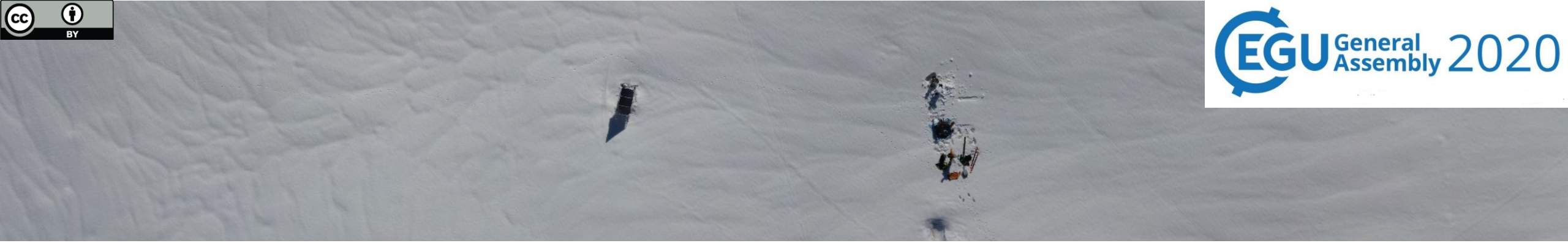

PRISMA hyperspectral satellite mission: first data on snow in the Alps

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Objectives:

- To present calibration/validation activities of the PRISMA satellite mission
- To introduce an experimental cal/val site located in the Alps
- To present a preliminary comparison between satellite and field data

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PRISMA satellite mission

- **PRISMA** (PRecursore IperSpettrale della Missione Applicativa) is a satellite mission by the Italian Space Agency (**ASI**).
- Launched in April 2019 (commissioning phase)
- On demand hyperspectral data of Earth surface
- The imaging spectrometer features **239 bands** covering the **visible**, **near infrared** and **shortwave infrared** wavelengths (400-2500 nm) with a **spectral resolution** <12nm.
- Spatial resolution: 30m, Swath: 30 km.

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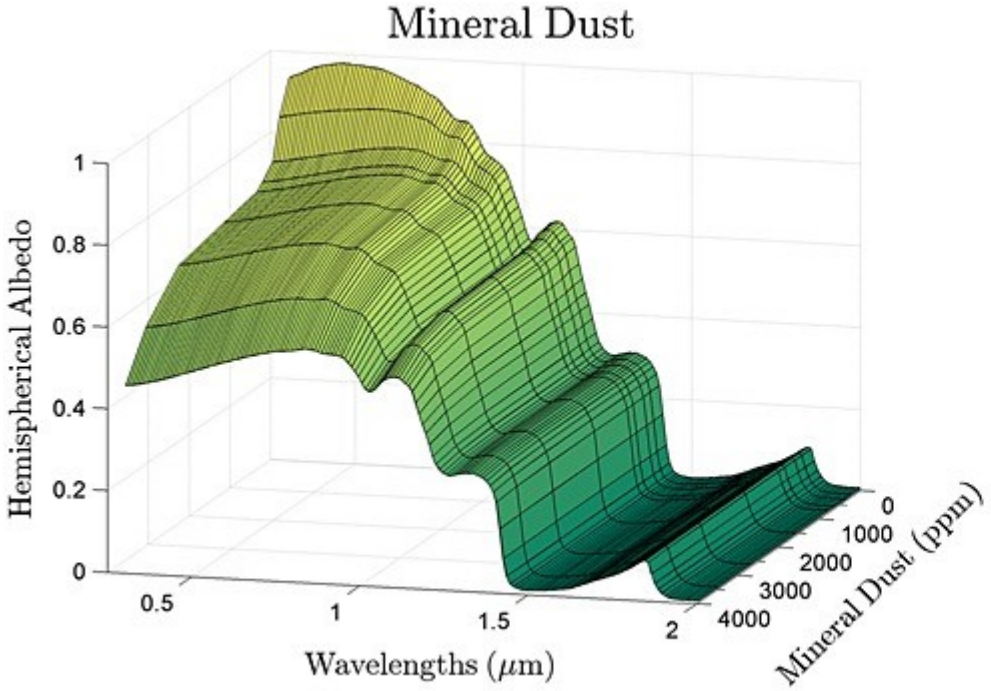
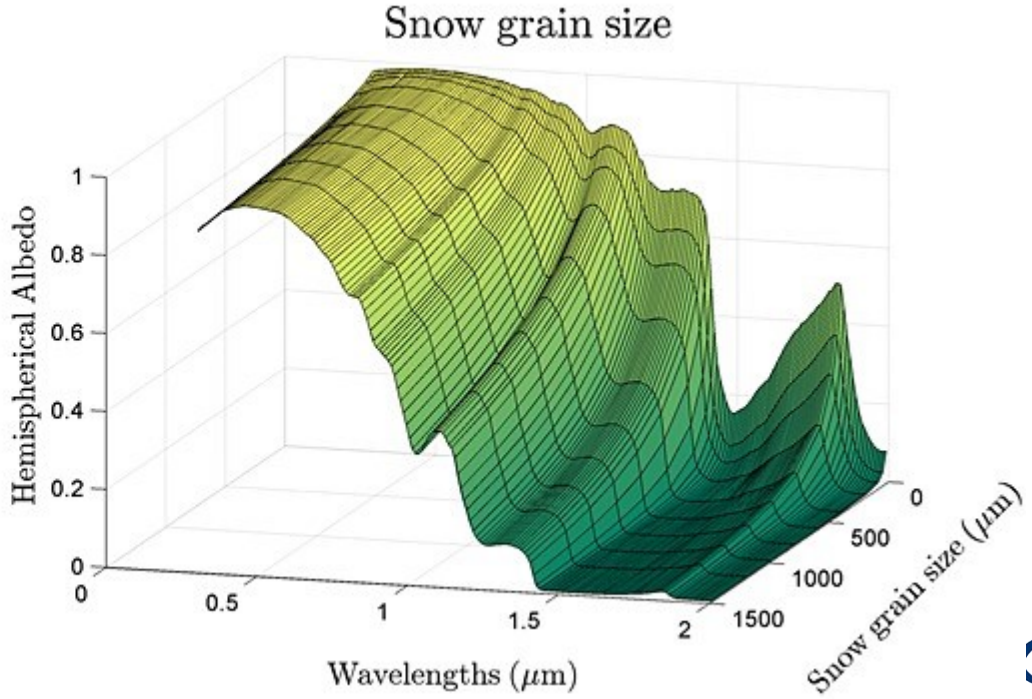
Snow spectroscopy

- Hyperspectral imaging is very important for studying snow properties such as: **spectral reflectance**, **broad band albedo**, **grain size**, **impurities** (mineral dust and algae), **liquid water content**, and **snow typing**

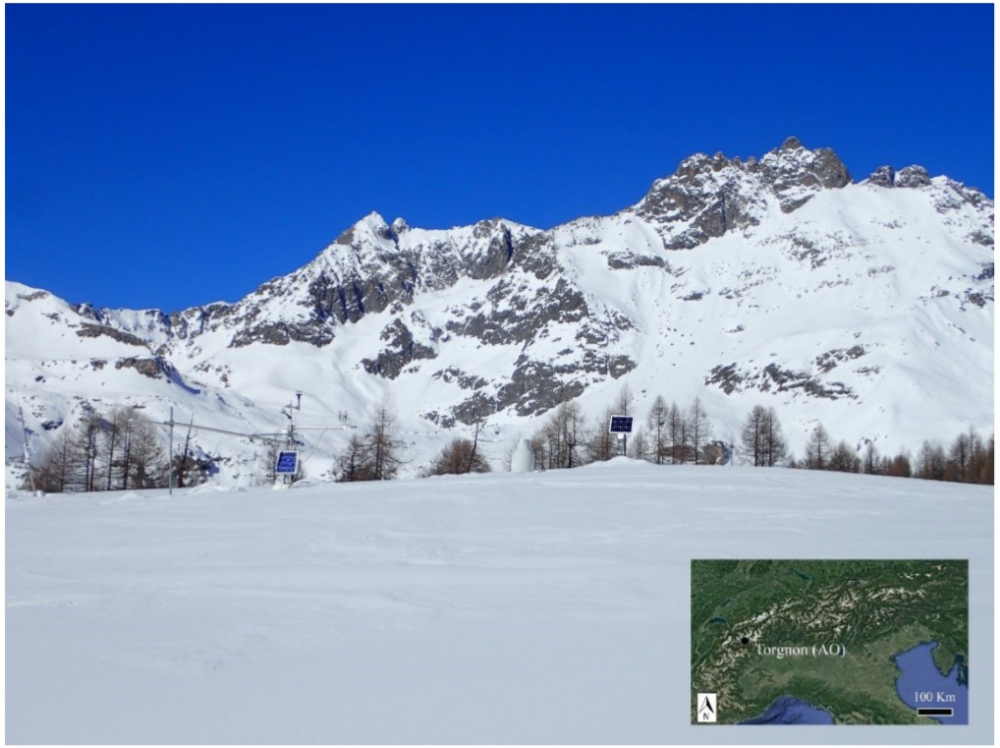




Di Mauro et al. 2015 JGR

Calibration and validation site

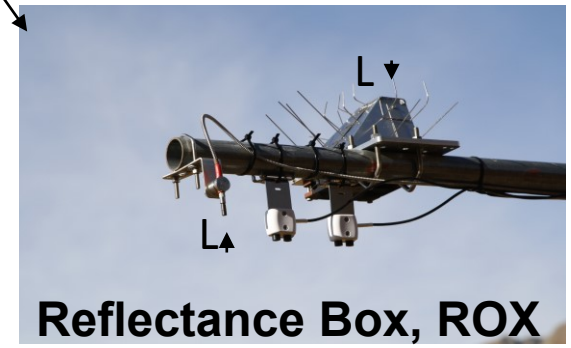
- High altitude (2160 m) experimental site (Torgnon, Aosta Valley) in the European Alps.
- Snow cover duration: October-May
- Field campaigns (2020) were organized in correspondence of PRISMA overpass
- Instruments operating at the site: net radiometer, webcam, sensors for snow depth, snow water equivalent, snow surface temperature, snow spectral albedo (400-900nm)



Details on the expertimental site: Di Mauro et al. 2019 TC

Unattended spectroscopy measurements

- **Automatic system (Reflectance Box, ROX)**
  - **Wavelength range:** VIS-NIR: ~ 400–950 mn
  - **Spectral Sampling Interval (SSI):** ~ 0.65 nm
  - **Spectral resolution (FWHM):** ~ 1.5 nm
  - **Signal to Noise Ratio (SNR):** ~ 250
  - **Field Of View (FOV):** Upwelling radiance ~ 25°; Downwelling radiance ~ 180°;
  - **Signal Optimization:** Automatic adaption to varying light conditions
  - **Dark current:** Accurate dark current determination at each measurement cycle
  - **Automatic acquisition:** Fully autonomous measurement mode
  - **Simultaneous metadata:** Air Temperature, GPS position, GPS time
  - **Dust Protection** Additional dust protection for Cosine Receptors



Operating since
November 2017

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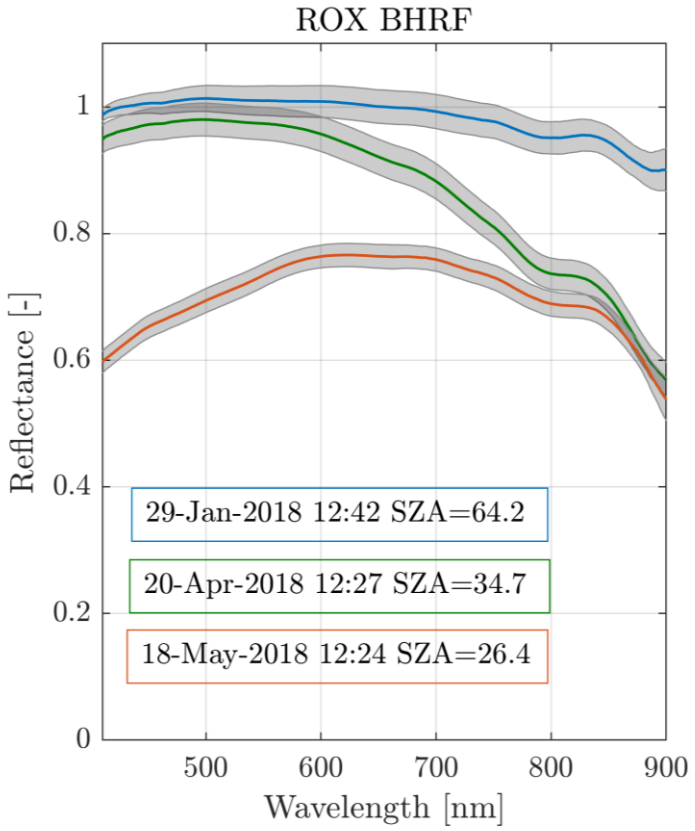
Unattended spectroscopy measurements



Examples of snow reflectance data in different period of the season:

Blue = accumulation period
Green = ripening phase
Red = melting phase and resurfacing of mineral dust (Di Mauro et al. 2019 TC)

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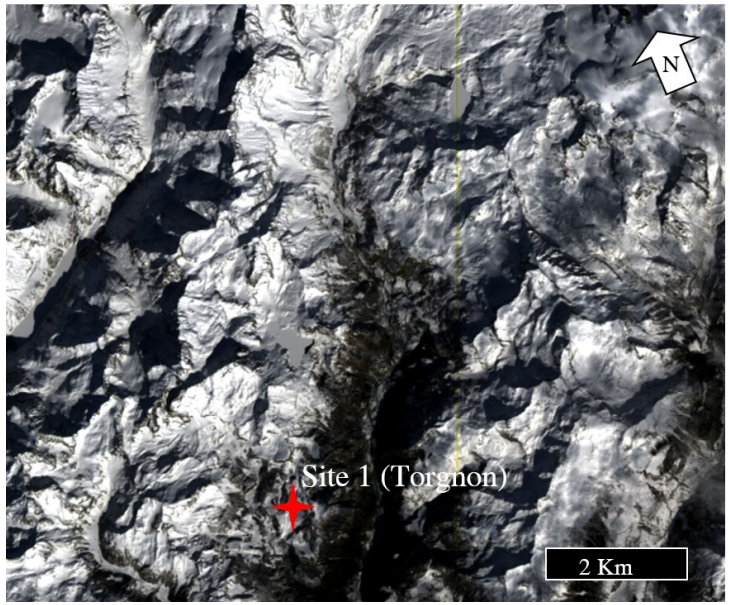
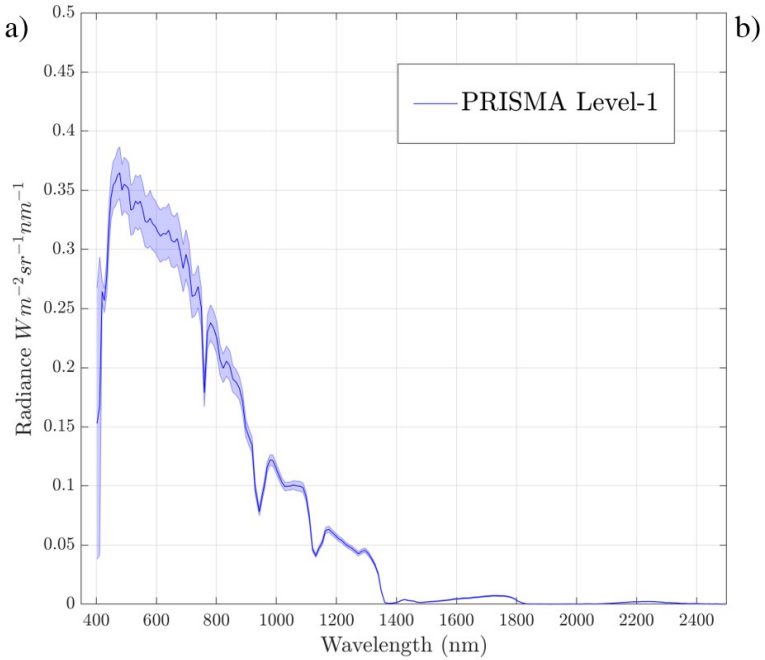
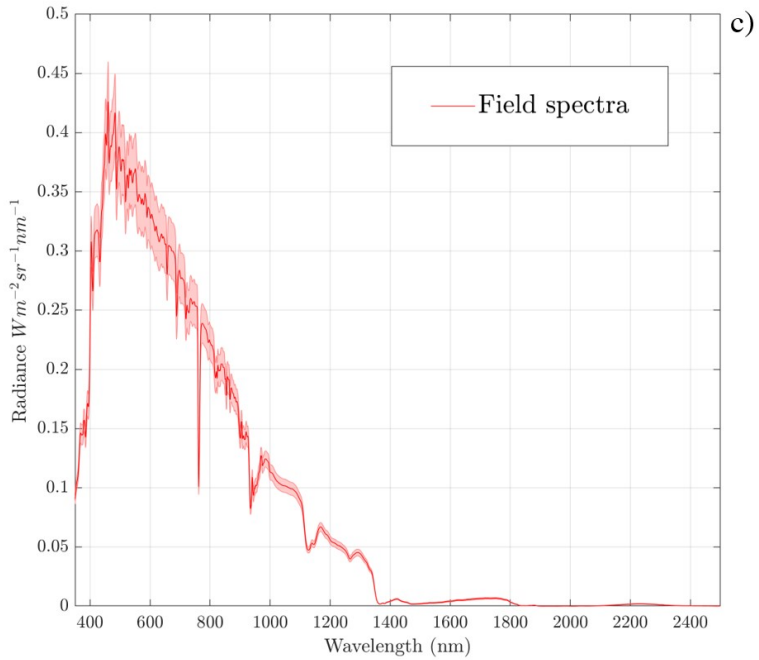
Comparison with PRISMA data



PRISMA image (15 Feb. 2020)



PRISMA TOA radiance

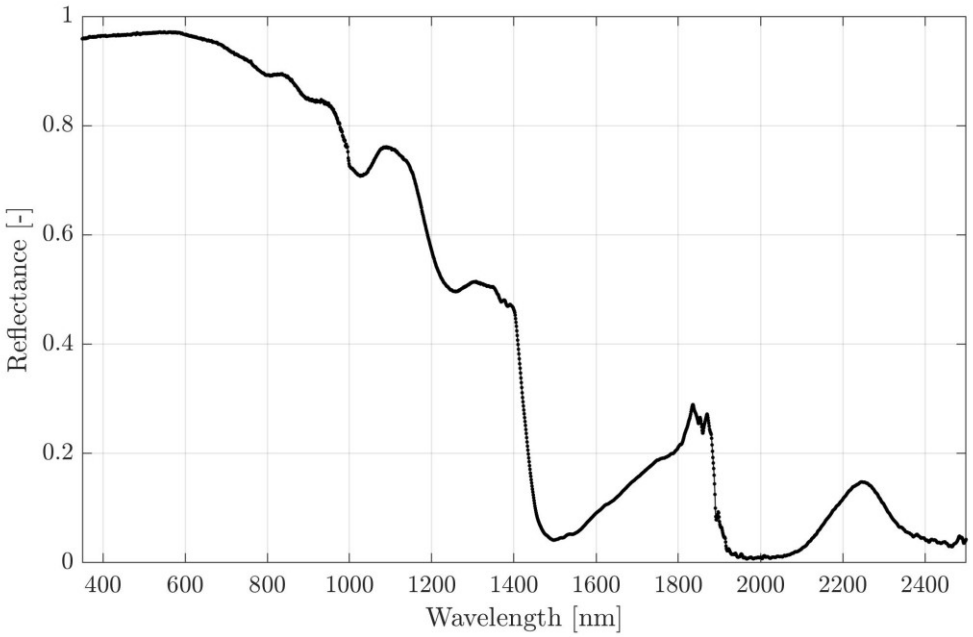


Spectral Evolution BOA radiance

- Preliminary comparison between field (Spectral Evolution field spectrometer) and satellite (PRISMA) radiance data shows promising results for the overpass of 15° February 2020

Next steps:

- Comparison between Bottom of Atmosphere (BoA) products and field spectroscopy data
- Propagation of field spectra to Top of Atmosphere (ToA) using MODTRAN radiative transfer model
- Retrieval of snow parameters from PRISMA reflectance spectra



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Thanks for your attention

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