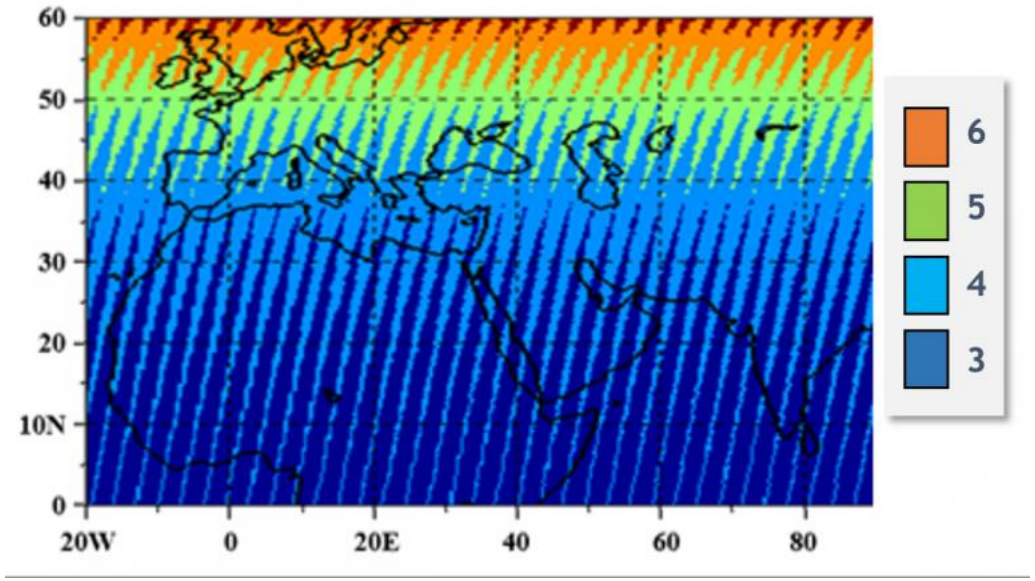
Snow surface temperature measurements at Pic du Midi observatory (Pyrenees)

Snow surface temperature

- Reflects the heat content in the snowpack
- Energy balance models solve for the surface temperature
- High spatio-temporal variability not captured by current TIR satellite missions (Landsat, MODIS)

Snow surface temperature

- Future TIR missions
  - CNES/ISRO **TRISHNA**: 60-90 m, 3 day, launch 2024
  - Copernicus **Sentinel-8**: 50 m, 3 day, launch 2029



TRISHNA Number of observations per cycle of 8 days

https://labo.obs-mip.fr/multitemp/trishna/

Snow surface temperature

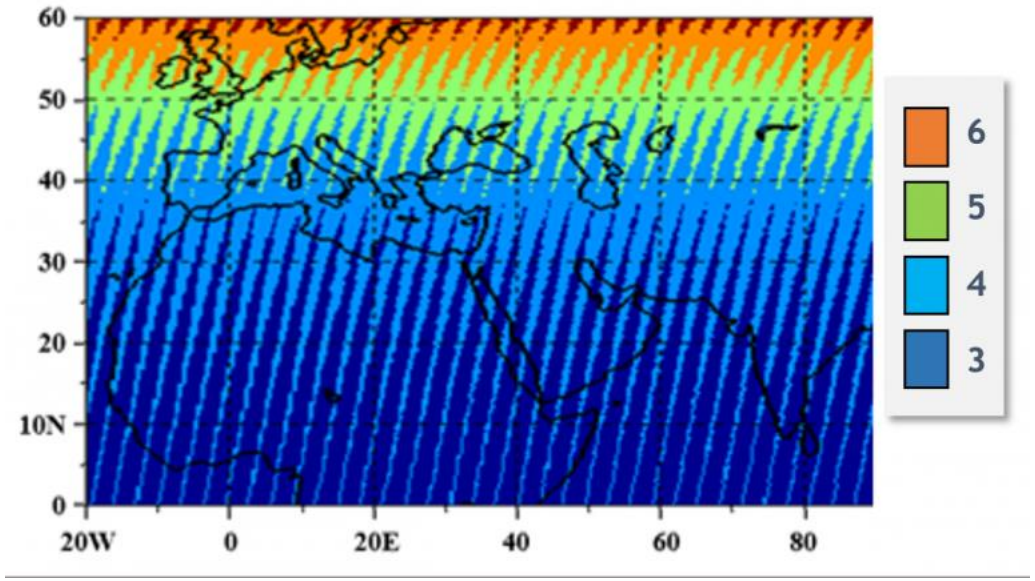
- Future TIR missions
  - CNES/ISRO **TRISHNA**: 60-90 m, 3 day, launch 2024
  - Copernicus **Sentinel-8**: 50 m, 3 day, launch 2029

➔Need to investigate the benefit of TIR data to improve snow models

Frequent observations

Large field of view

Near nadir



TRISHNA Number of observations per cycle of 8 days

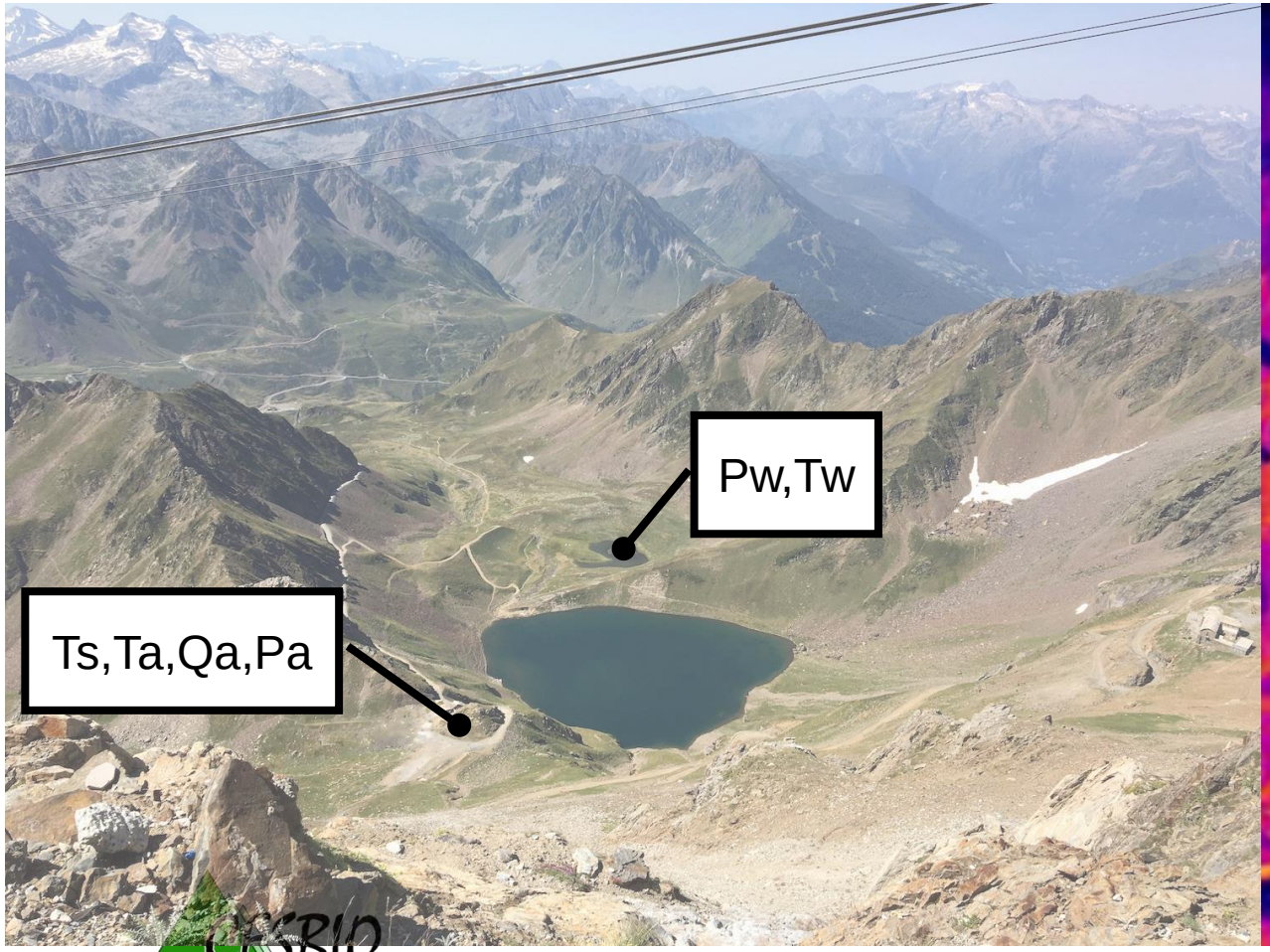
https://labo.obs-mip.fr/multitemp/trishna/

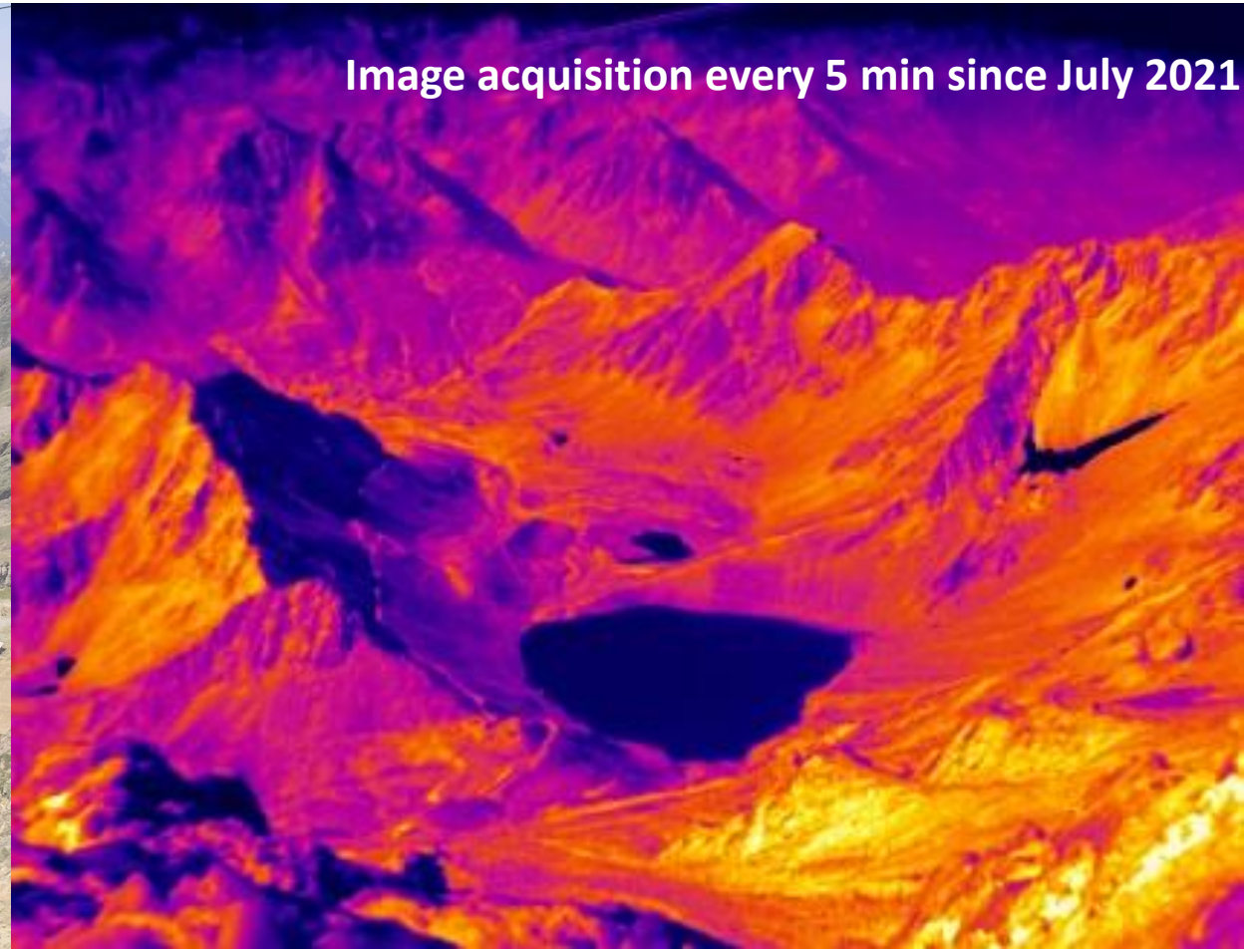
Pic du Midi observatory

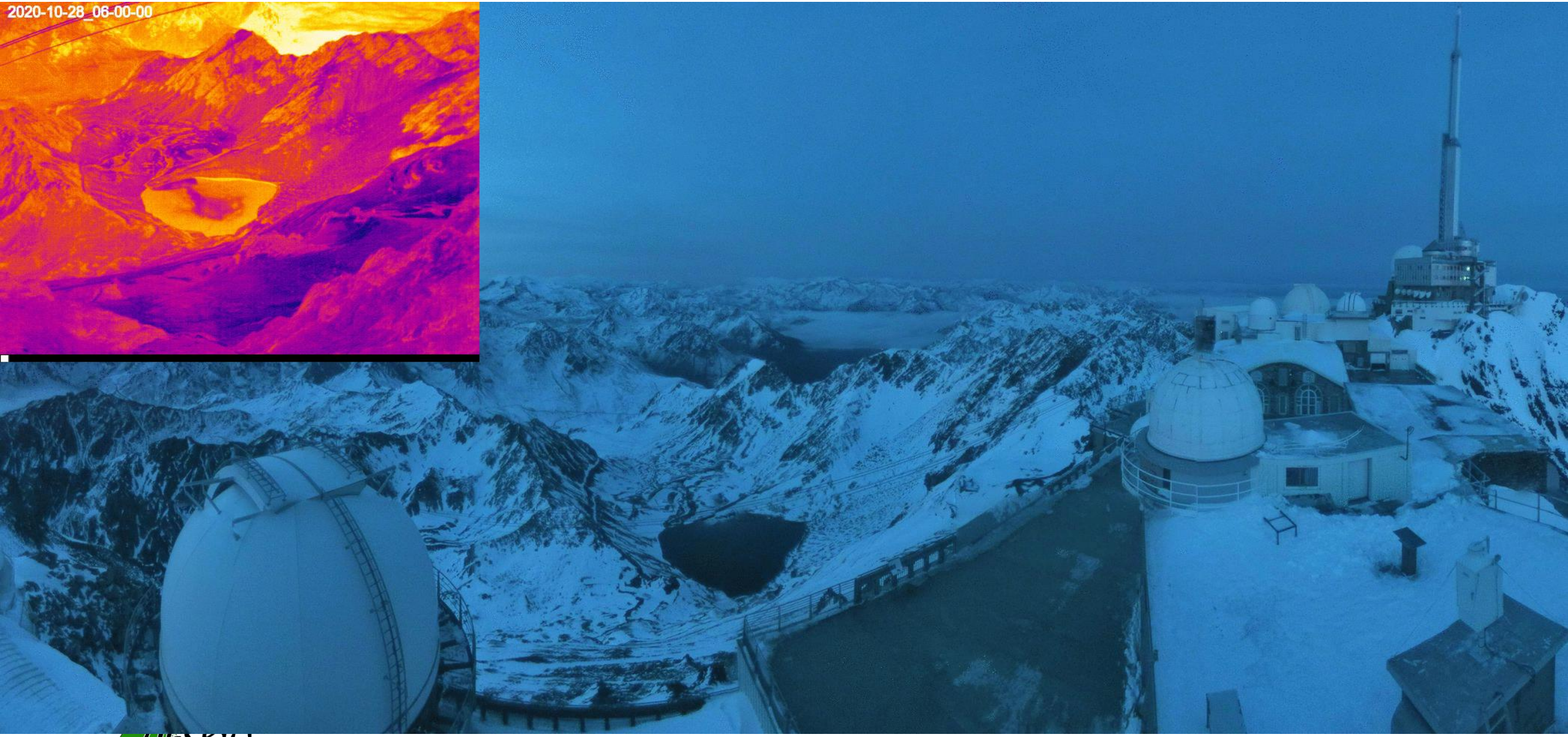
Pic du Midi observatory

Pic du Midi observatory

Optris TIR camera 7.5 – 13 µm FOV 60° x 45°





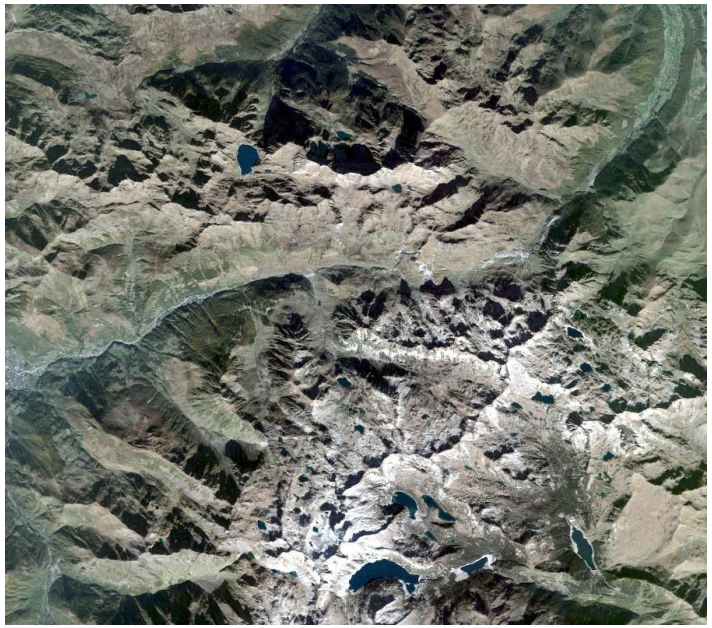


CESBIO

Snow depth from Pléiades

16 mar 2021

16 km

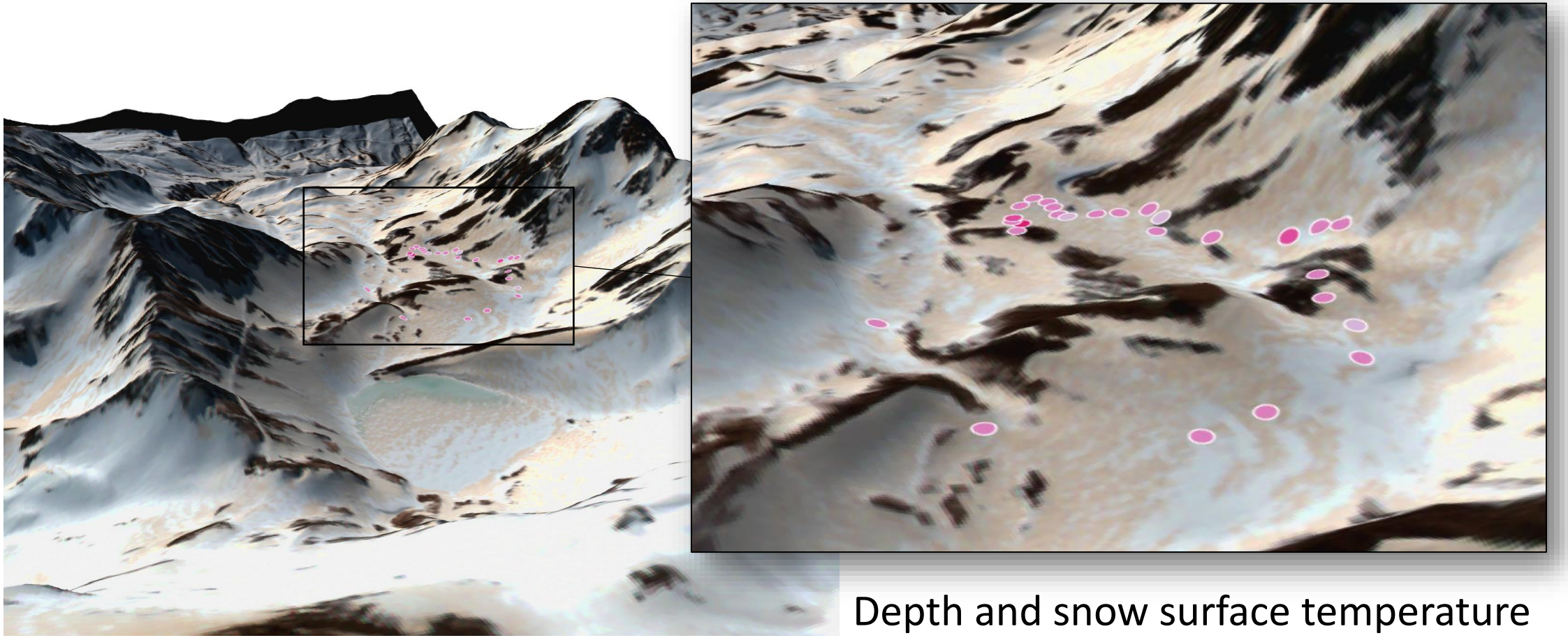


Snow depth
(work in progress)
Cf. Marti et al. 2016,
Deschamps-Berger et al. 2021)

Field measurements 23 mar 2021

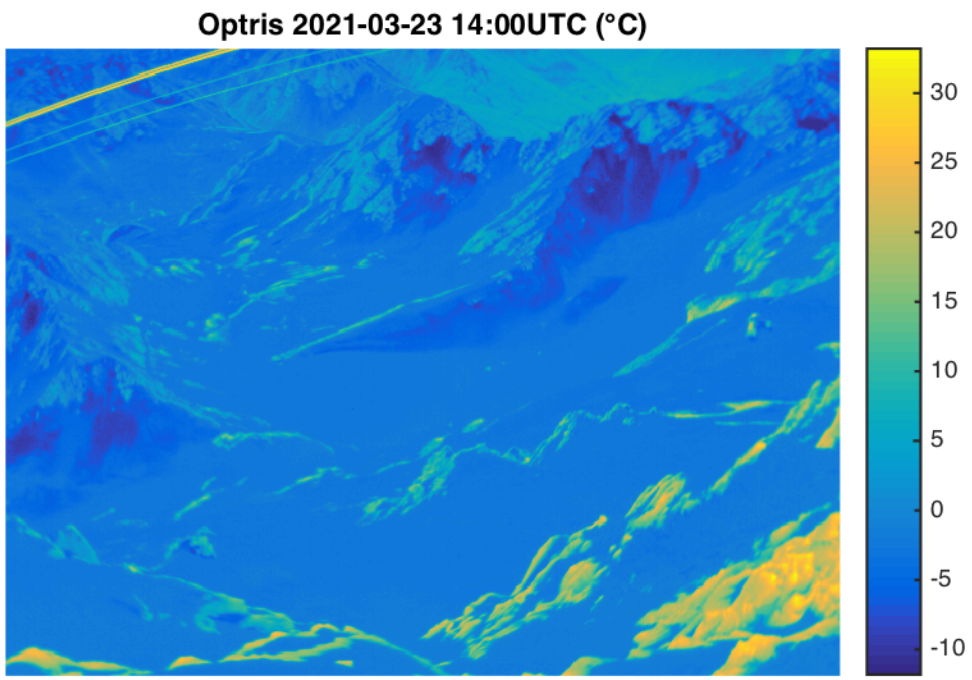
density 470 ± 44 kg/m3

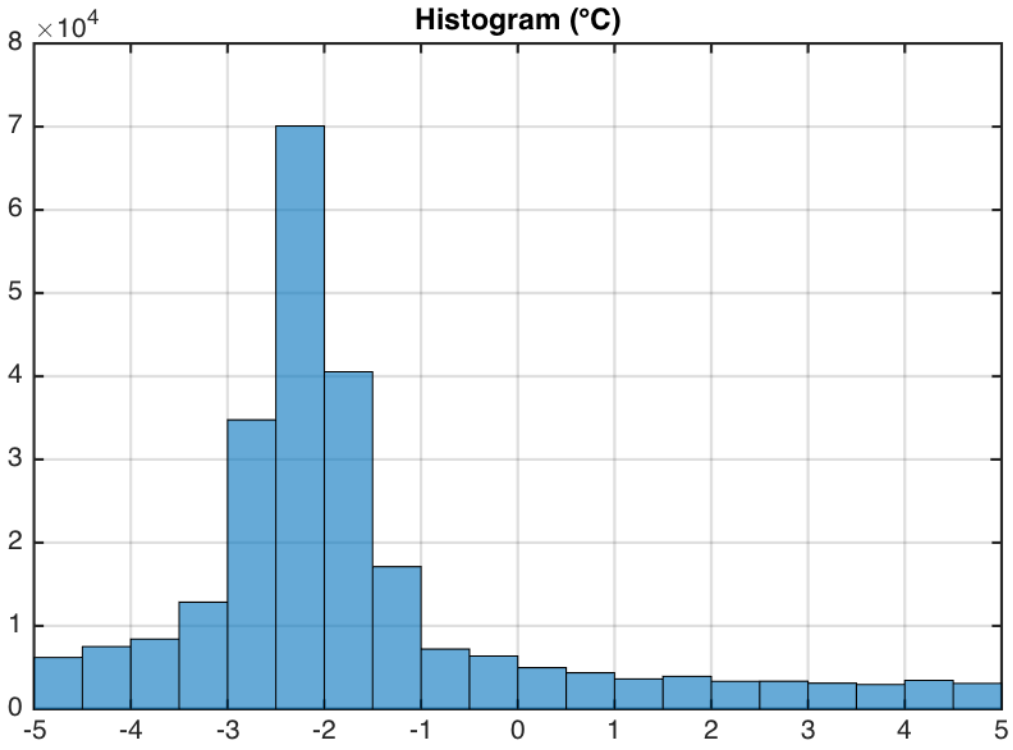
Field measurements 23 mar 2021



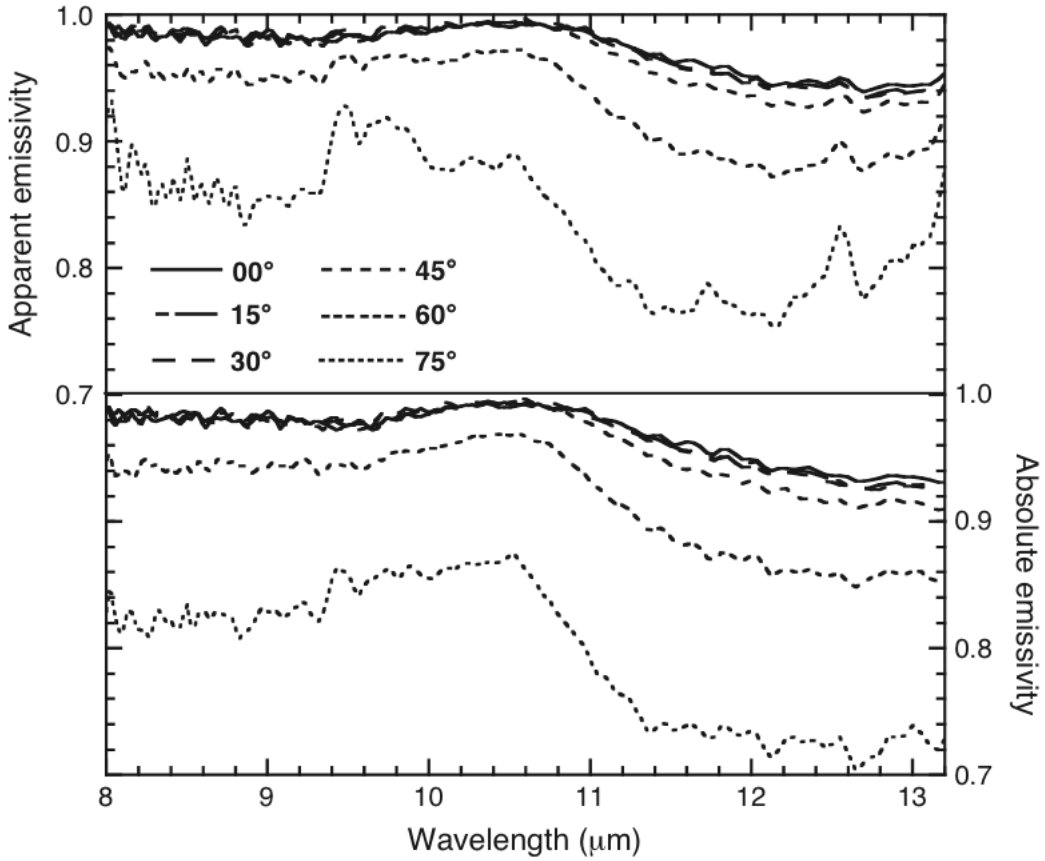
Depth and snow surface temperature = - 0.5°C to 0.1°C

Field measurements 23 mar 2021



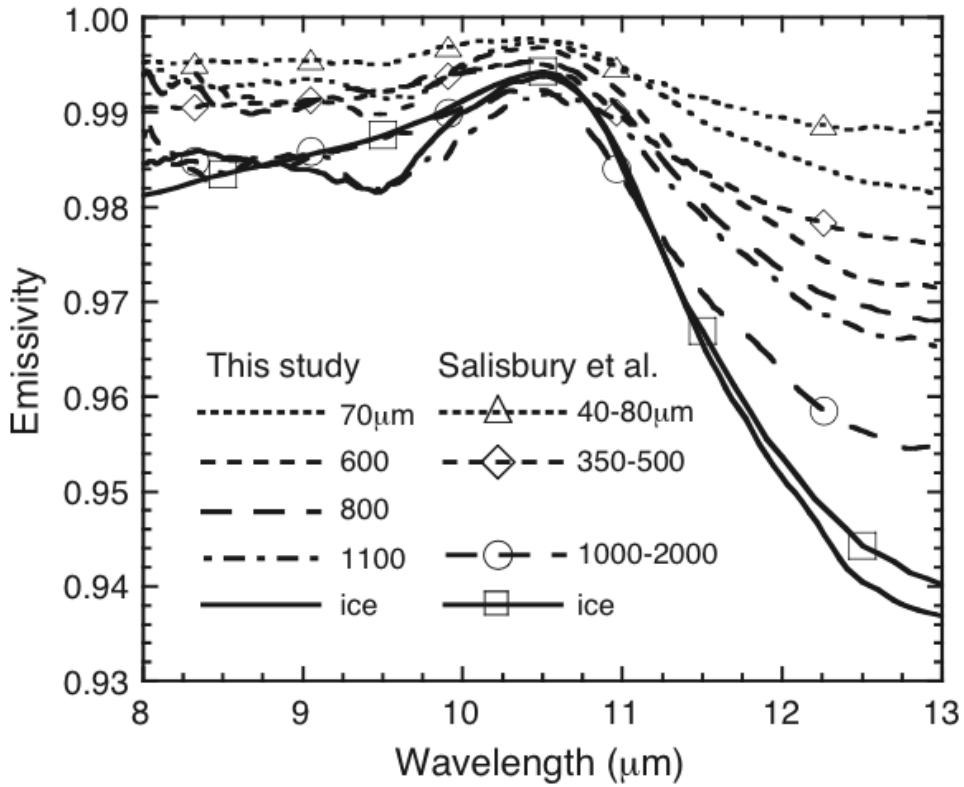


Snow emissivity varies with exitance angle



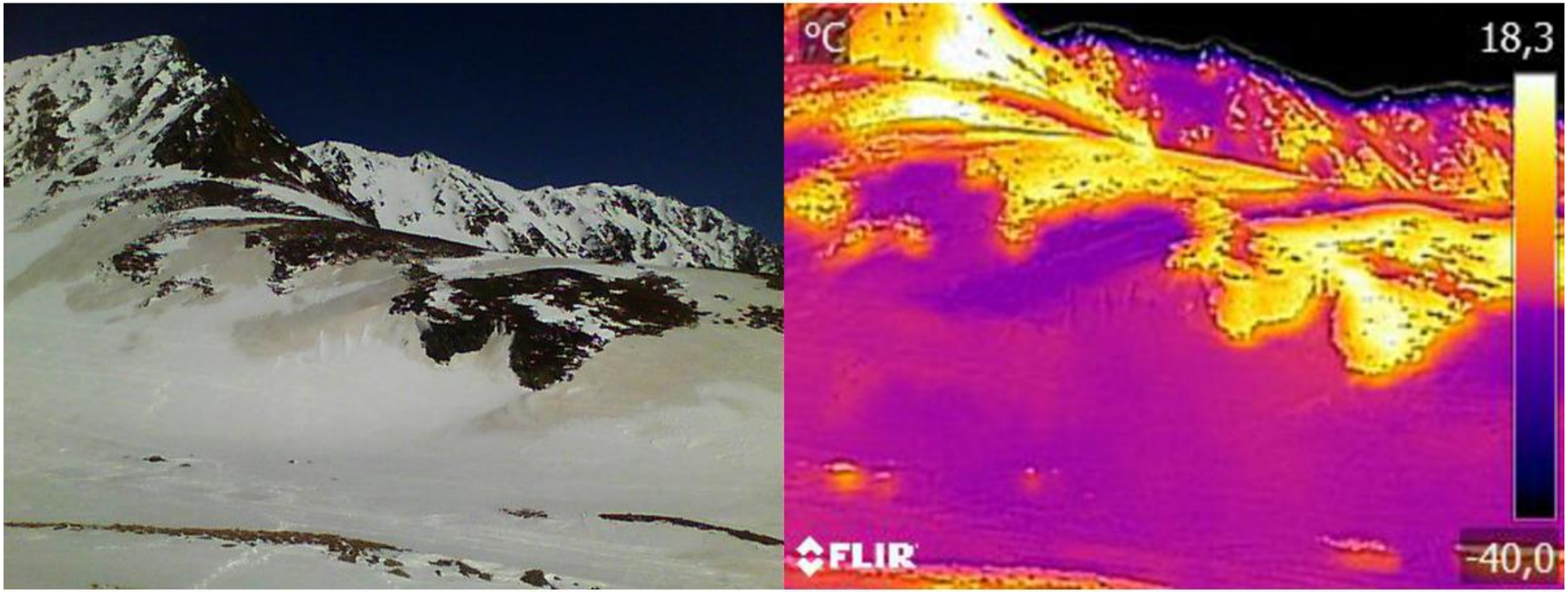
M. Hori et al. / Remote Sensing of Environment 100 (2006) 486–502

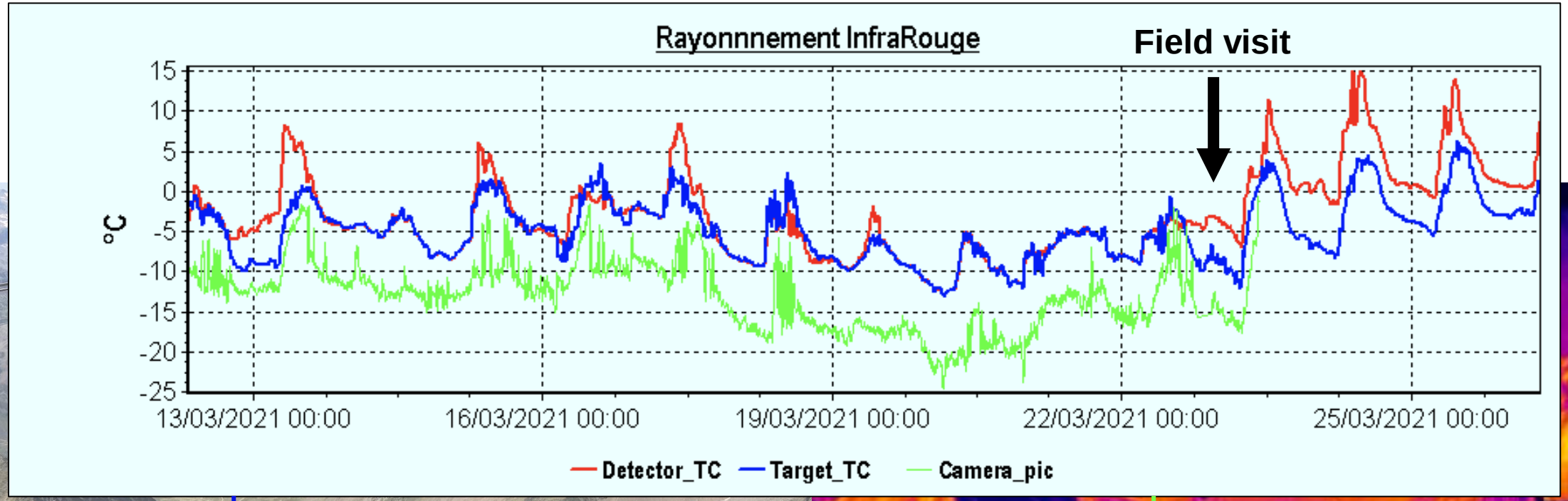
Snow emissivity varies with grain size



M. Hori et al. / Remote Sensing of Environment 100 (2006) 486–502

Variations of temperature with snow type

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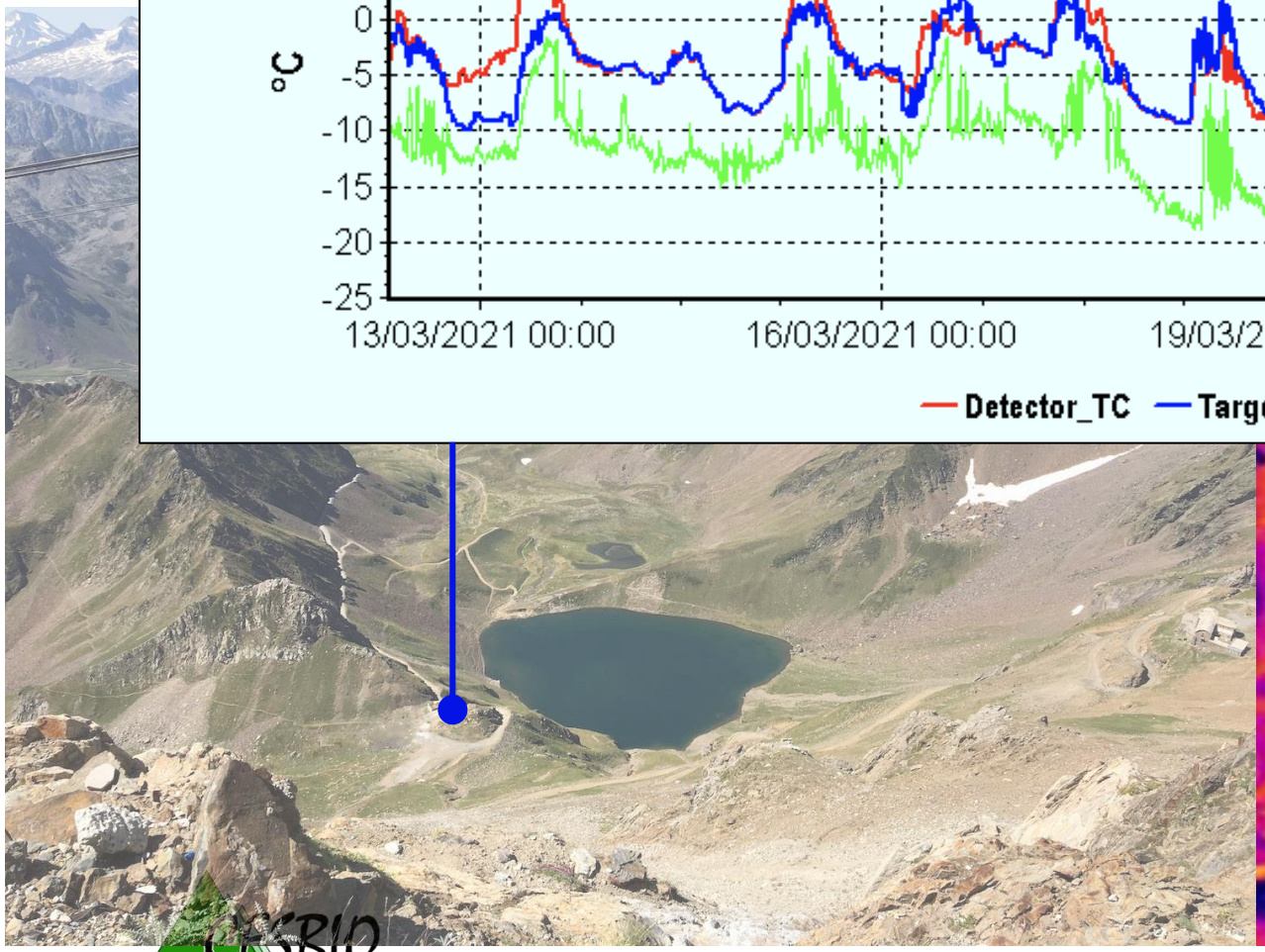
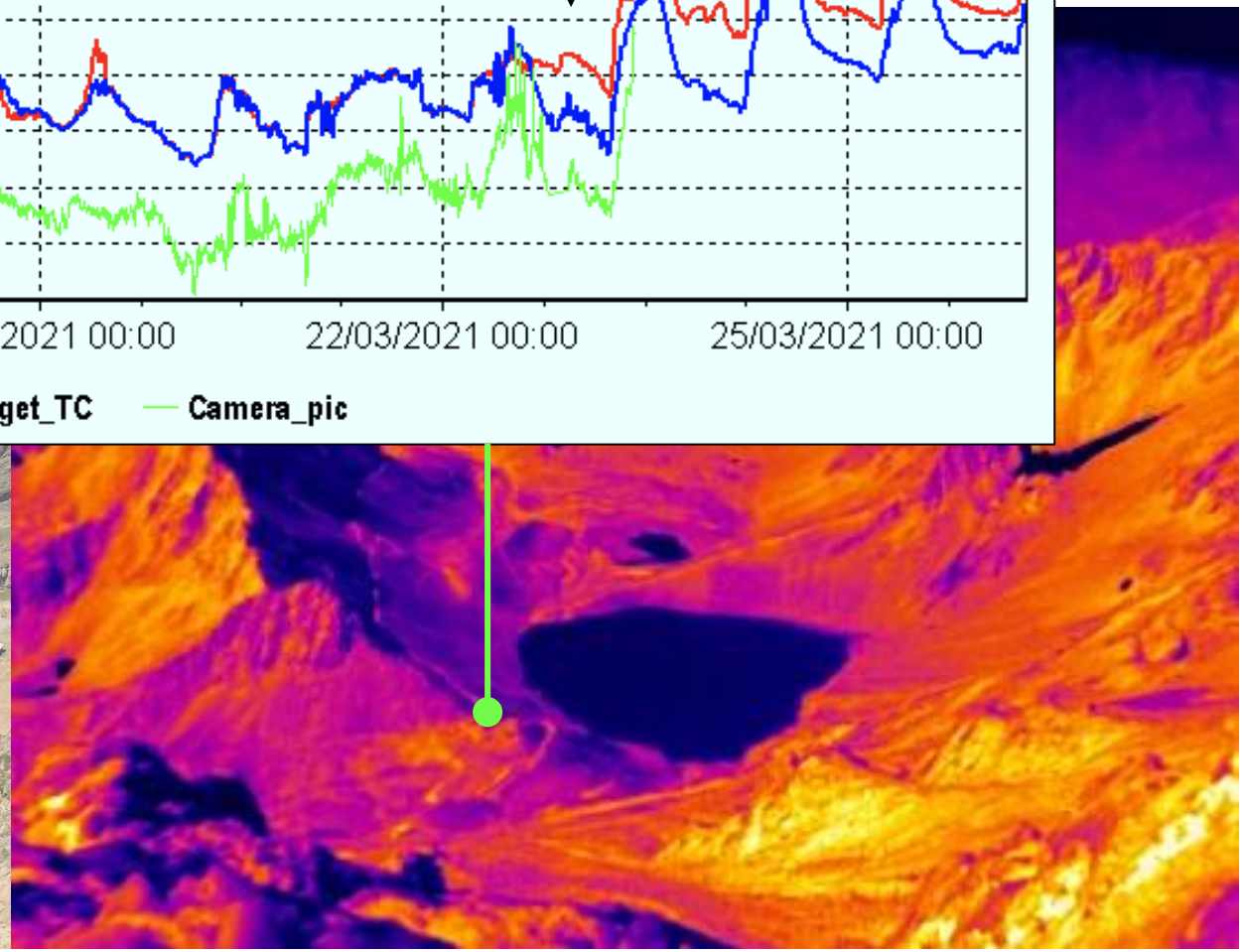
Detector_TC
Target_TC
Camera_pic





Conclusion

- New study site to monitor snow surface temperature
- Basic weather data at 2300 and 2800 m asl
- Annual peak snow depth by Pléiades stereoscopic imagery
- Plan to conduct drone snow depth surveys and more in situ density measurements