



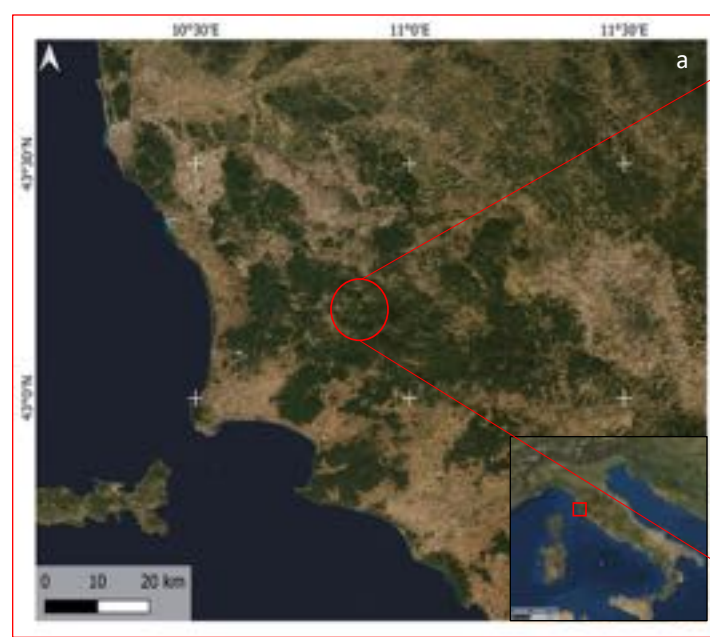
Musacchio M., Rabuffi F., Silvestri M., Buongiorno M.F.

The integration of different scaled hyperspectral dataset for surface classification

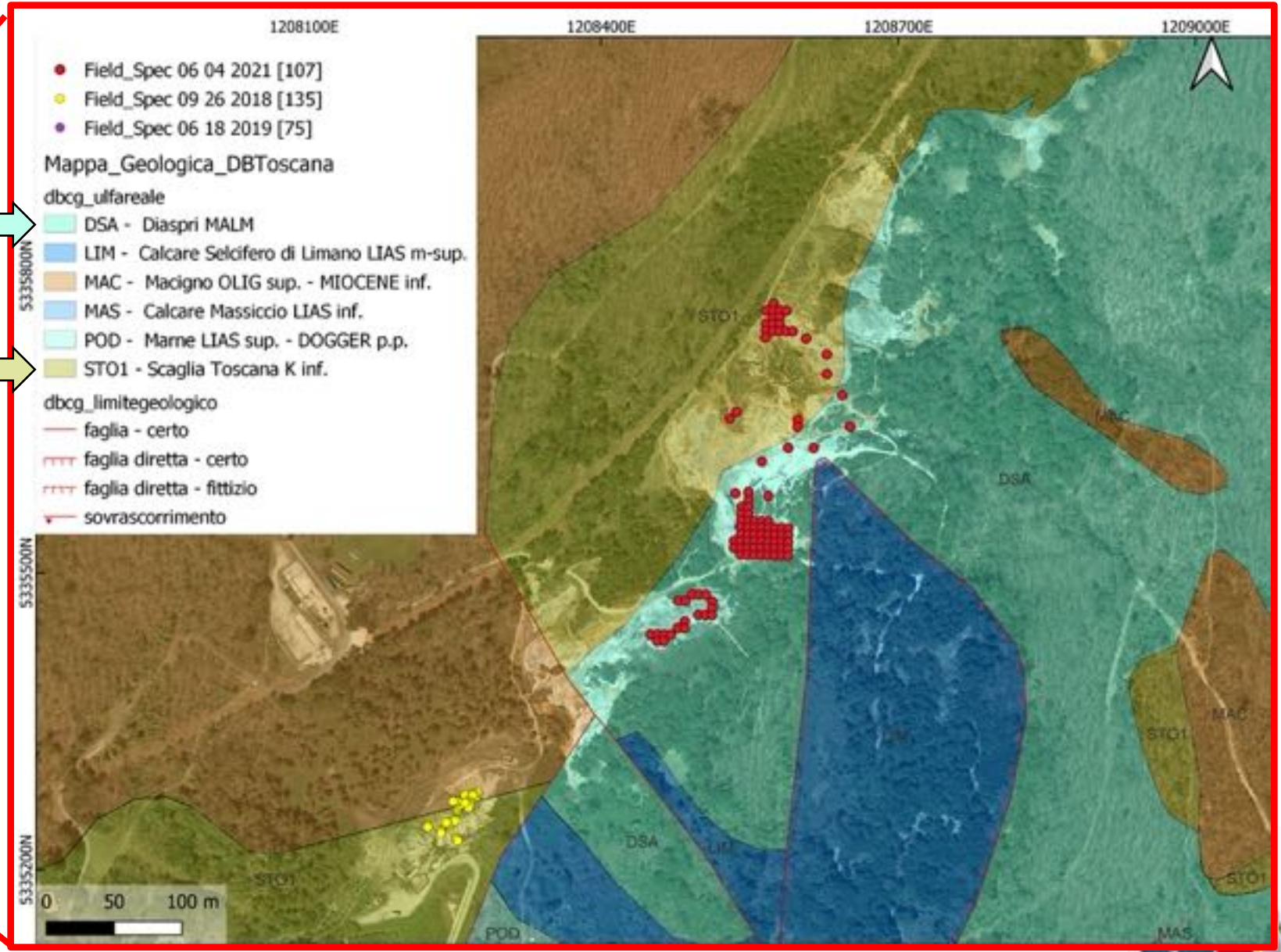


Biancane site (PBN) (Tuscany, Italy)

- The natural park characterized by boraciferous region has been modified by human activity. Steam is completely utilized for energy production, and the hydrothermal manifestations are now present in limited areas only.
- The outcropping rocks varies from **“massive limestone”**; fumaroles mineralizations **deeply altered by circulation of hydrothermal fluids** and **sulphur crystal blooms**



Surface Geology



Data used

- Ground Truth
 - Surface spectroscopy spectra: about 200 sites for about 2000 single spectrum
- Remote sensed
 - ASI-PRISMA data: “PRS_L2D_STD_20200904101349”
 - AVIRIS-NG data: “Ang20210604t104752”

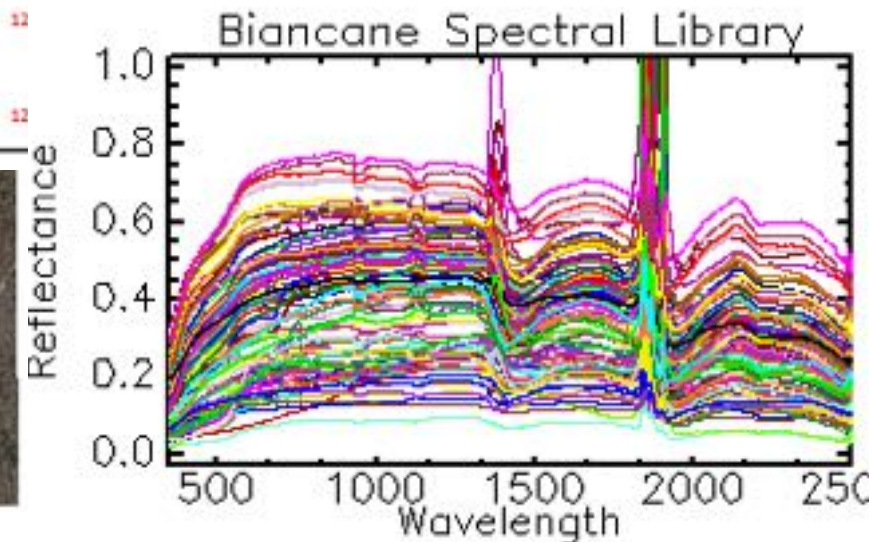


Ground truth data

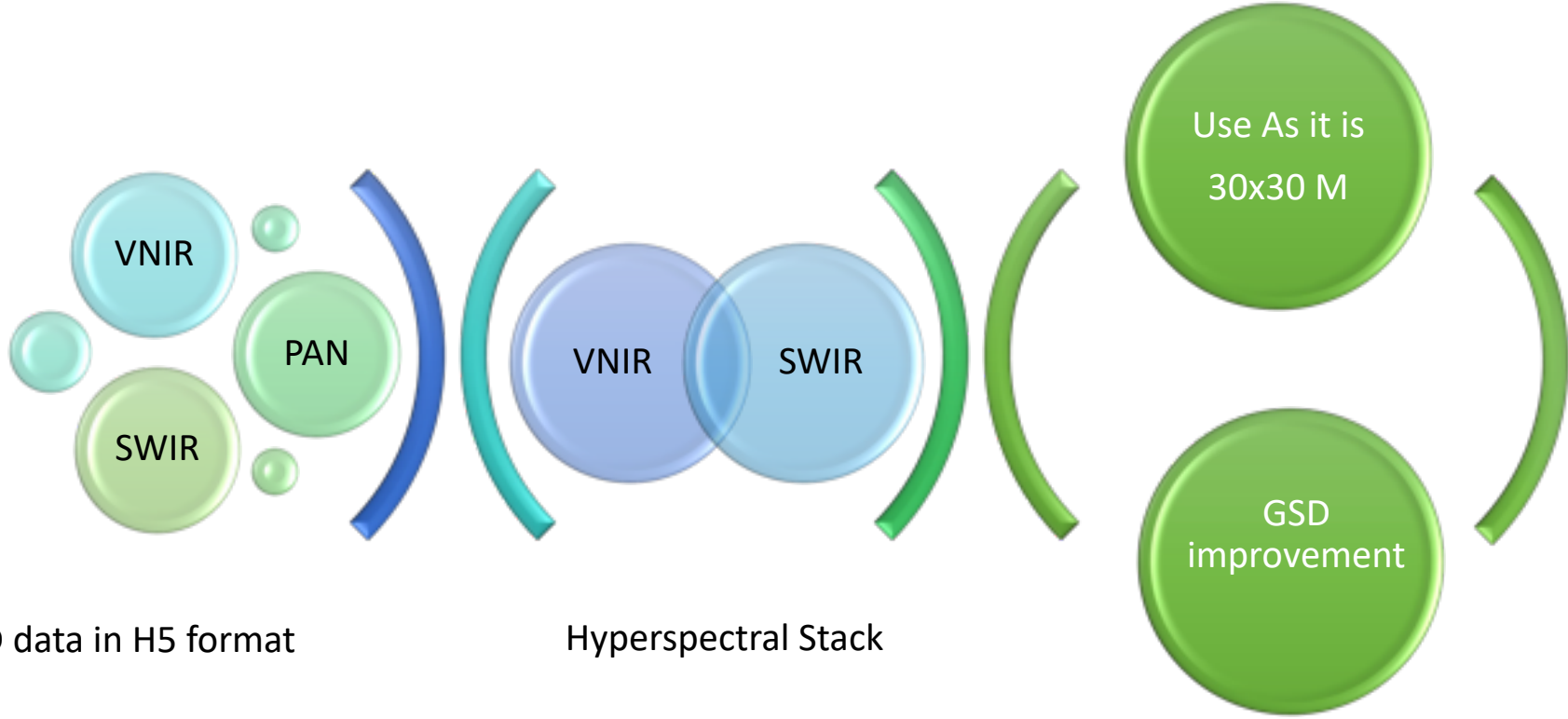
- About 600 different spectra from about 100 sites have been collected

- Field_Spec 06 04 2021 [107]
 - Field_Spec 09 26 2018 [135]
 - Field_Spec 06 18 2019 [75]
 - Field_Spec 06_19_2019 [270]
- Google.cn Satellite

Field Campaign deployed from 2018 to 2021



PRISMA Data Processing



L2D data in H5 format

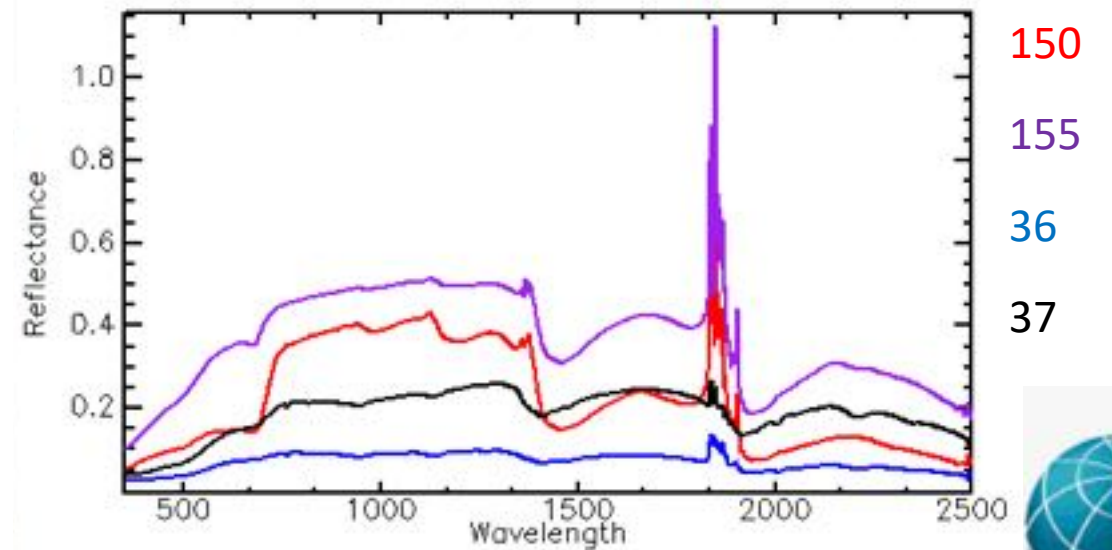
Hyperspectral Stack



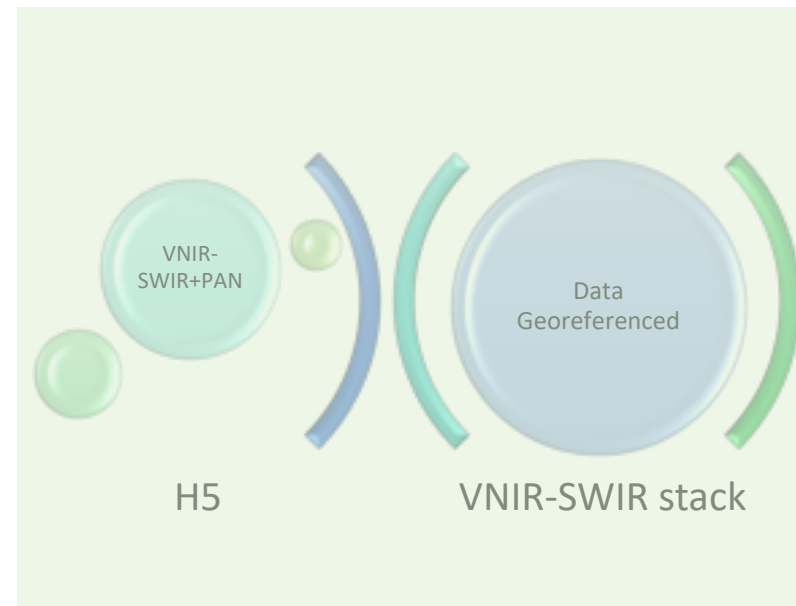
Original GSD PRS_L2D_STD_20200904101349



Four classes have been identified relevant four spectra numbered 36-37 150 155



Processing of PRISMA reflectances (L2D product) to enhance the ground resolution



Gram Schimdt Spectral sharpening algorithm using the

1. AVIRIS-NG for the High spatial resolution
2. PRS for the Low spatial resolution/hyper band

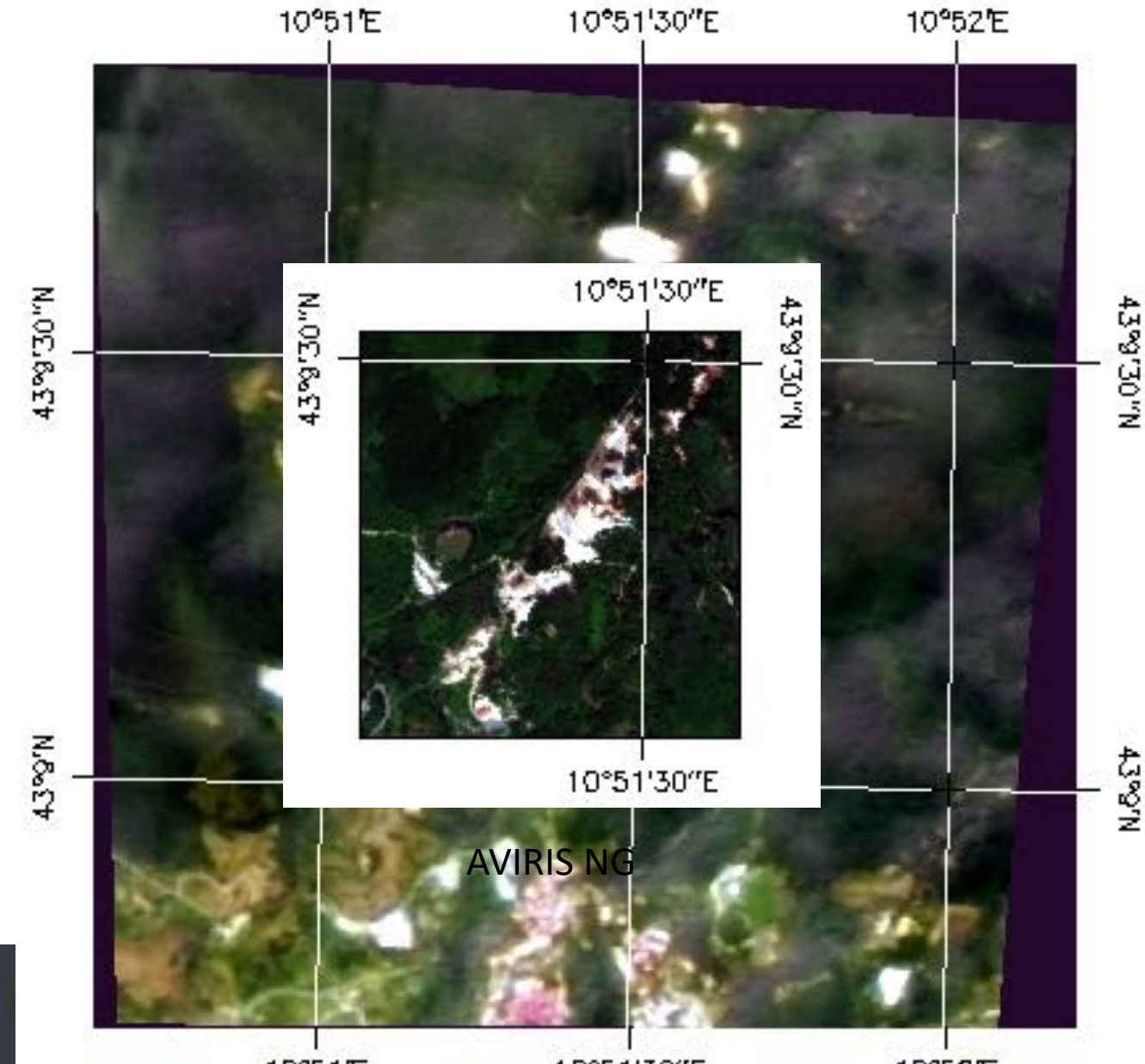


PRS VNIR-SWIR
With the same AVIRIS GSD

PRS VNIR-SWIR co-registered
to AVIRIS-NG



Result of the PanSharpening



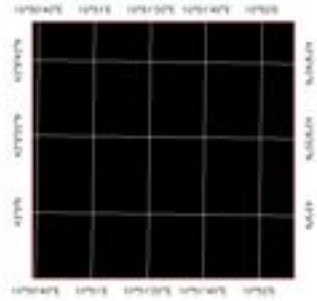
PRISMA (pan sharp)



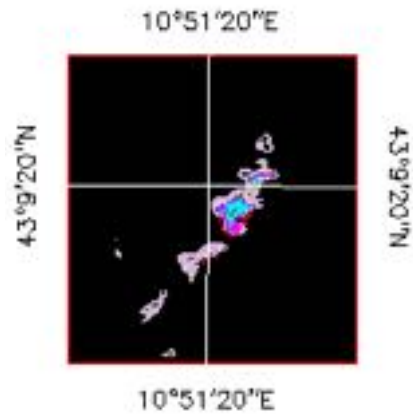
Classification results

Only PRISMA VNIR channels can be classified
By using two different sampled Spectral libraries,
between this two images there aren't differences

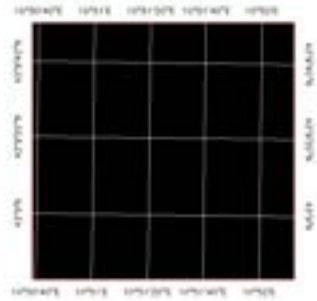
VNIR-SWIR



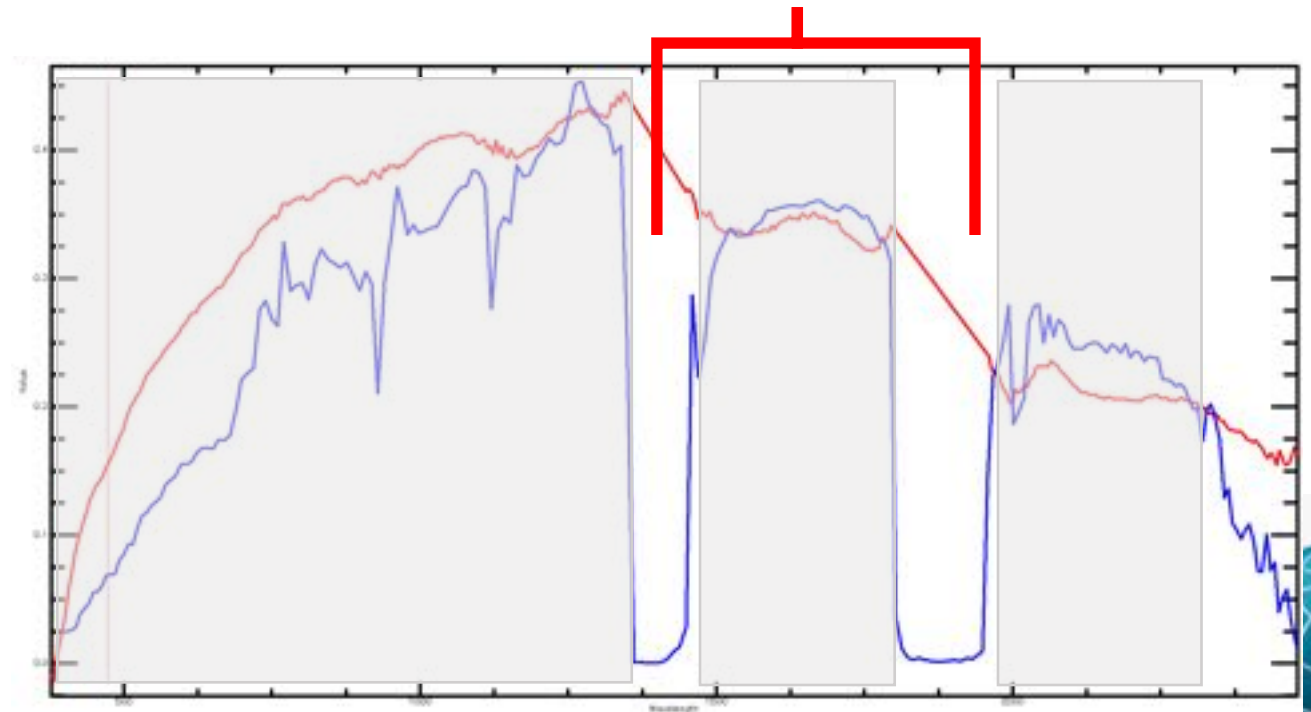
VNIR



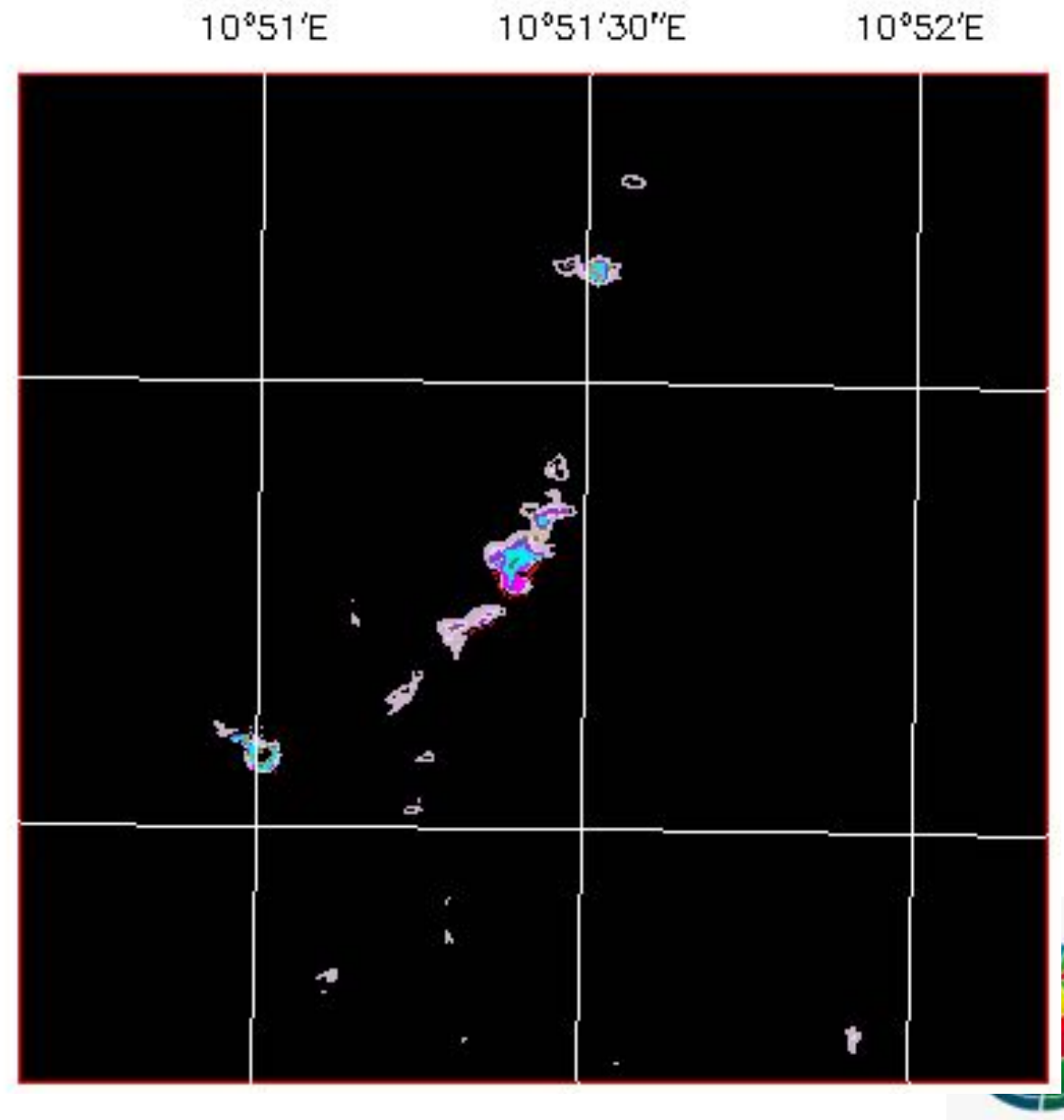
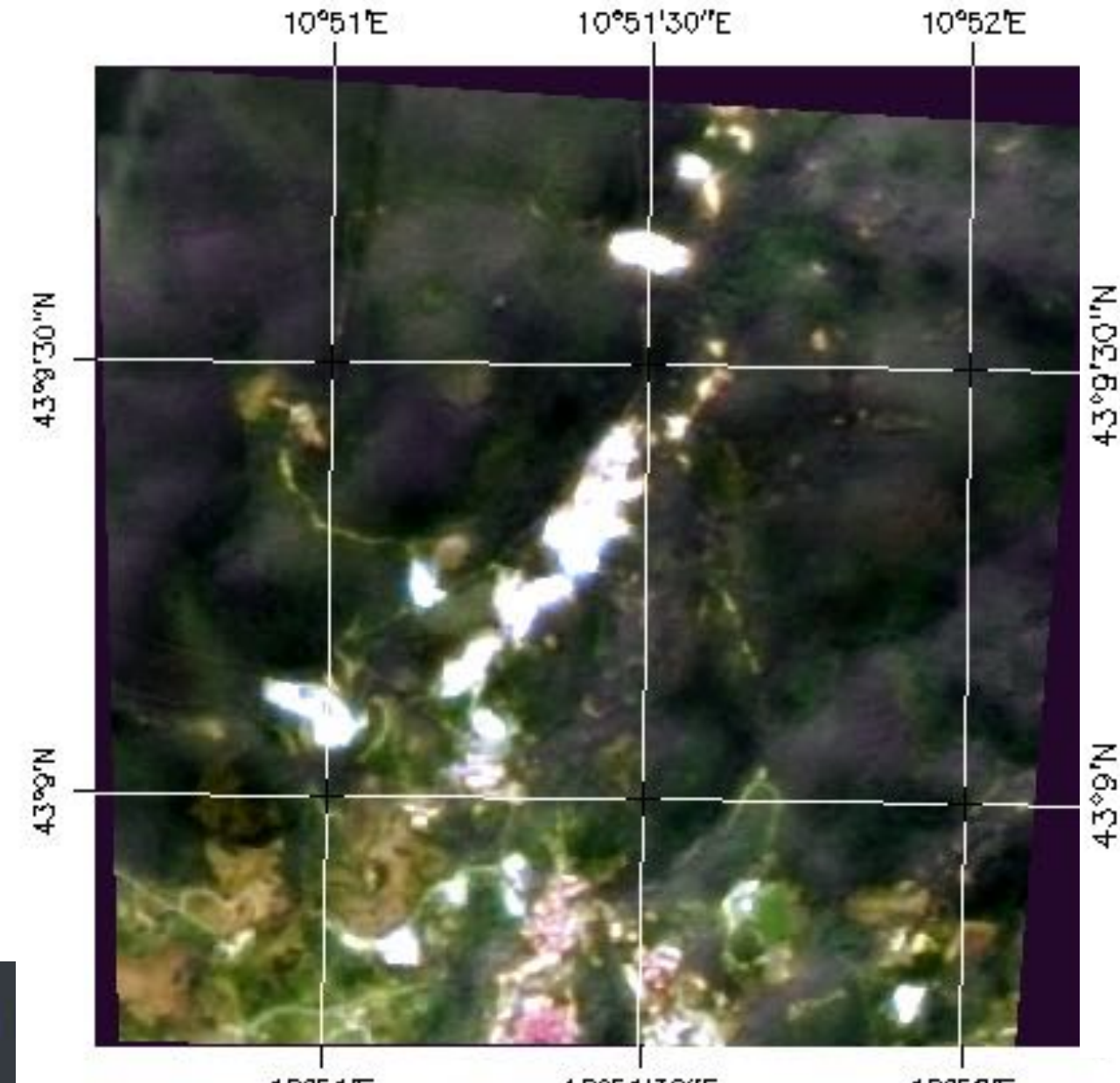
SWIR



No solution window for ASI-PRISMA
by using SAM

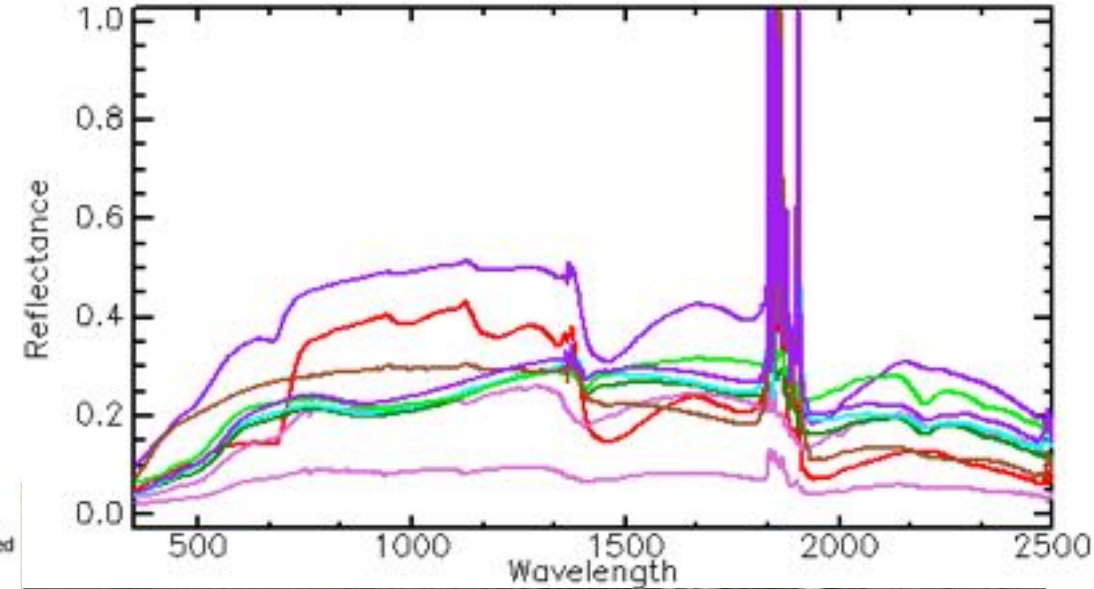
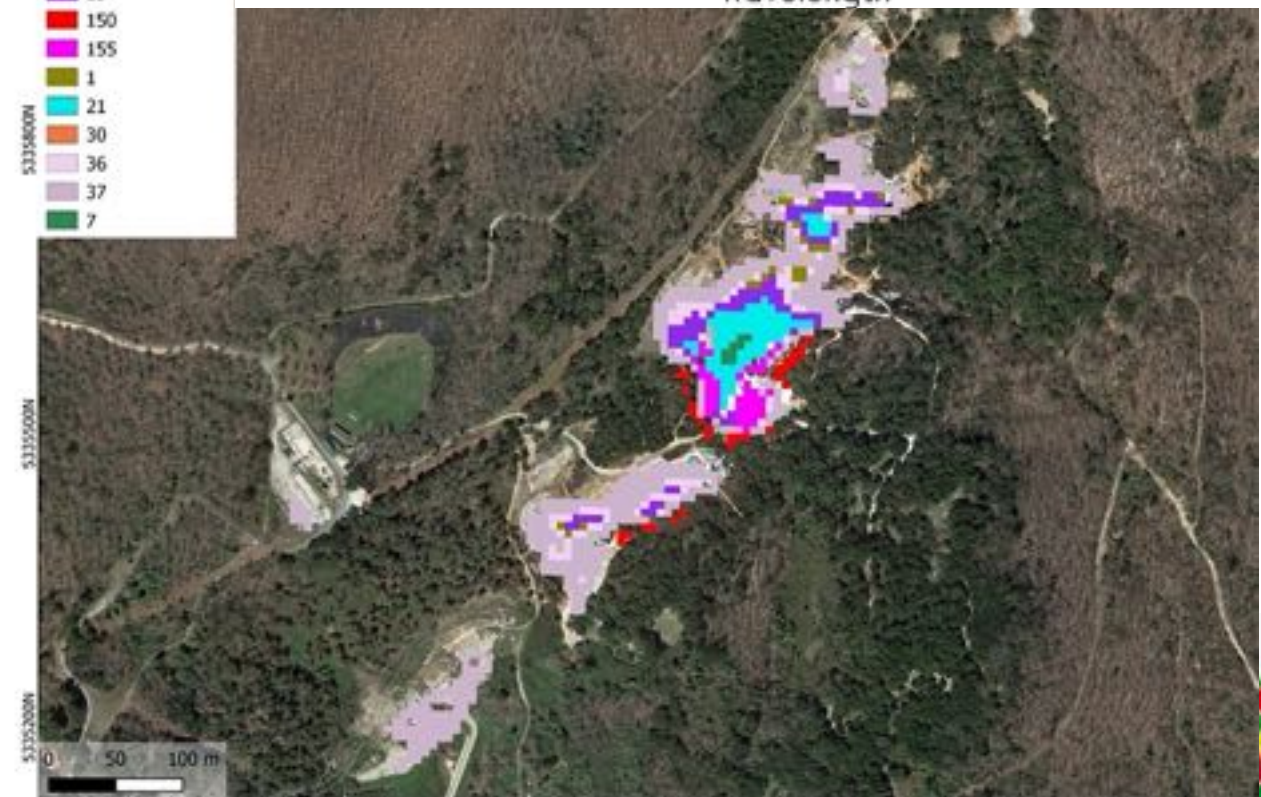
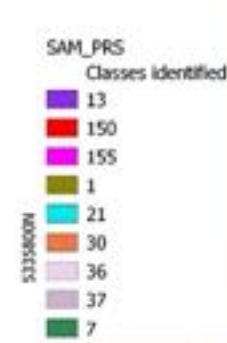
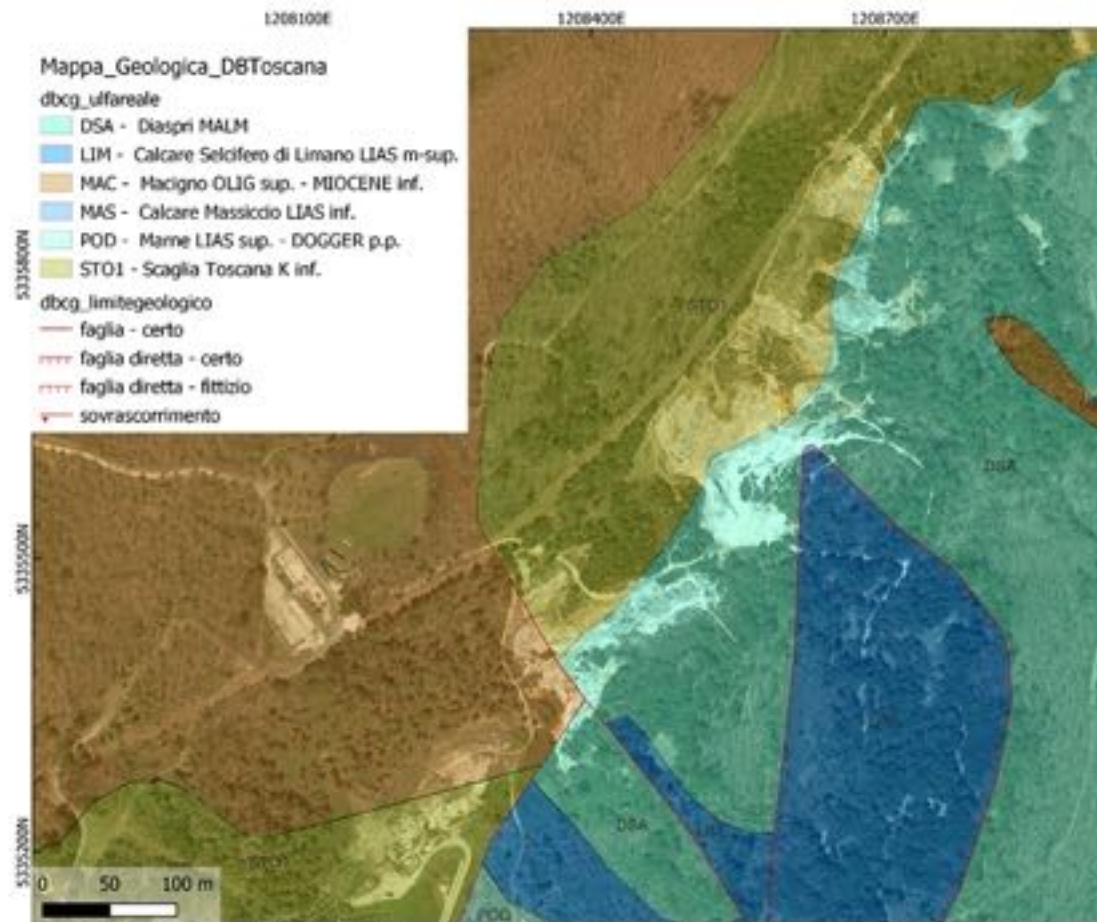


Result of the PanSharpening

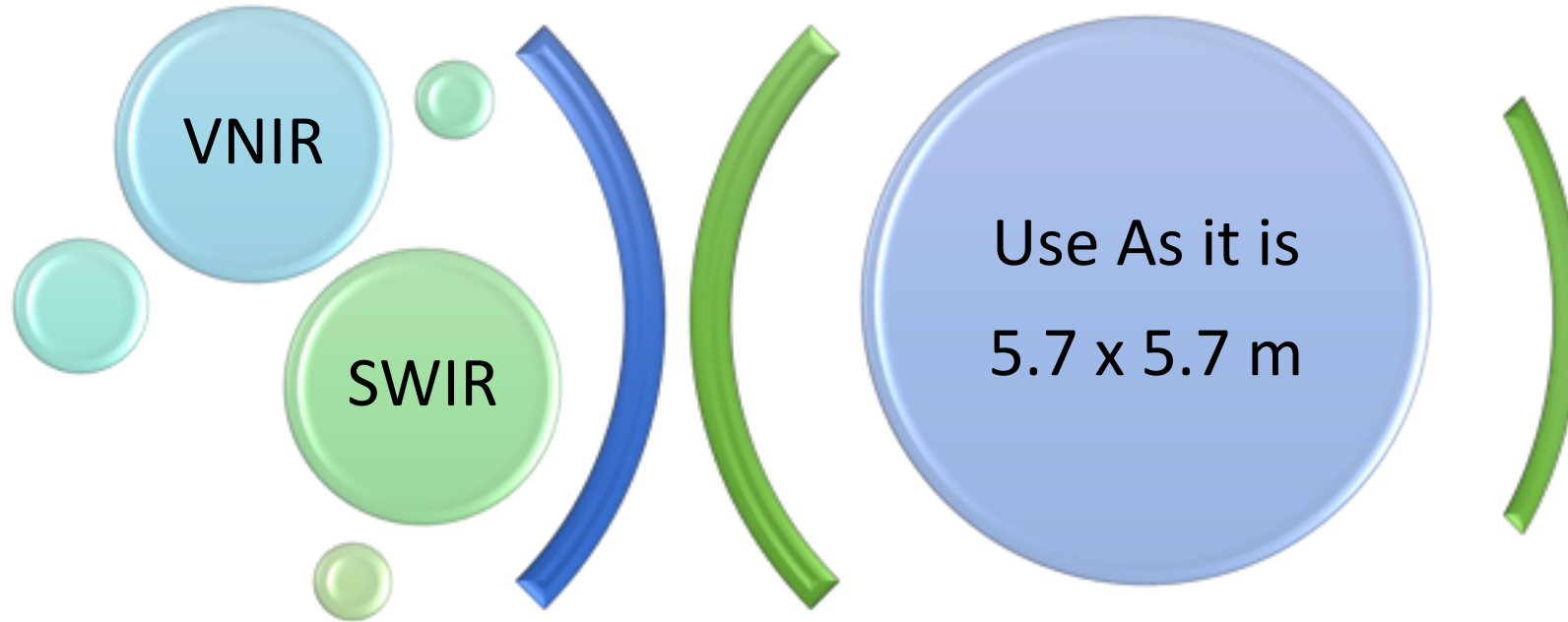


PRS 5,7x5,7 m Soil classification

Surface classification obtained by applying the SAM algorithm to VNIR channels



AVIRIS Data Processing

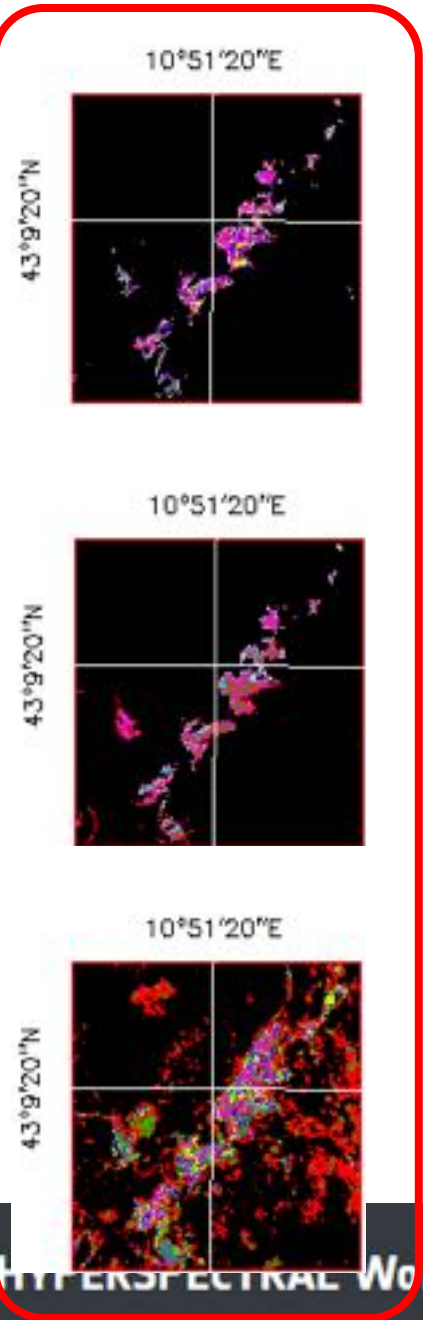


Hyperspectral Stack



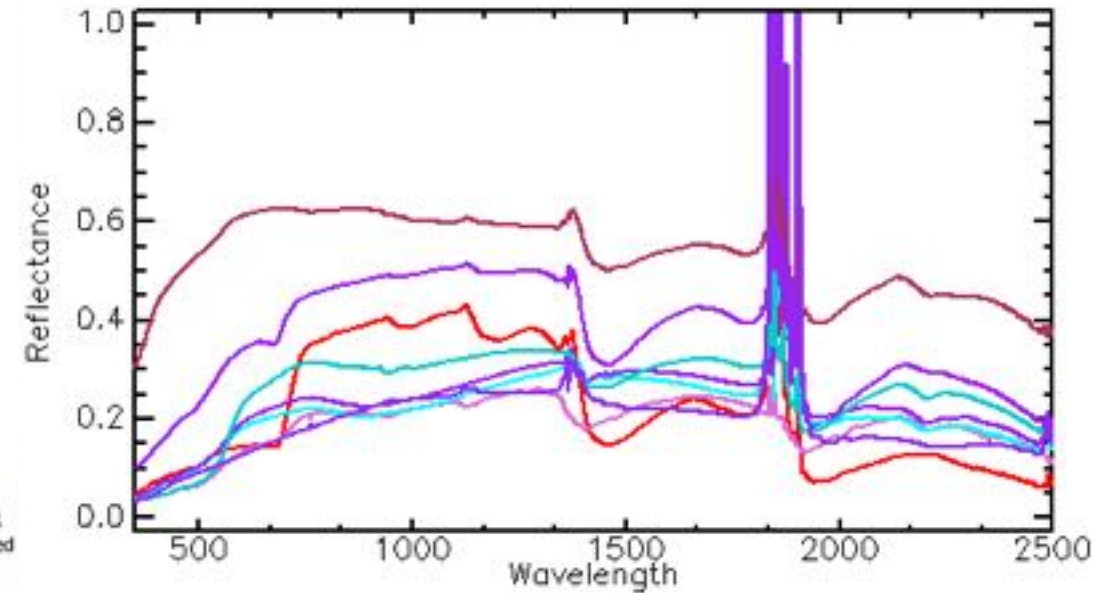
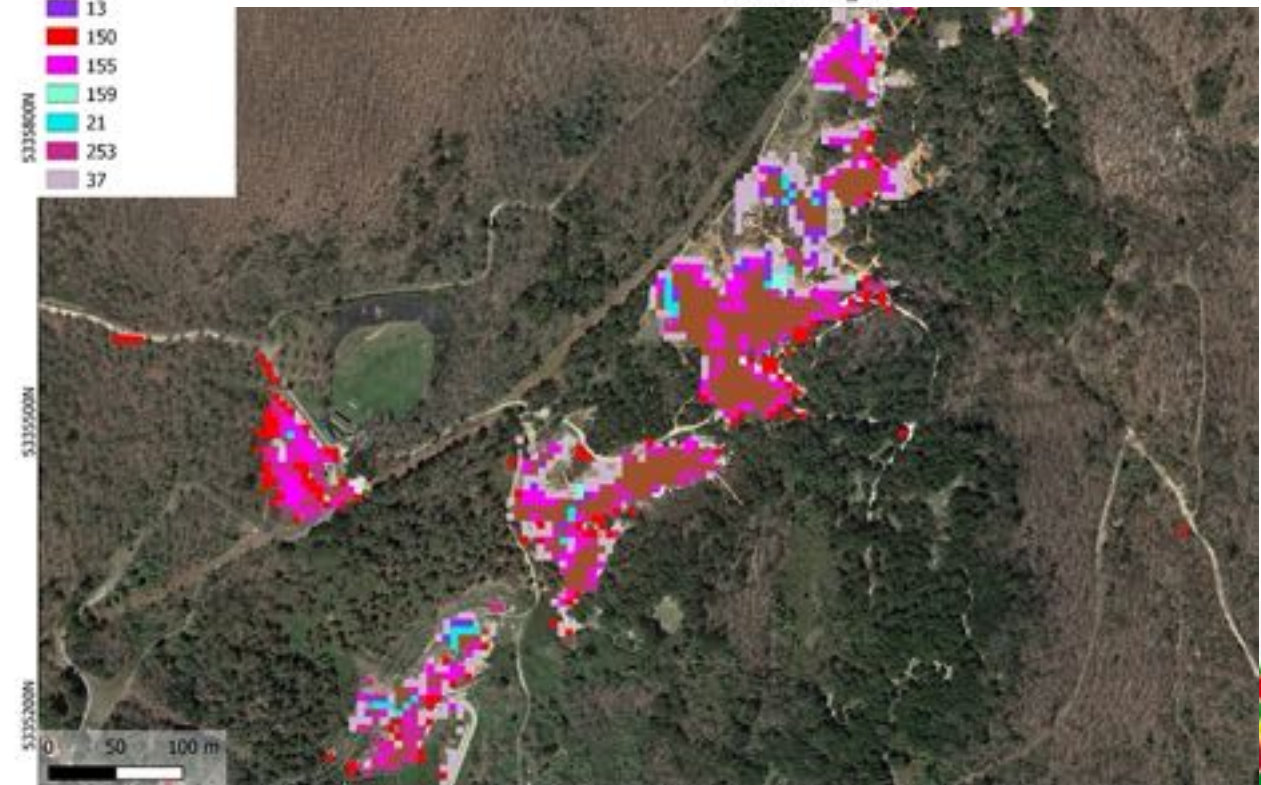
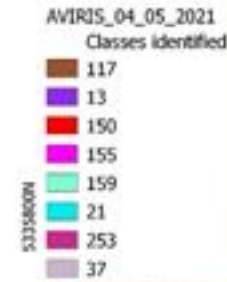
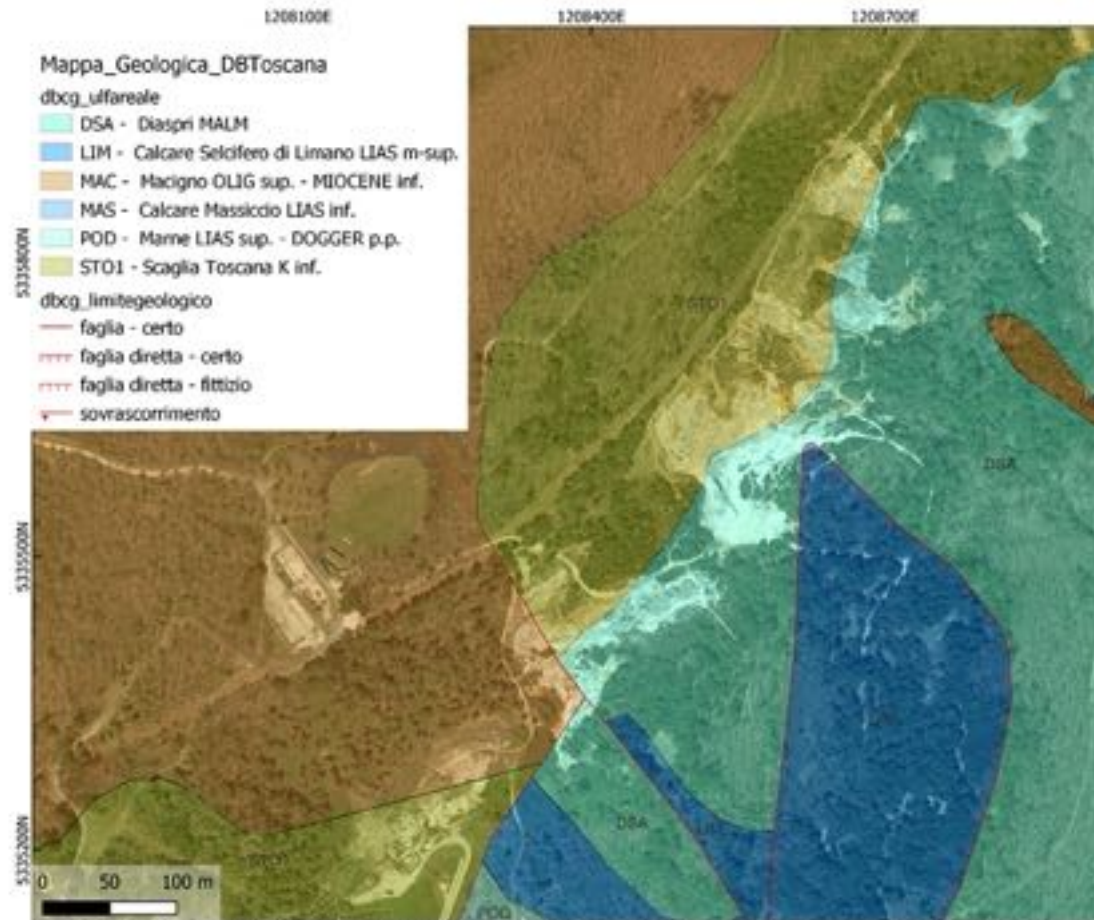
Classification results

- Ang20210604t104752_XX_v2z2 acquired under the 2021 JPL-ESA joined activity
- AVIRIS-NG, acronym for the Airborne Visible InfraRed Imaging Spectrometer - Next Generation, measures the wavelength range from 380 nm to 2510 nm (similar to ASD and PRISMA) with 5 nm sampling and a GSD varying according the flight elevation. AVIRIS NG data over PBN was acquired in parallel to the field campaign hold on 4th of May 2021 with a GSD of 5.7 m



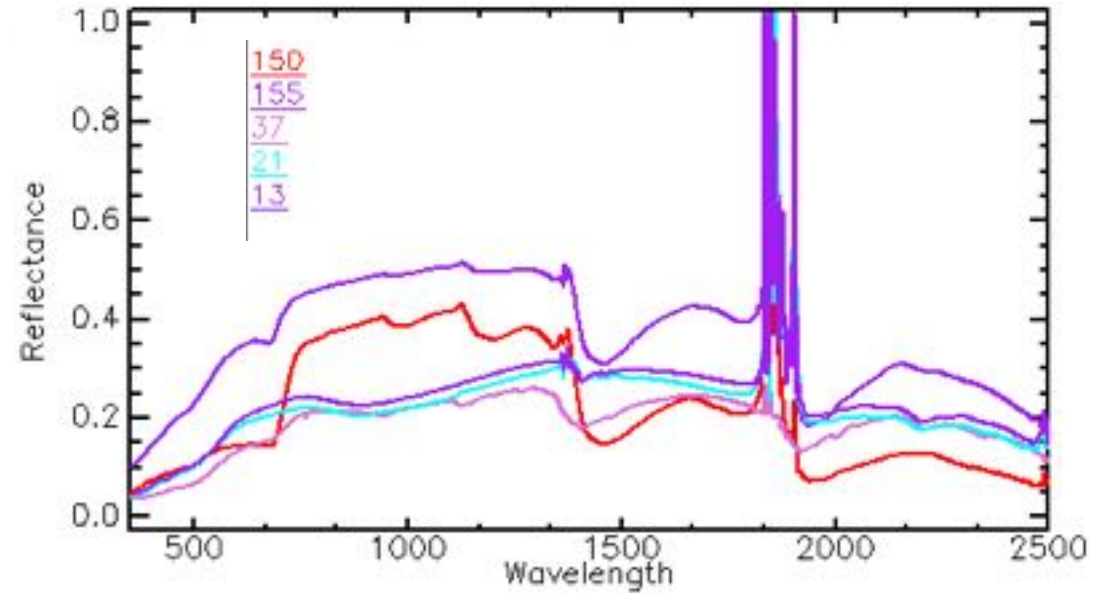
AVIRIS 5,7x5,7 m Soil classification

Surface classification obtained by applying the SAM algorithm to VNIR channels



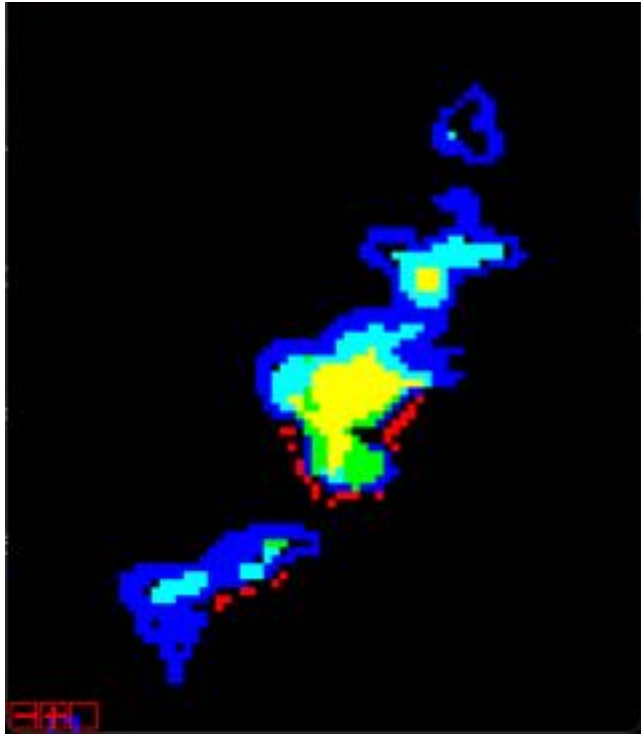
Class comparison

PRISMA	AVIRIS
1	13
7	21
13	37
21	117
30	150
36	155
37	159
150	253
155	

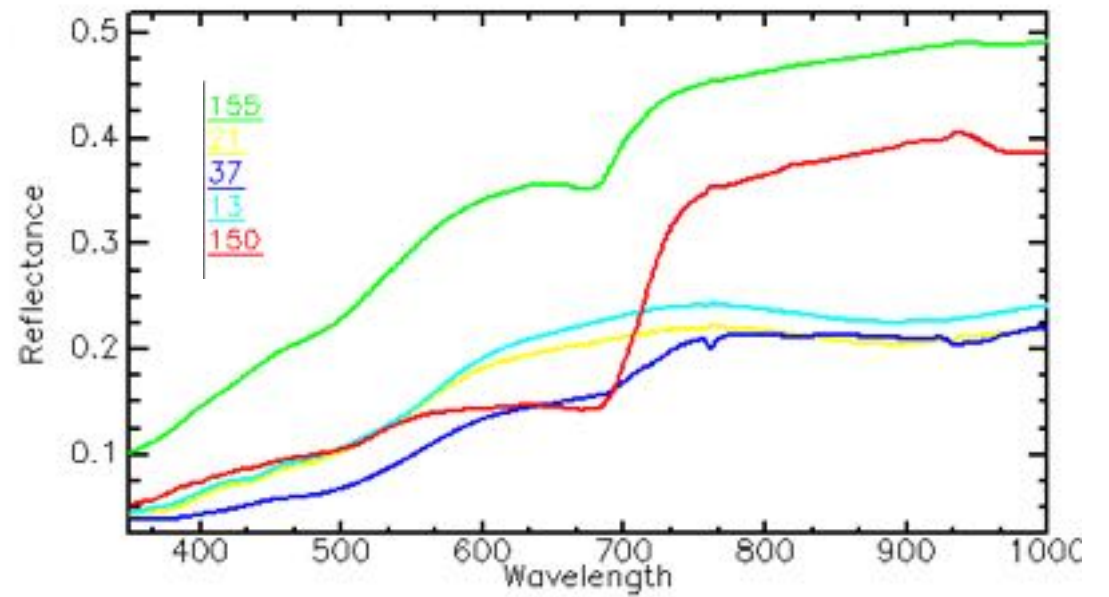
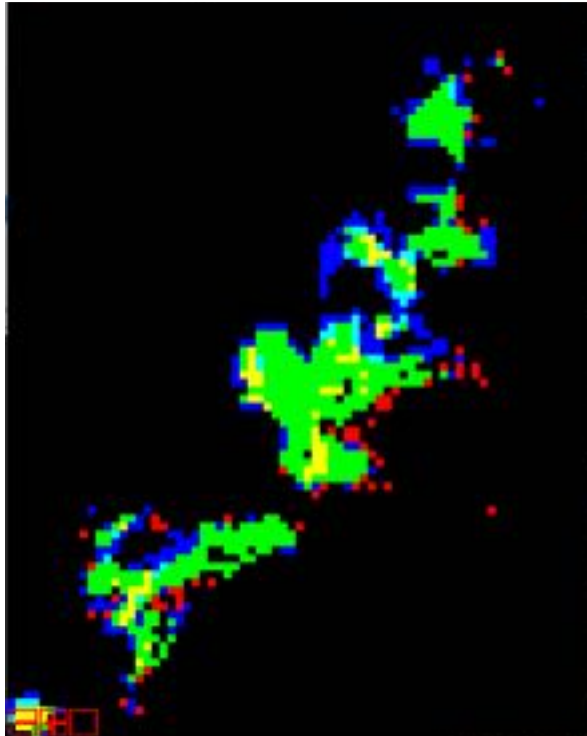


Conclusion

PRISMA



AVIRIS-NG



Next steps

- Role of the surface geology
- Understanding why the classifications are different
 - Understanding the weight of GSD wrt Radiometry
- What classification is better?

