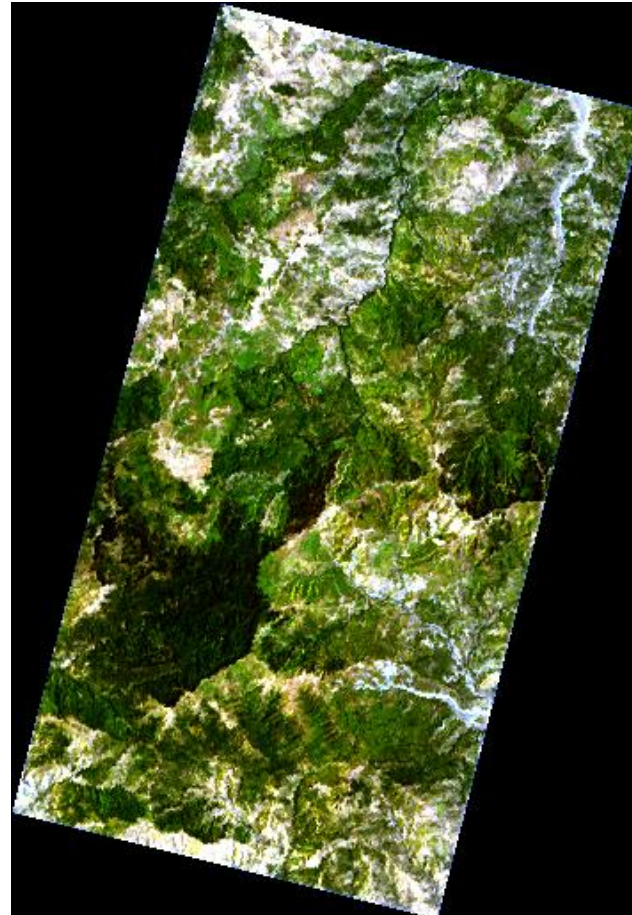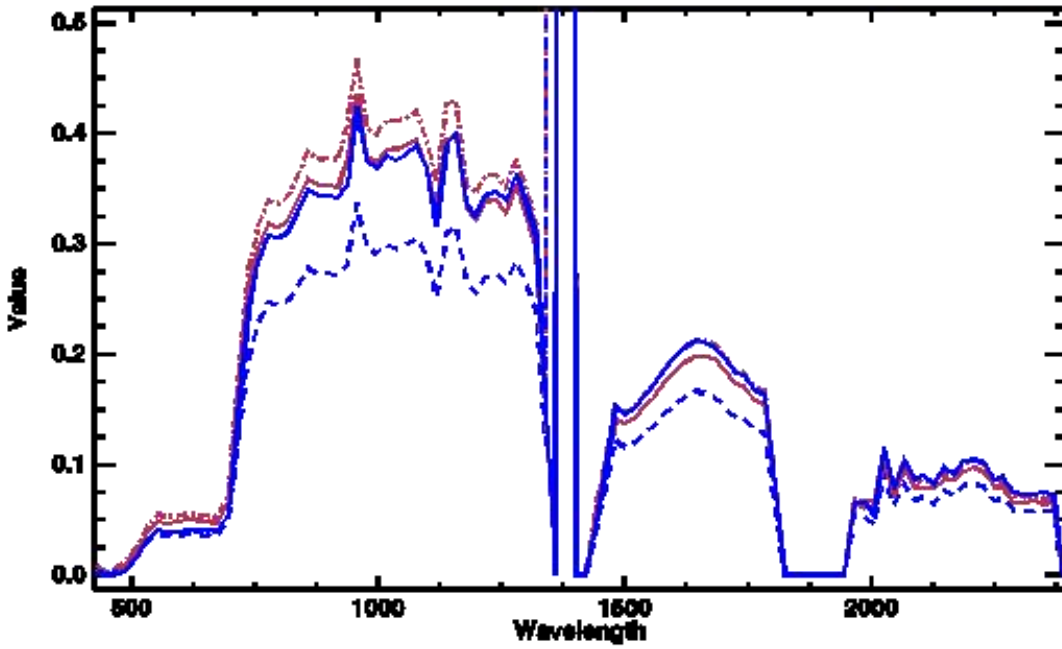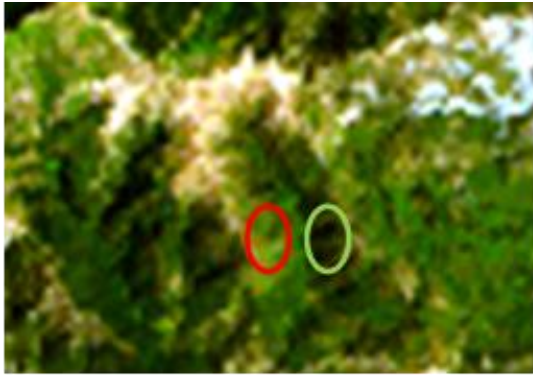## CASI 1500 – Reggio Calabria, Italy

DEM Parameter

DEM *Sun/soil angle* *shadows*
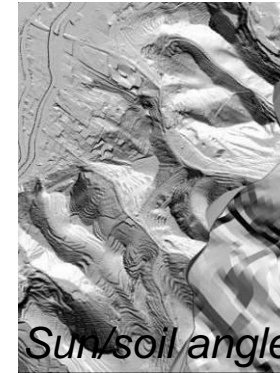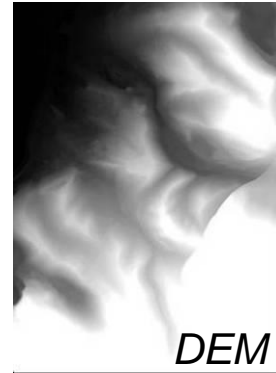
Shadows correction on
CASI DATA
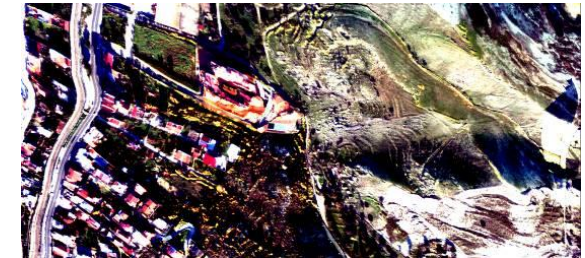
Hyperion – Nebrodi Mounts, Sicily, Italy

RGB reflectance image with and without DEM correction

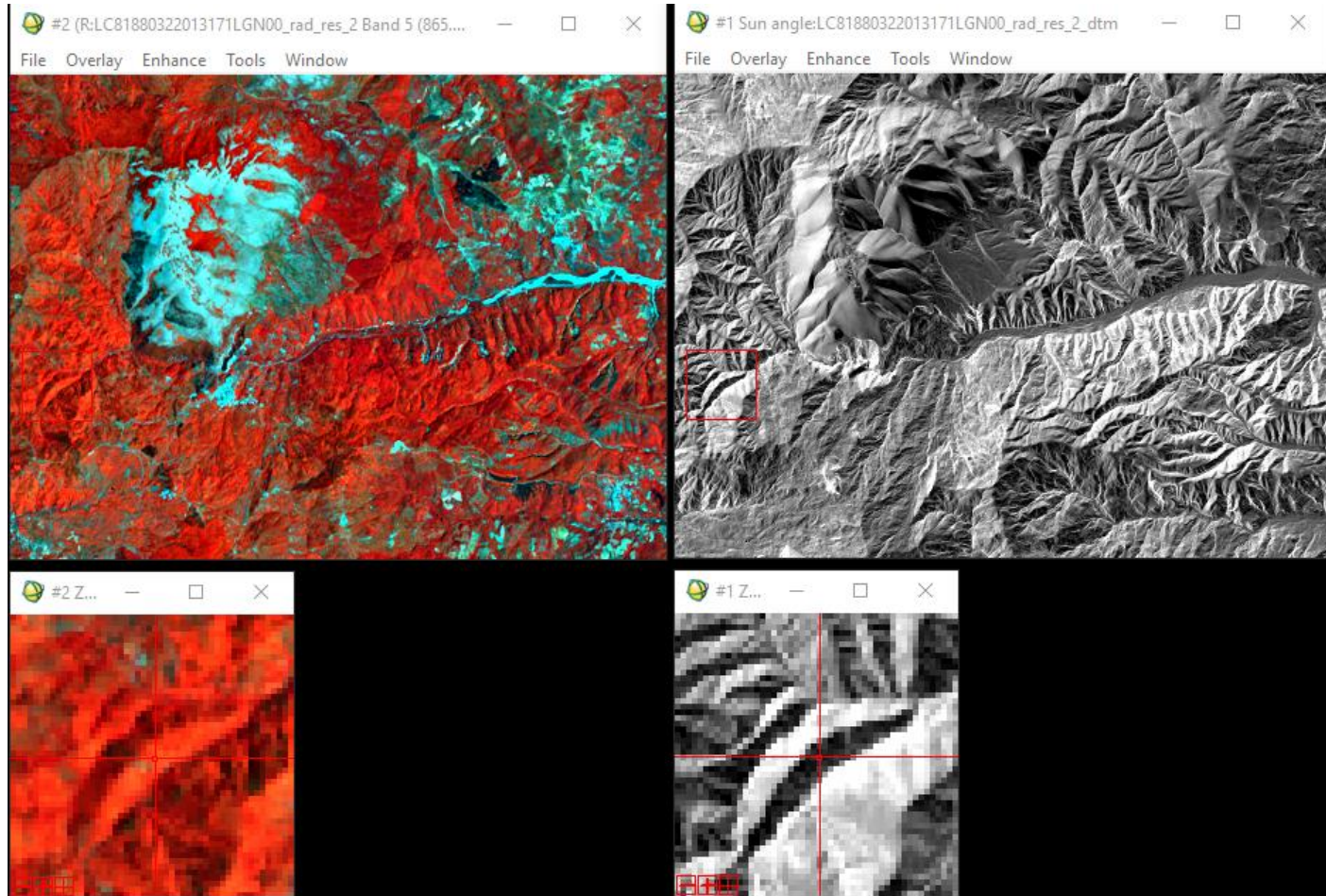Vegetation spectra of slopes with different expositions, with and without topographic correction
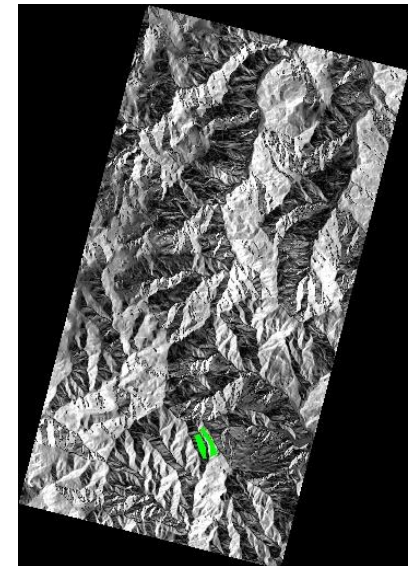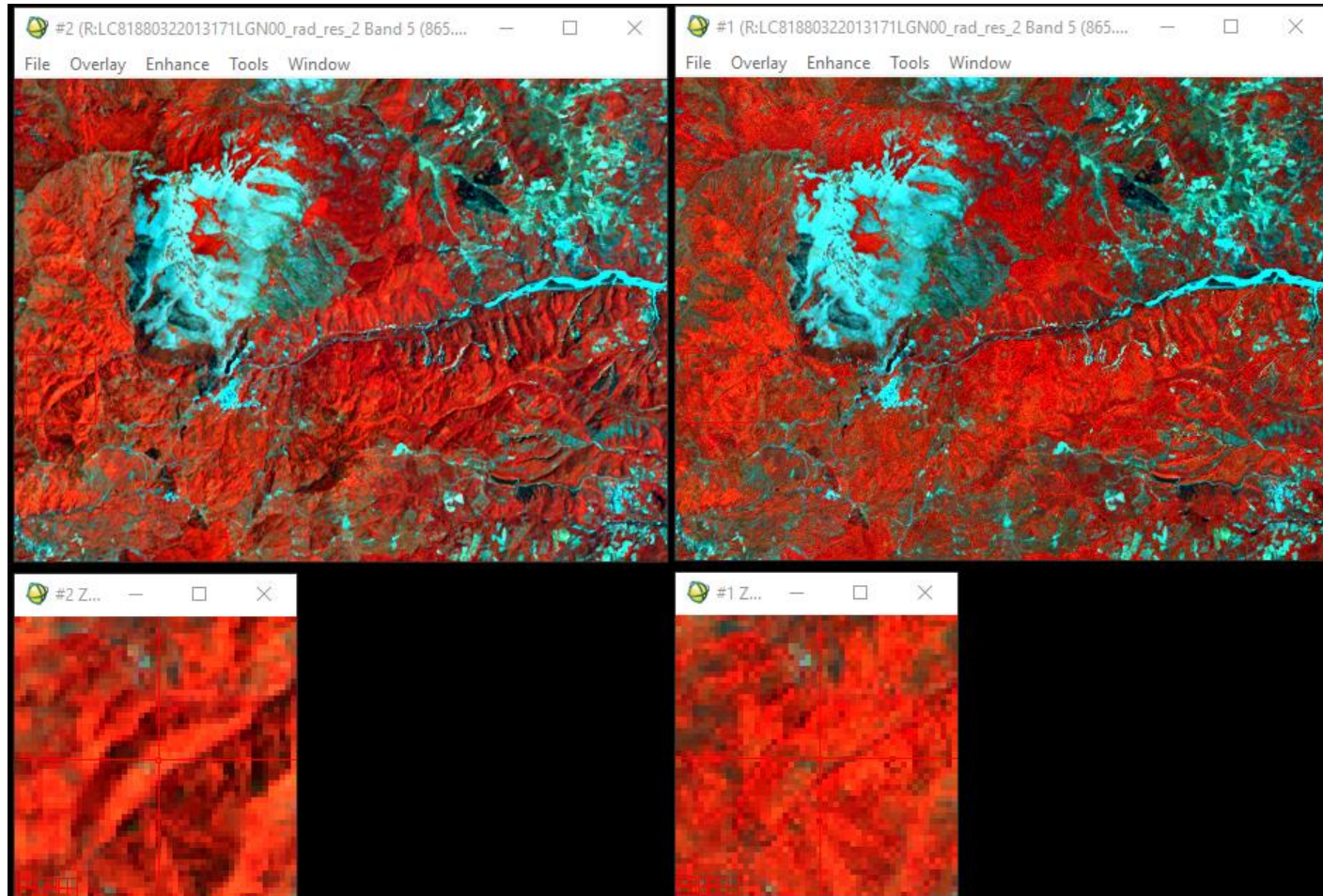
Landsat 8, Appennino Lucano National Park, Italy
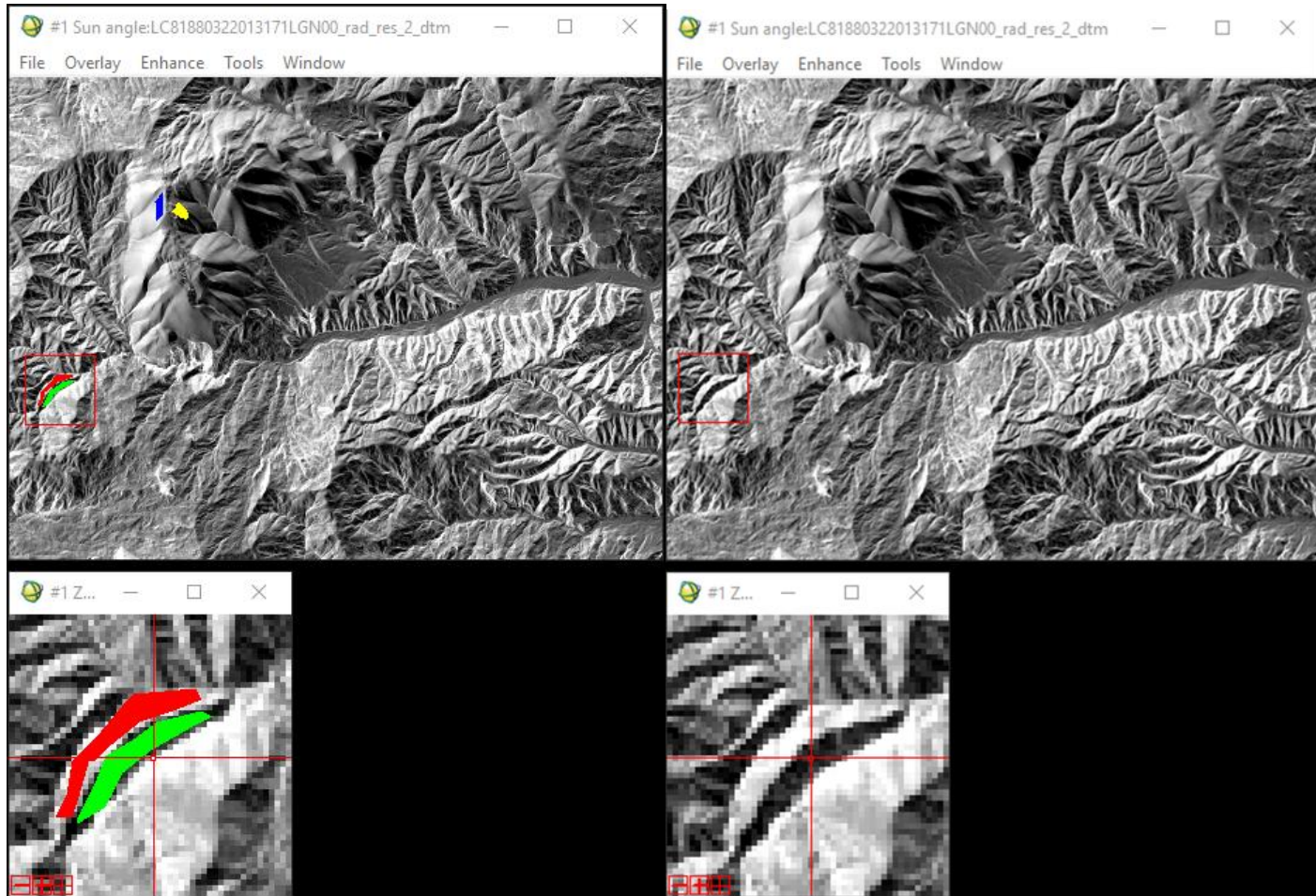

False colors image (R: 865 nm ; G: 561 nm ; B: 482 nm) highlighting topographic effects

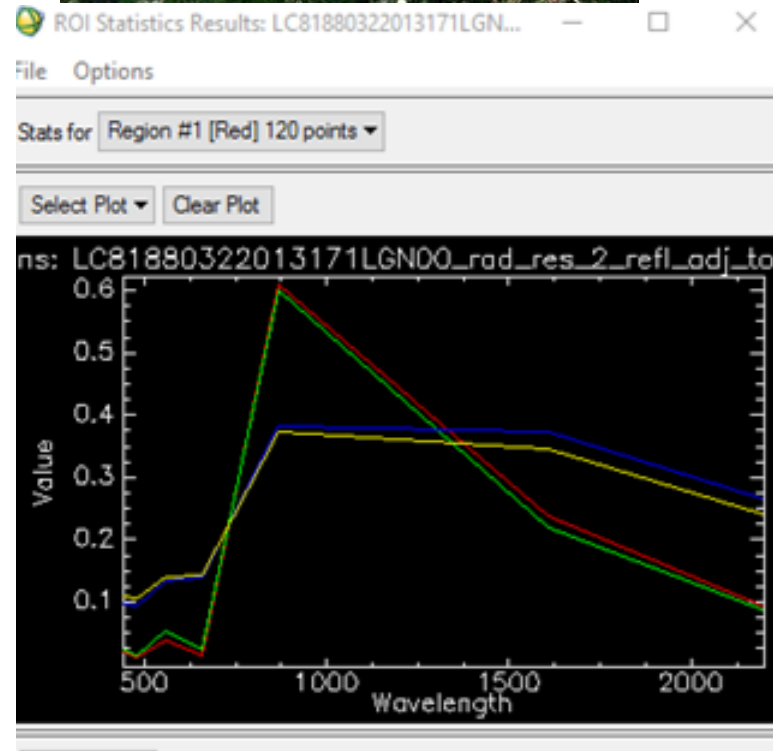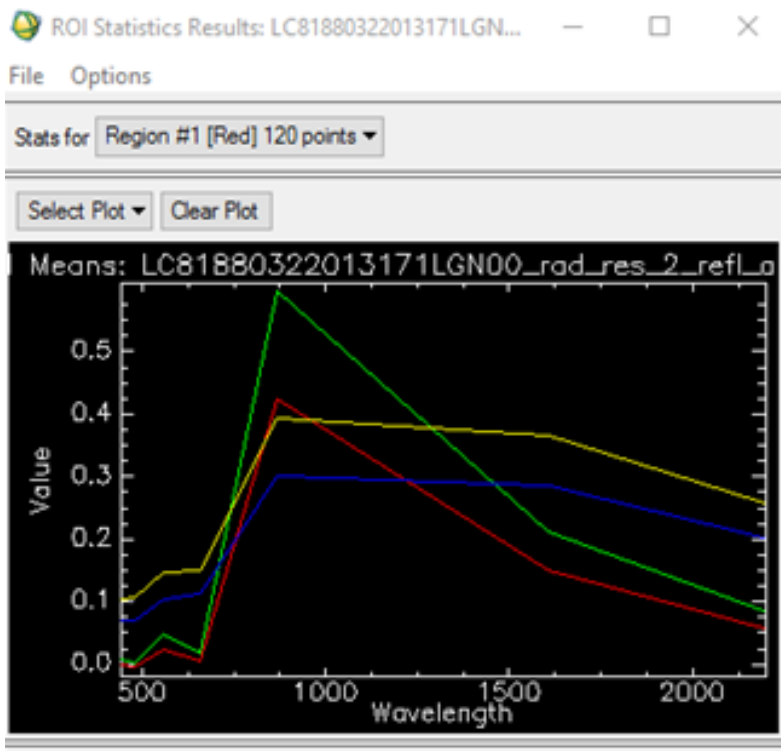## Landsat 8, Appennino Lucano National Park, Italy

False colors reflectance image before (left) and after (right) topographic correction

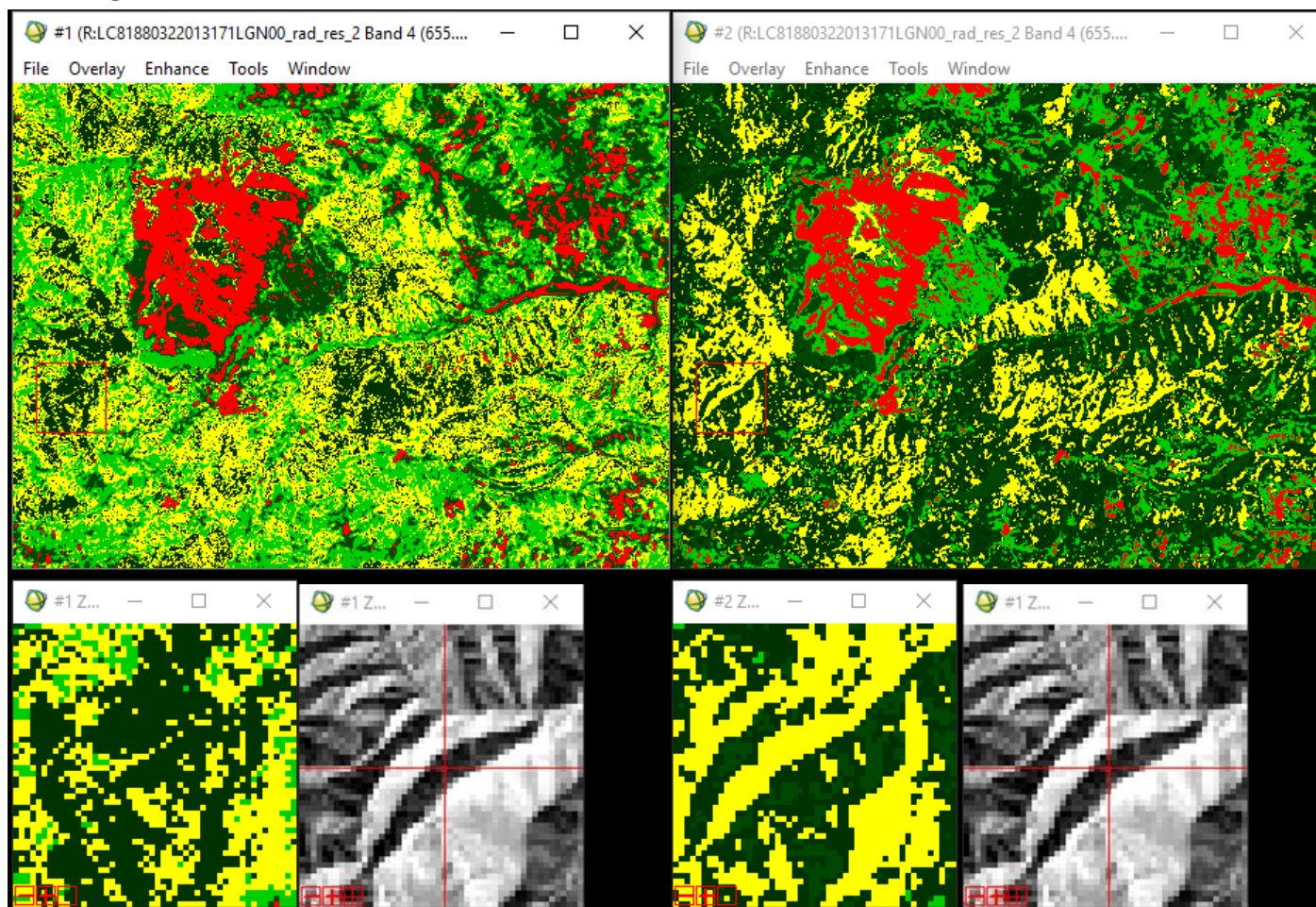## Landsat 8, Appennino Lucano National Park, Italy

Two ROI couples have been selected to point out slope illumination effects on two different soil covers

Comparison between spectra belonging to different classes before and after topographic correction
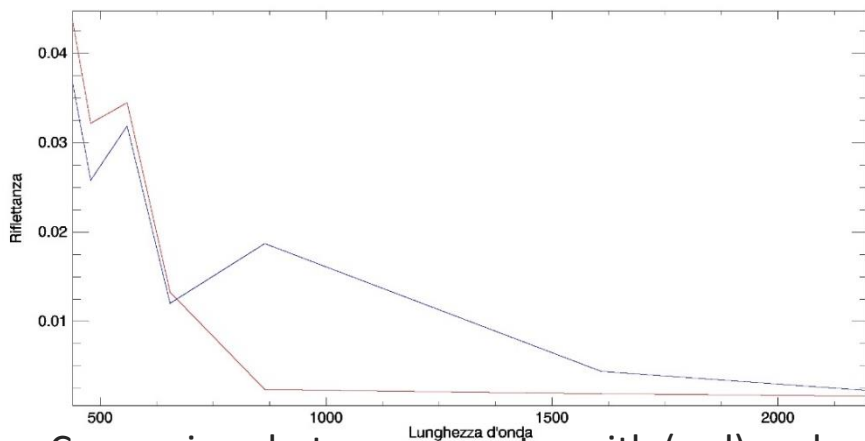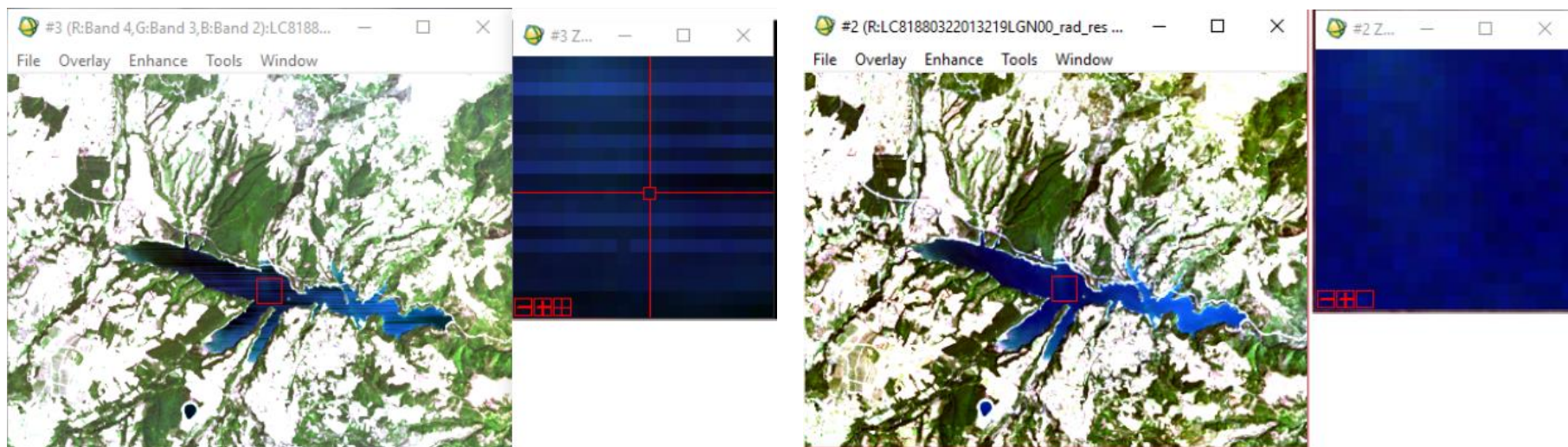
Impact of topographic correction on classification procedures
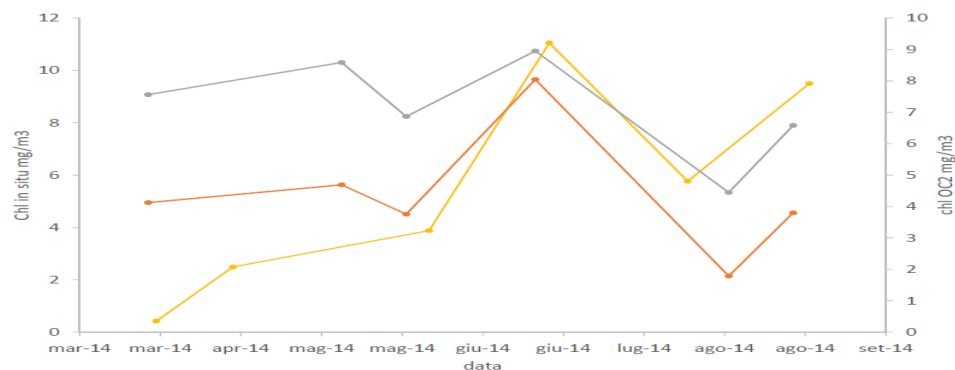

Unsupervised K-means classification before and after topographic correction

The correlation between DEM and classification noteworthy decreases after topographic correction

Landsat 8, Appennino Lucano National Park, Italy – Pertusillo lake

Comparison between spectra with (red) and without (blue) adjacency correction

Mean chlorophyll behavior between 2013 march and 2014 august: in situ (yellow), OC2 USGS (grey), OC2 after atmospheric correction
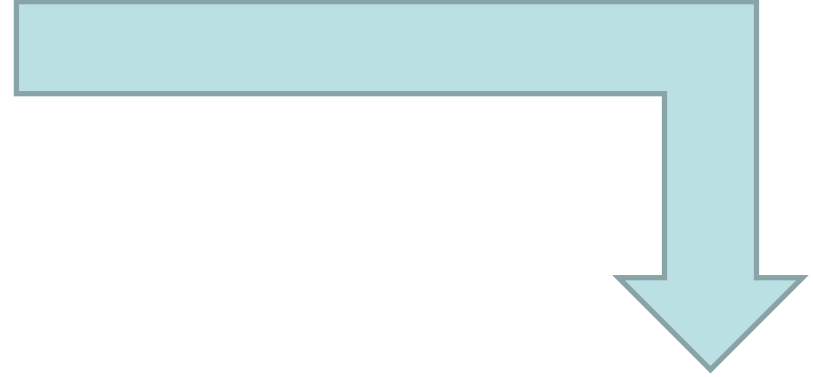
Preprocessing Software

Software interface

Before correctio

Thank you for your attention

After correction