NEW INSTRUMENTED SITE FOR FUTURE THERMAL INFRARED MISSIONS CALIBRATION AND VALIDATION

INTERNATIONAL WORKSHOP ON HIGH-RESOLUTION THERMAL EO 2023

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Outline

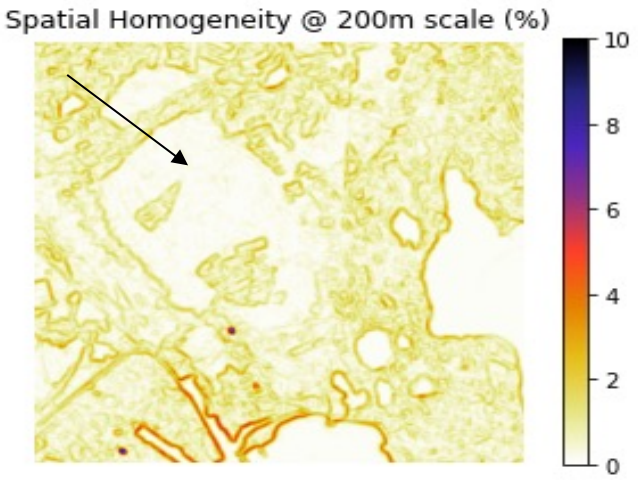
- La Crau site choice
- Installation of a new mast
- Available instrumentation
- First measurements
- Overall processing
- Comparison with ECOSTRESS and Landsat 9

La Crau site choice

- To prepare the future CAL/VAL of TRISHNA and other TIR missions, it has been decided to develop an instrumented site with thermal infrared sensors

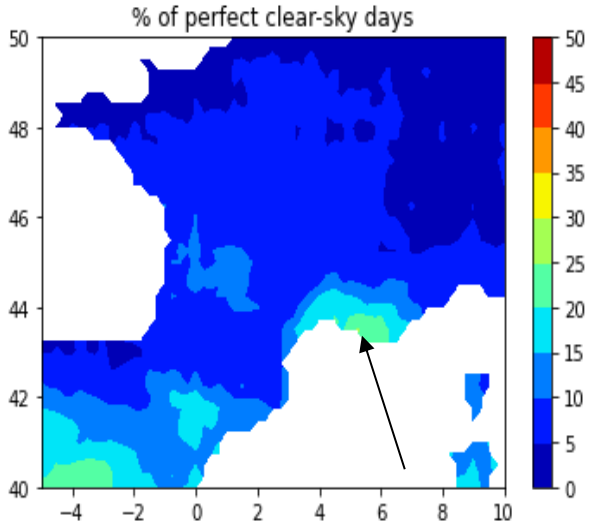
- Evaluation of the La Crau site, already used as VNIR automated calibration site (Radcalnet)

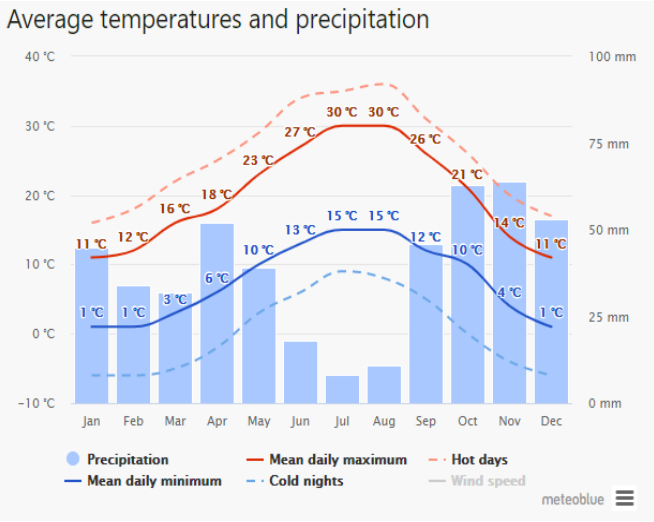
La Crau site location



Estimation of spatial homogeneity on Landsat 8 TIR spectral band

Cloud Cover



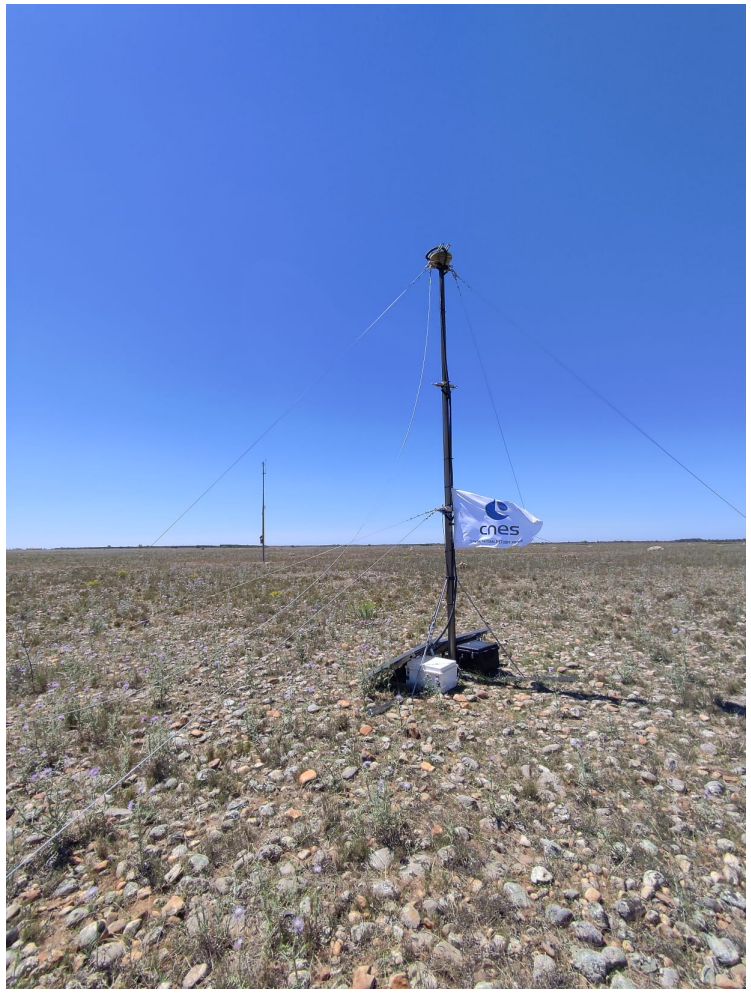


Installation of a new mast

- Installation, last April, of a 9m pneumatic mast to deploy new instruments

Available instrumentation

- December 2022: Installation of a thermal radiometer loaned by NASA-JPL at the top of the mast and electrical facilities (solar panels and batteries)



JPL Radiometer key features

- 143 x 102 x 133 mm
- 1,845 kg
- 1 large band (8-14µm)
- Active black body inside
- Brightness temperature measurement
- 5 zenithal angles of acquisition
- Day/Night acquisitions

https://calval.jpl.nasa.gov/radiometers

Available instrumentation - soon

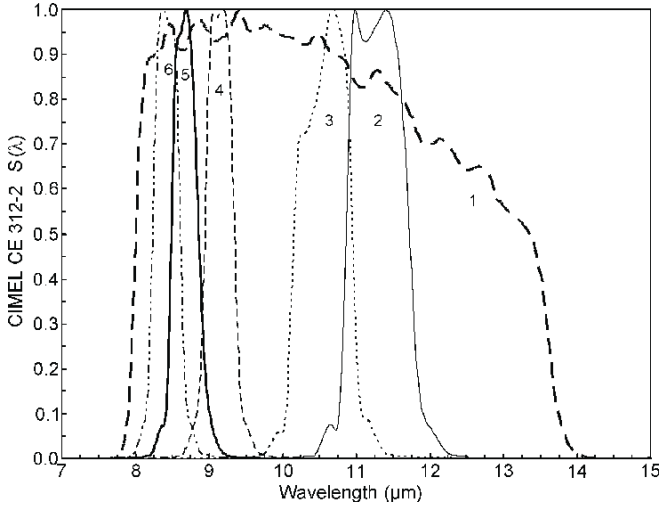
- Future installation of CNES permanent instrumentation dedicated to TIR multi-mission CAL/VAL (Trishna, LSMT, SBG) :
  - **CIMEL CE312 : multi-spectral thermal instrument for temperature/emissivity separation**
  - **Thermo Buttons : small data logger for temperature validation**
  - **Emissivity box : device for field emissivity measurement, design in progress**

Thermo Button

CIMEL CE 312 key features

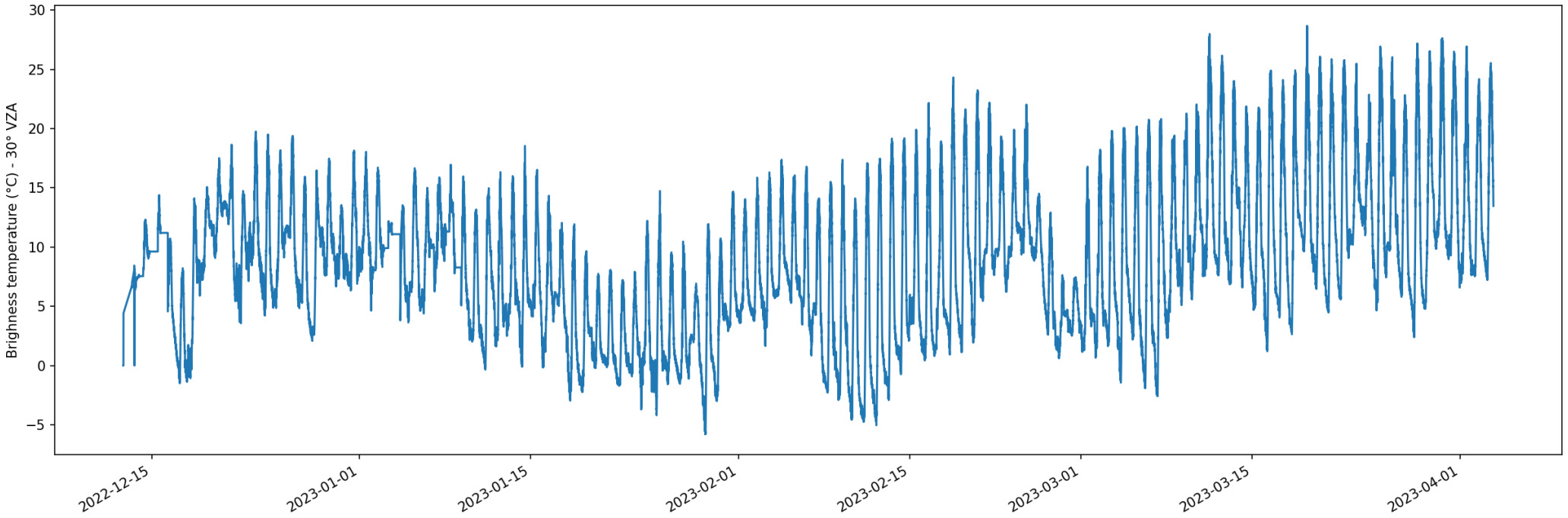
- 250 x 80 mm (inst. only)
- 1 kg (inst. only)
- 1 large band (8-14µm)
- 5 narrow bands (8.1-8.5, 8.5-8.9, 8.9-9.3, 10.3-11, 11-11.7 µm) – “ASTER”
- Black body separated
- Not autonomous system yet

https://www.cimel.fr/ce312/?lang=fr#specifications

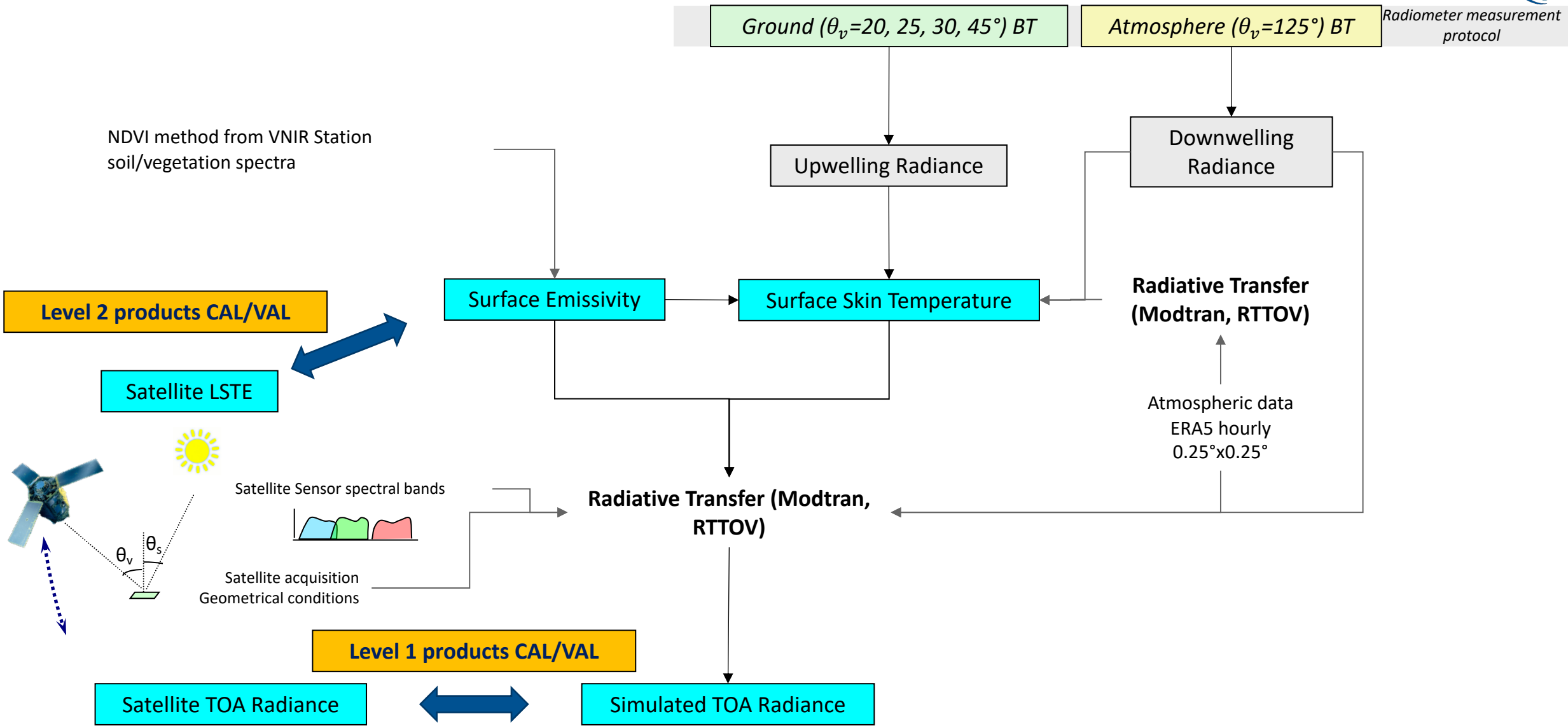


First measurements

- Automatic measurement every 1’15”

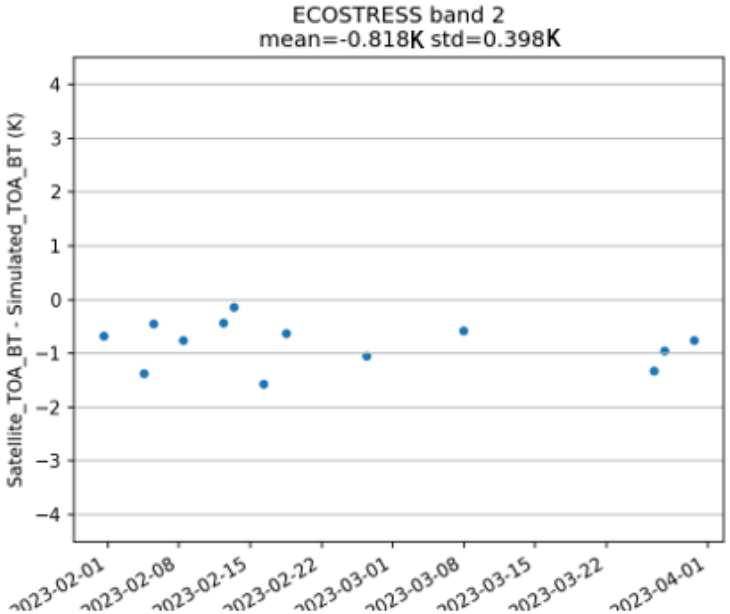


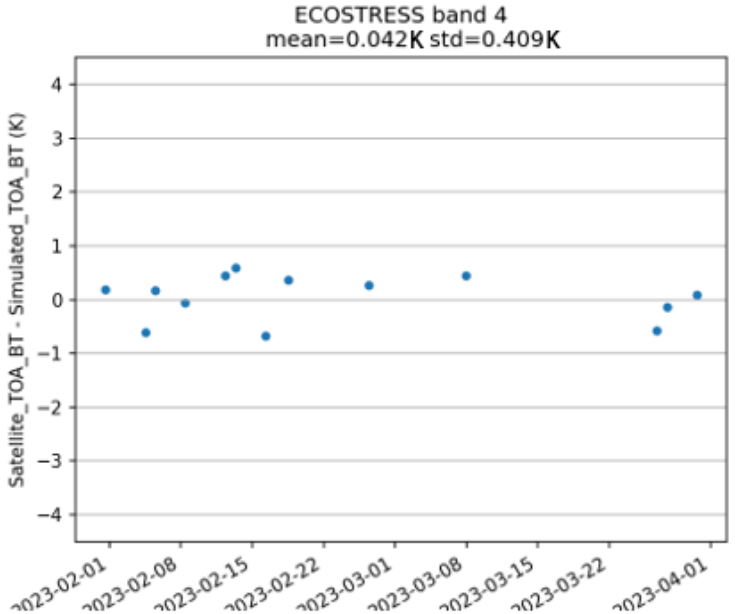
La Crau TIR CAL/VAL station processing

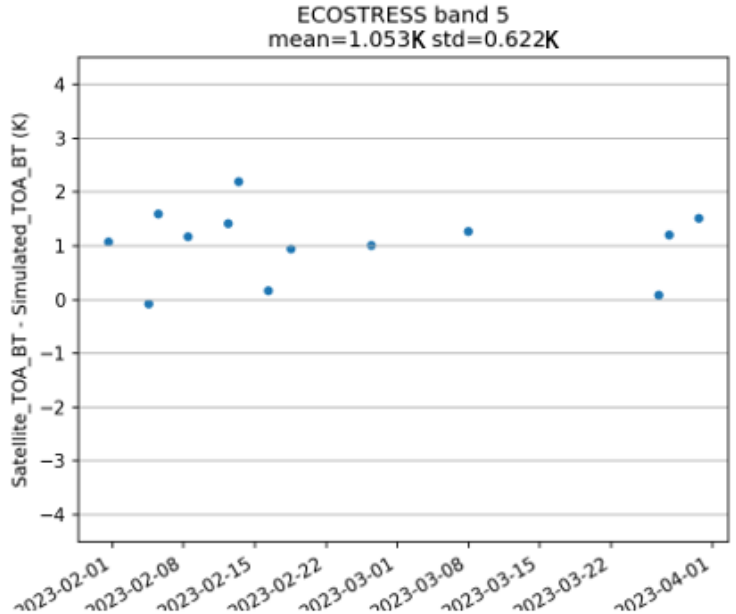


Evaluation for ECOSTRESS (collection 2)

Calibration coefficient validation : ECOSTRESS TOA measured BT - Simulation of TOA BT using the station



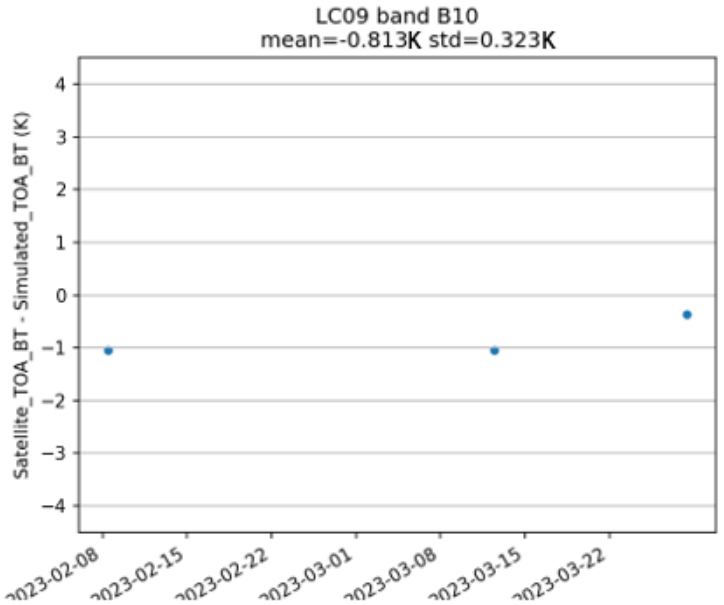


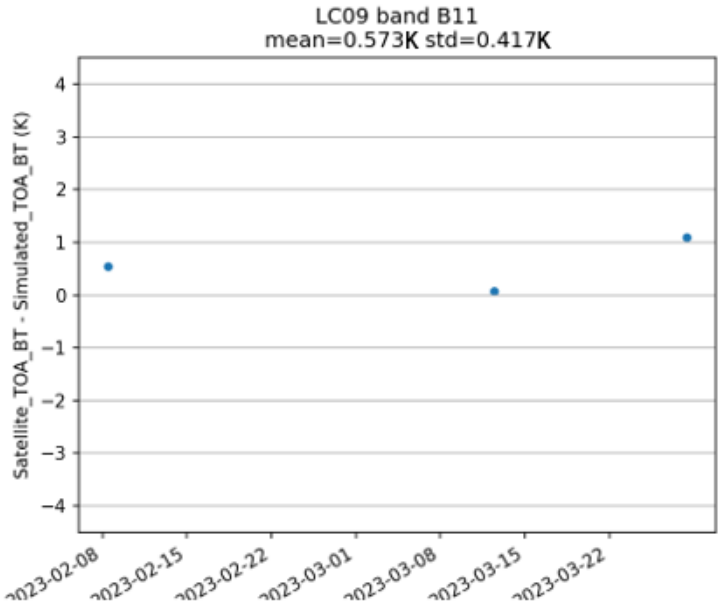


Very good overall consistency!
Slight interband differences

Evaluation for LANDSAT9

Calibration coefficient validation : LANDSAT9 TOA measured BT - Simulation of TOA BT using the station





Good consistency but need to be confirmed with a larger number of matchups

Conclusion

- Installation in 2022 of permanent instrumentation in la Crau for TIR CAL/VAL

- First evaluation of L1 products for ECOSTRESS or LANDSAT9 show very good consistency within 1 degree!
  - To be confirmed with additional data

- This is the beginning...
  - Field/Airborne campaigns to perform in 2023/2024, in particular to characterize the emissivity
  - Additional instrumentation to be installed