CNES + NPL field campaign to Gobabeb

Location of a new calibration site + characterization
Preliminary Results

Location of the site Spatial homogeneity from satellite data

Spatial Homogeneity Index

$$SHI_{L\times L} = \frac{\sigma(\rho)_{L\times L}}{\overline{\rho}_{L\times L}}$$

Spatial Representativeness Index

$$SRI_{L\times L} = \frac{\rho - \overline{\rho}_{L\times L}}{\overline{\rho}_{L\times L}}$$

At different scales:

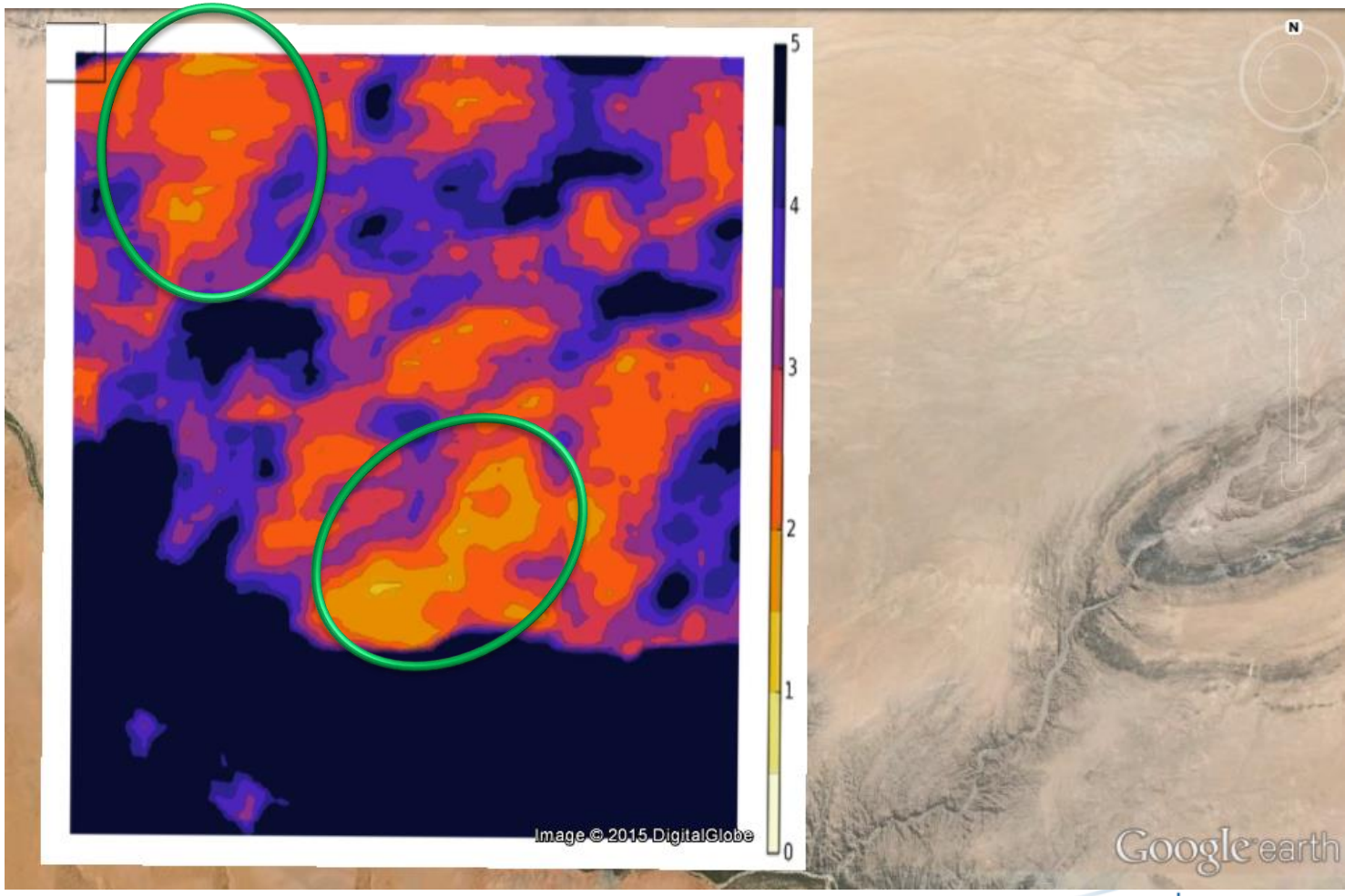
- 100x100 m²
- 200x200 m²
- 500x500 m²
- 1000x1000 m²
- 2000x2000 m²

Data used:

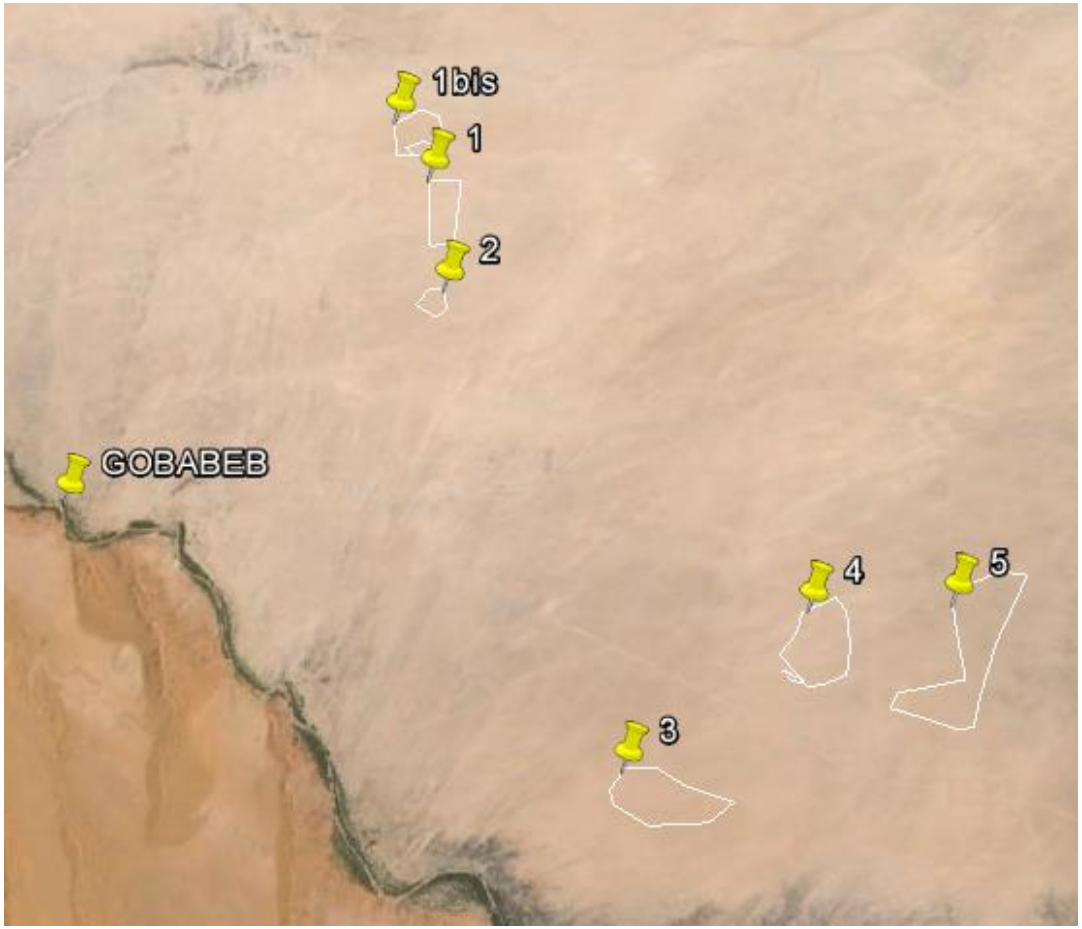
- SENTINEL2A: all 10 m and 20 m spectral bands
  - 18 Sept 2015
  - 28 Sept 2015
- PLEIADES (Panchromatic 70 cm spectral band)
  - 9 Feb 2015 (PHR1B)
  - 6 Sept 2015 (PHR1A)

Location of the site Spatial homogeneity from satellite data

Spatial homoneneity better than 3% (1 km²)



Potential sites



Potential sites: visual assessment + GSM

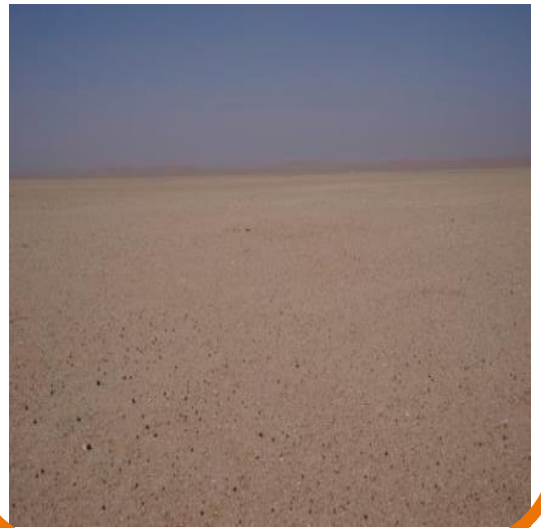
1

2

1bis

3

4



5

Characterization
ASD – Surface reflectance – Ongoing Work

$$\rho_t = \frac{L_t}{L_{ref}} \rho_{ref}$$

ASD measurements

Characterized by NPL in the lab…

…but the wind is getting it dirty faster than expected

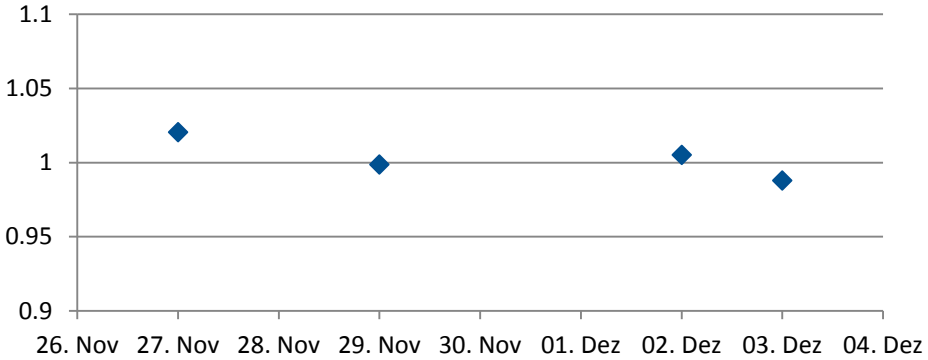
-> needs to be monitored

Spectralon panel reflectance monitoring – Ongoing Work

Spectralon reflectance is calculated as $\rho_{spec}(\theta_s, t) = f(t) \frac{\left(\rho_{direct}(\theta_s) \times E_{dir}(t) + \rho_{hemispheric} \times E_{dif}(t)\right)}{E_{dir}(t) + E_{dif}(t)}$

- Direct and diffuse irradiances given by 6S
- Directionnal and hemispheric reflectance measured in the lab (NPL)
- Dimming factor from comparison to « super reference » - brought by NPL to Gobabeb

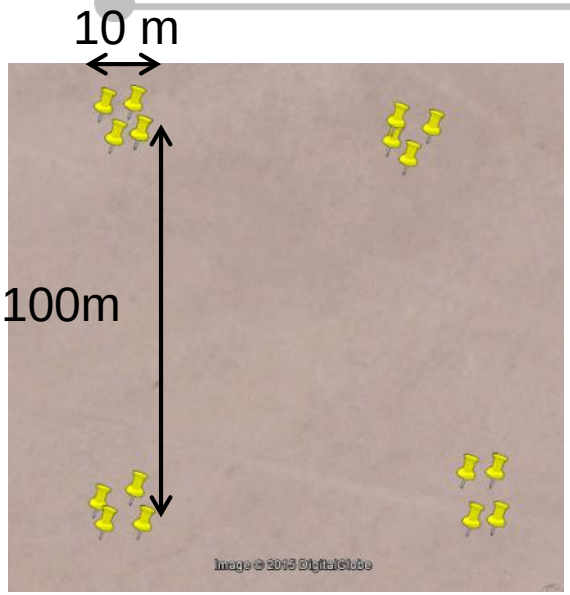
Change in Spectralon apparent reflectance at 500 nm from comparison to "super reference"

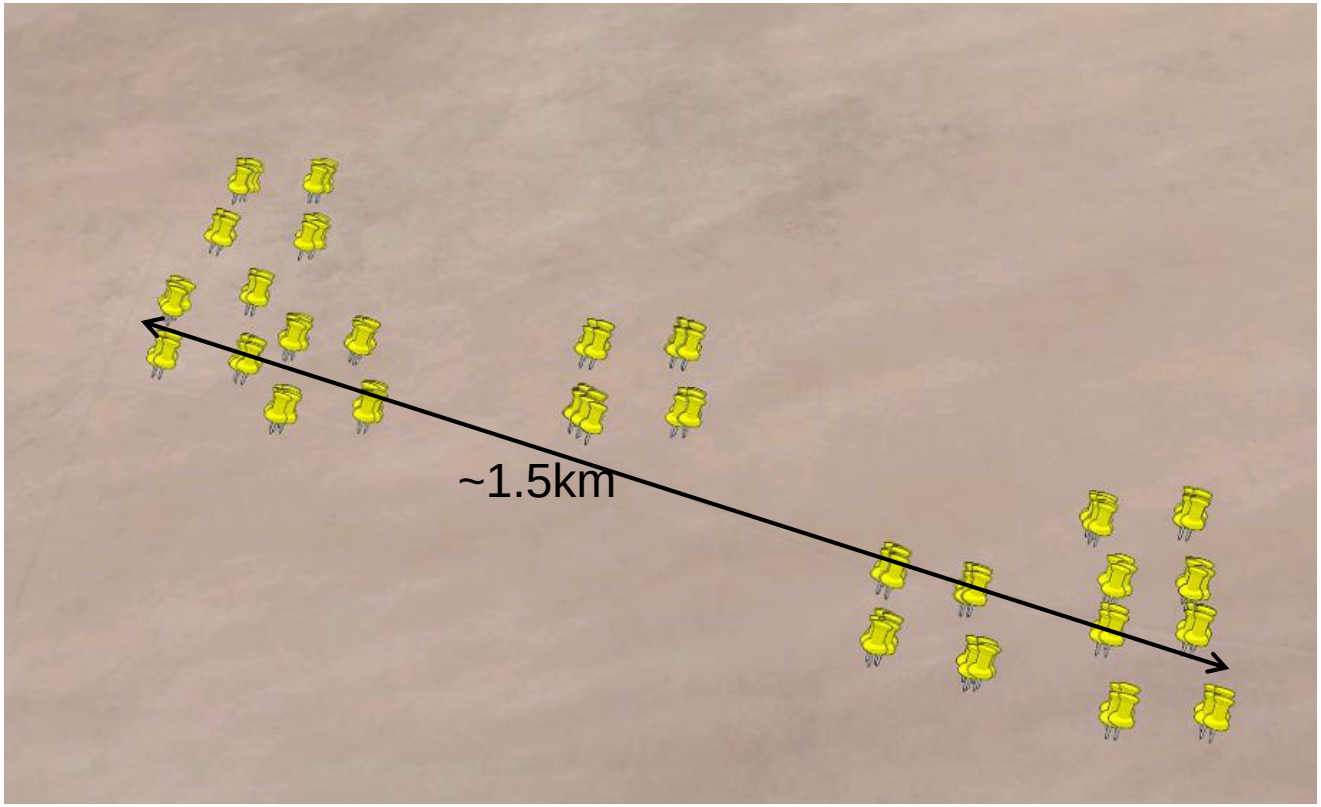


This spectralon reflectance is used in order to determine the ground reflectance for all measurements

cnes

Surface reflectance protocol





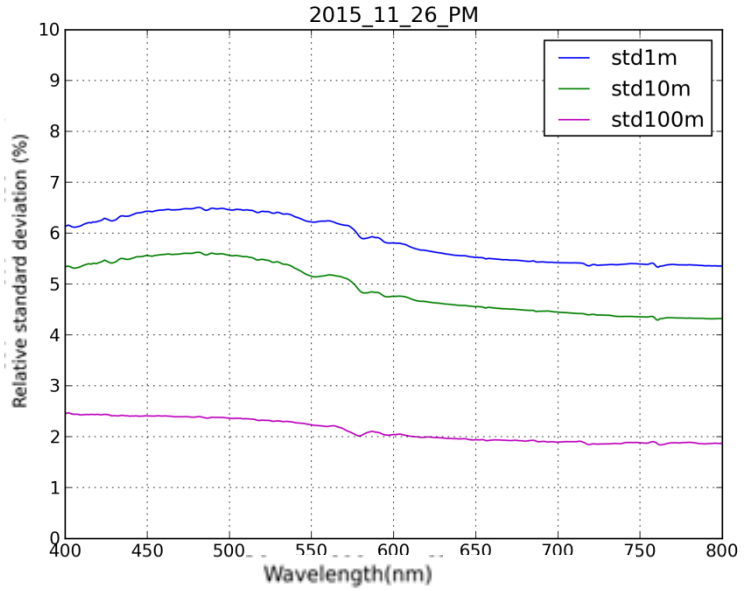
16 x 2 x 7 = 224 series = 2240 points

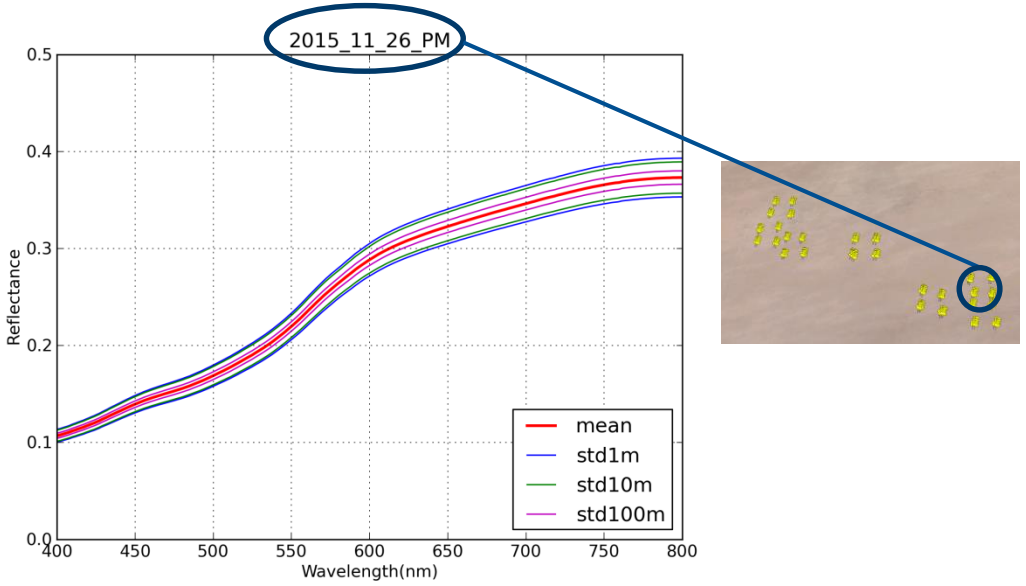
Characterize surface reflectance at different resolutions:

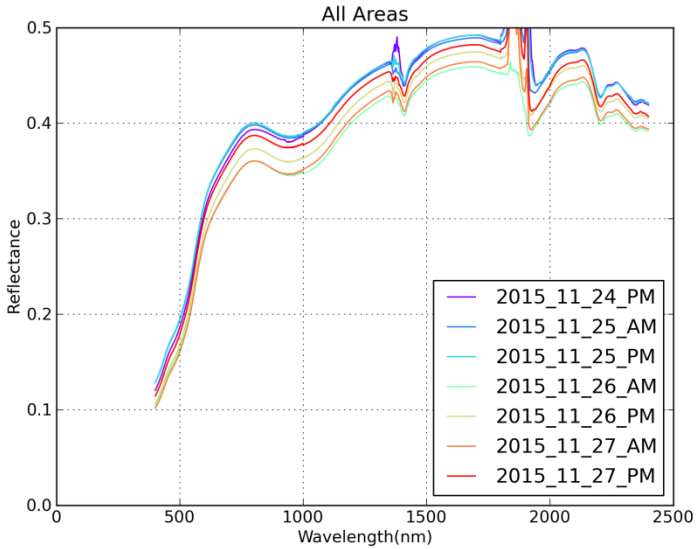
- < 1m (ASD + CIMEL footprint)
- 10m (CIMEL surface)
- 100m (potential sensors to calibrate)

+ 2 loops: account for BRDF (sun related)

Surface reflectance – Ongoing Work





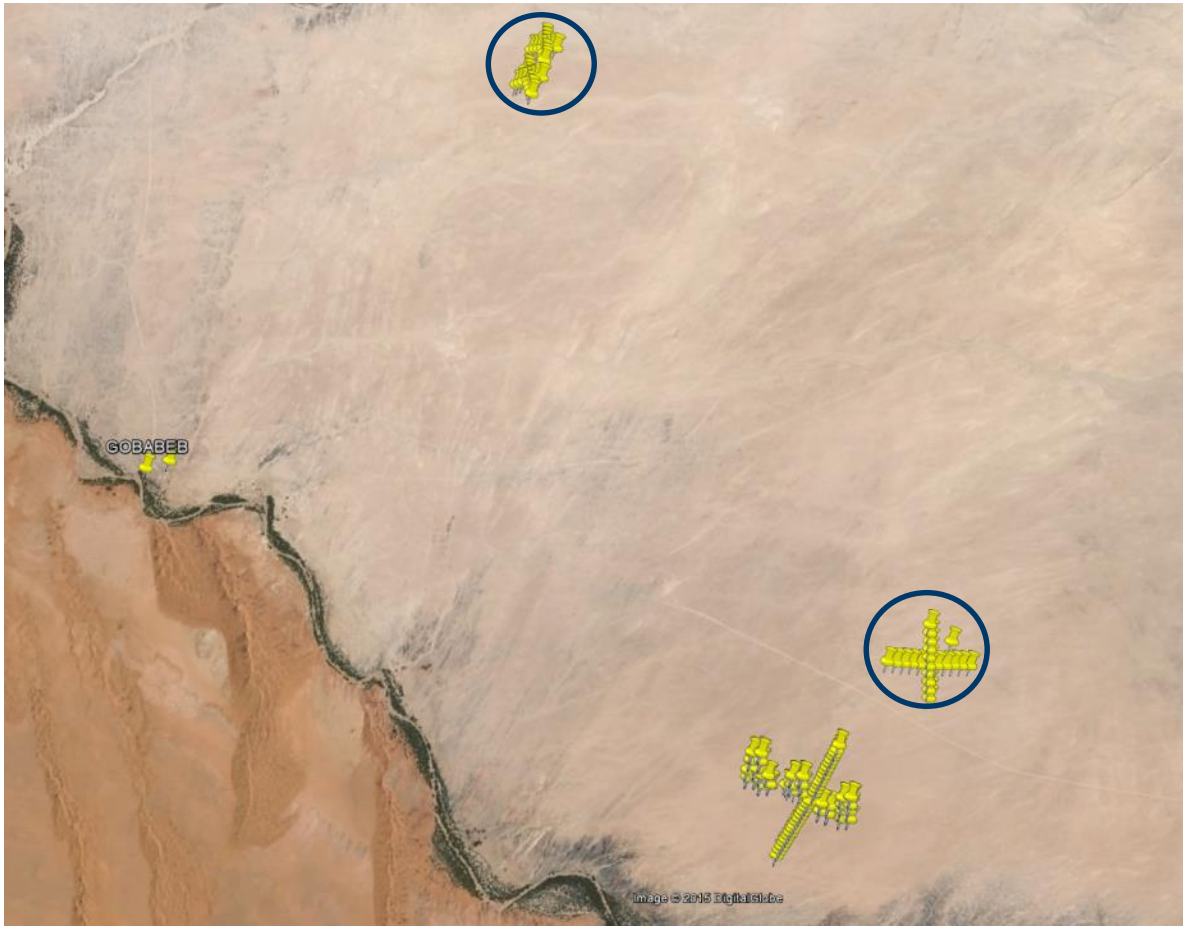


Variability of reflectance at different scales is slightly larger than the one measured by satellite

-> spectralon reflectance to be finally corrected (BRDF + dimming, esp in the SWIR)

-> ground BRDF not taken into account yet

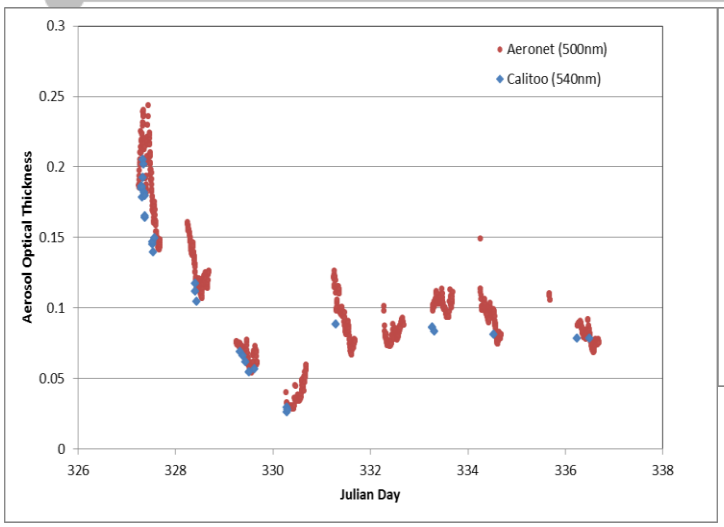
Surface reflectance

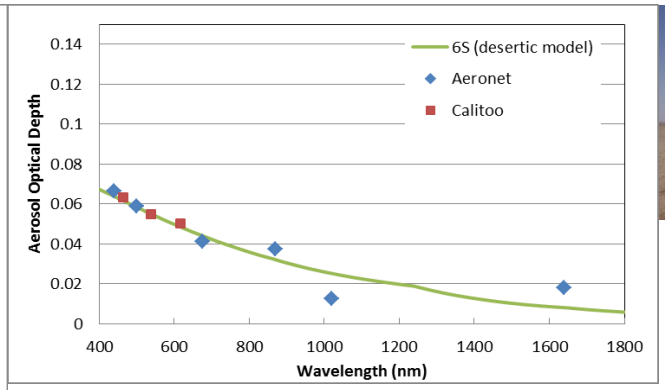


Measurements on 2 other less preferential sites

-> Results not yet available

Characterization
CIMEL – Aerosols



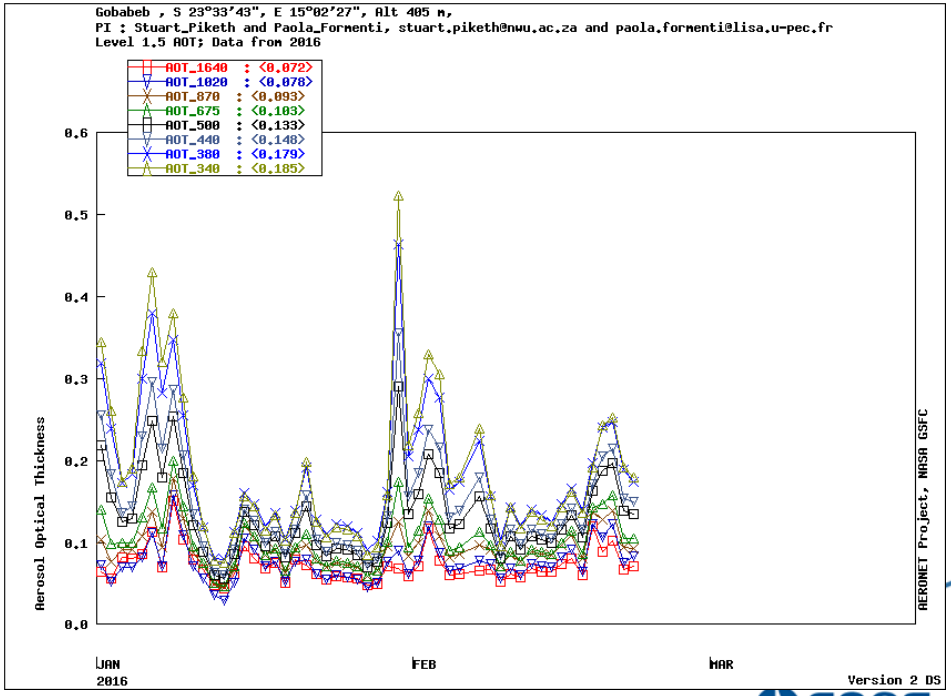


Data from CNES CIMEL not available yet

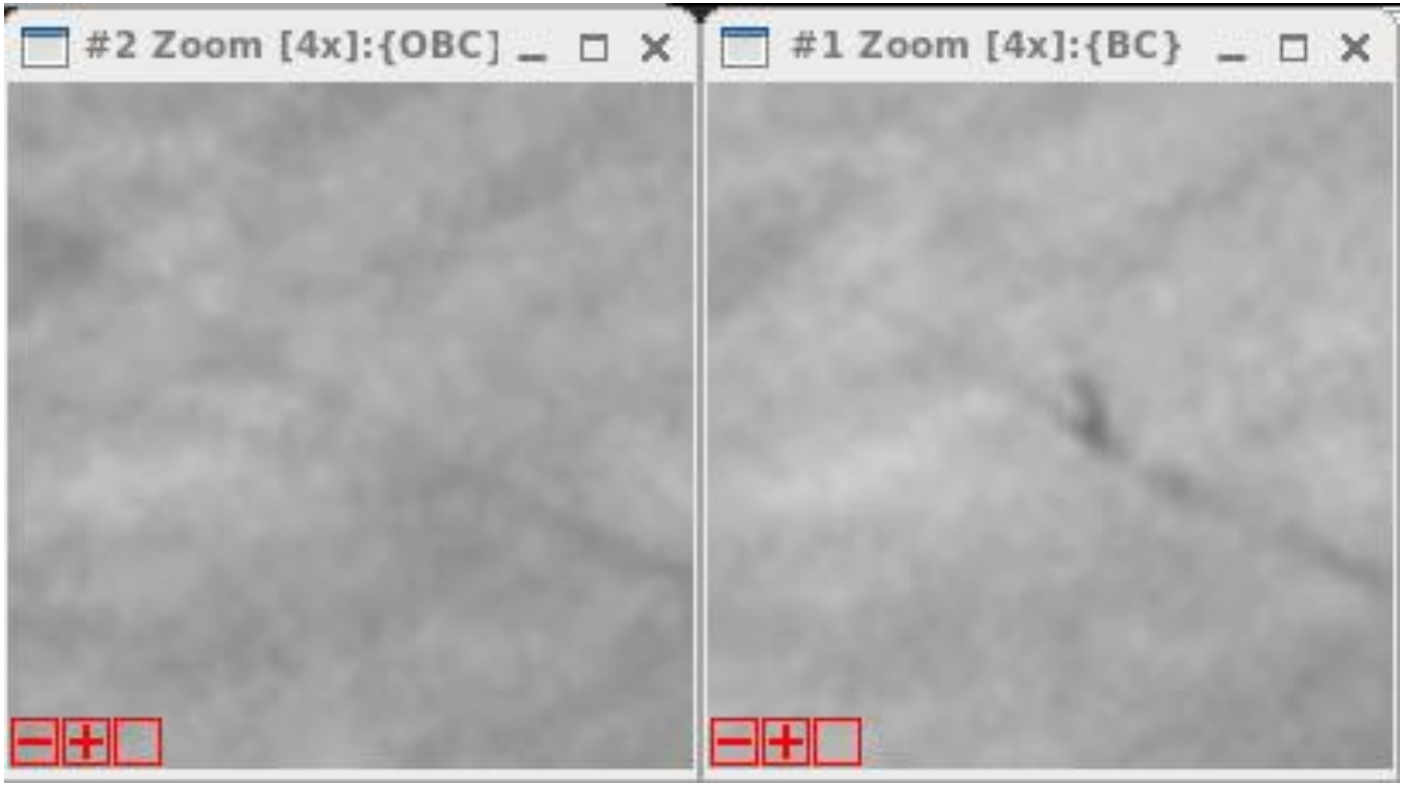
Until then: use of the Gobabeb AERONET station (7km away) AOT

-> Consistency between station and place of measurements confirmed by Calitoo (handheld sunphotometer)

-> Relatively low AOT most of the time



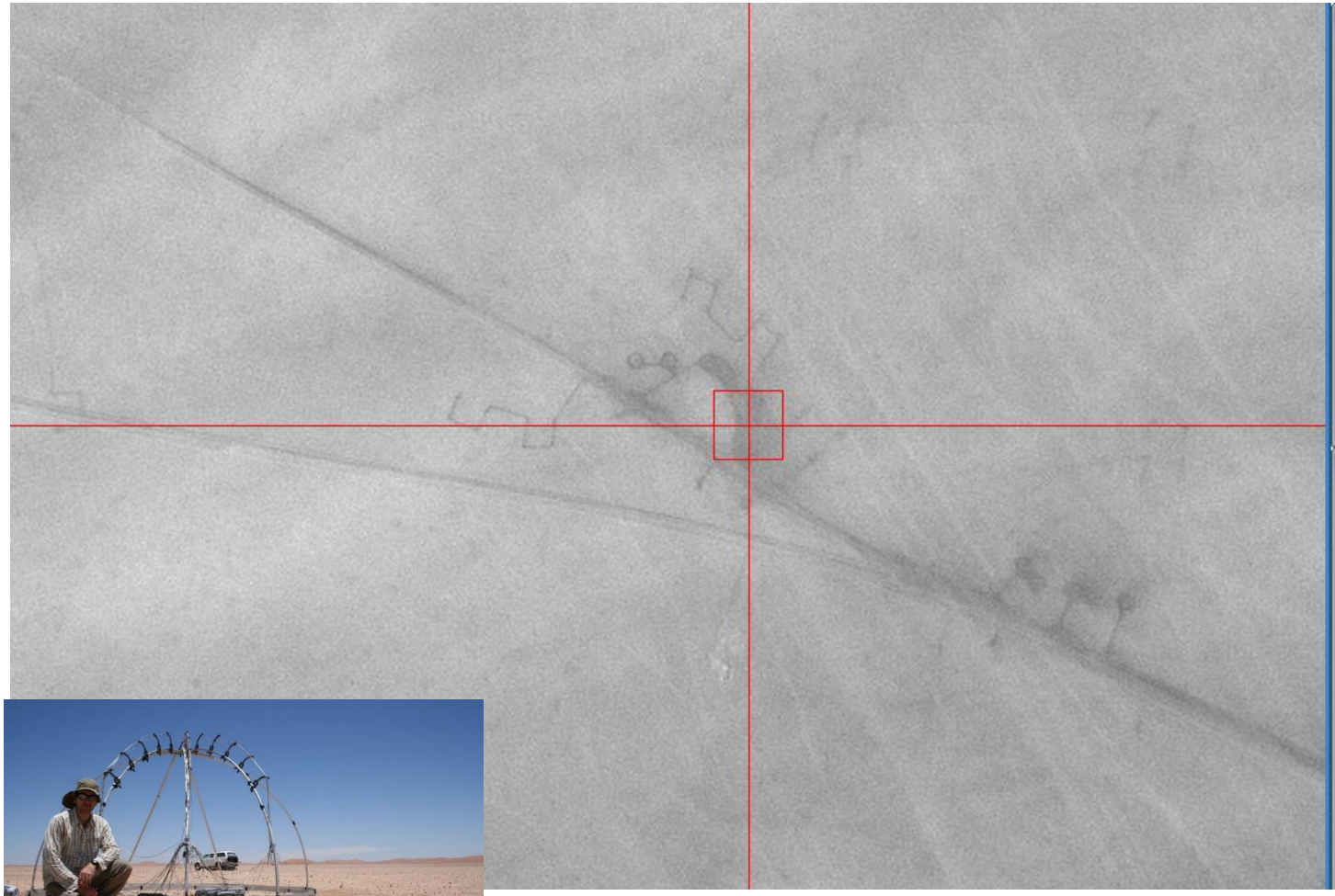
Campaign impact – Sentinel2 10m

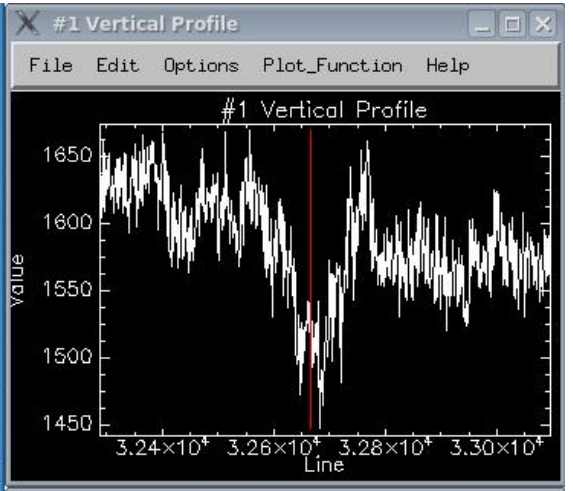


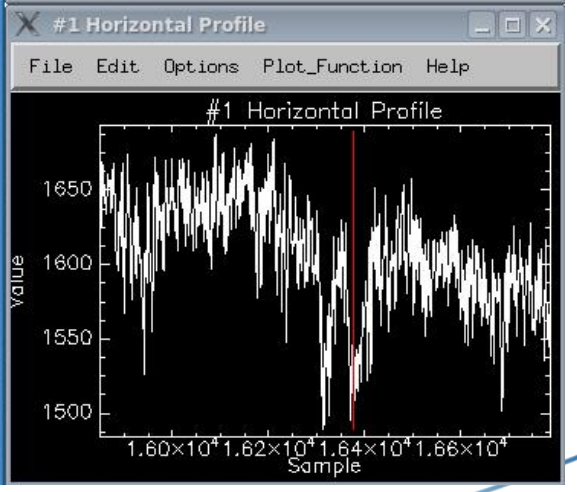
Before (September) After (Nov 27th)

<u>Be careful for mast installation !!</u>

Campaign impact – PLEIADES 70cm - December 2016







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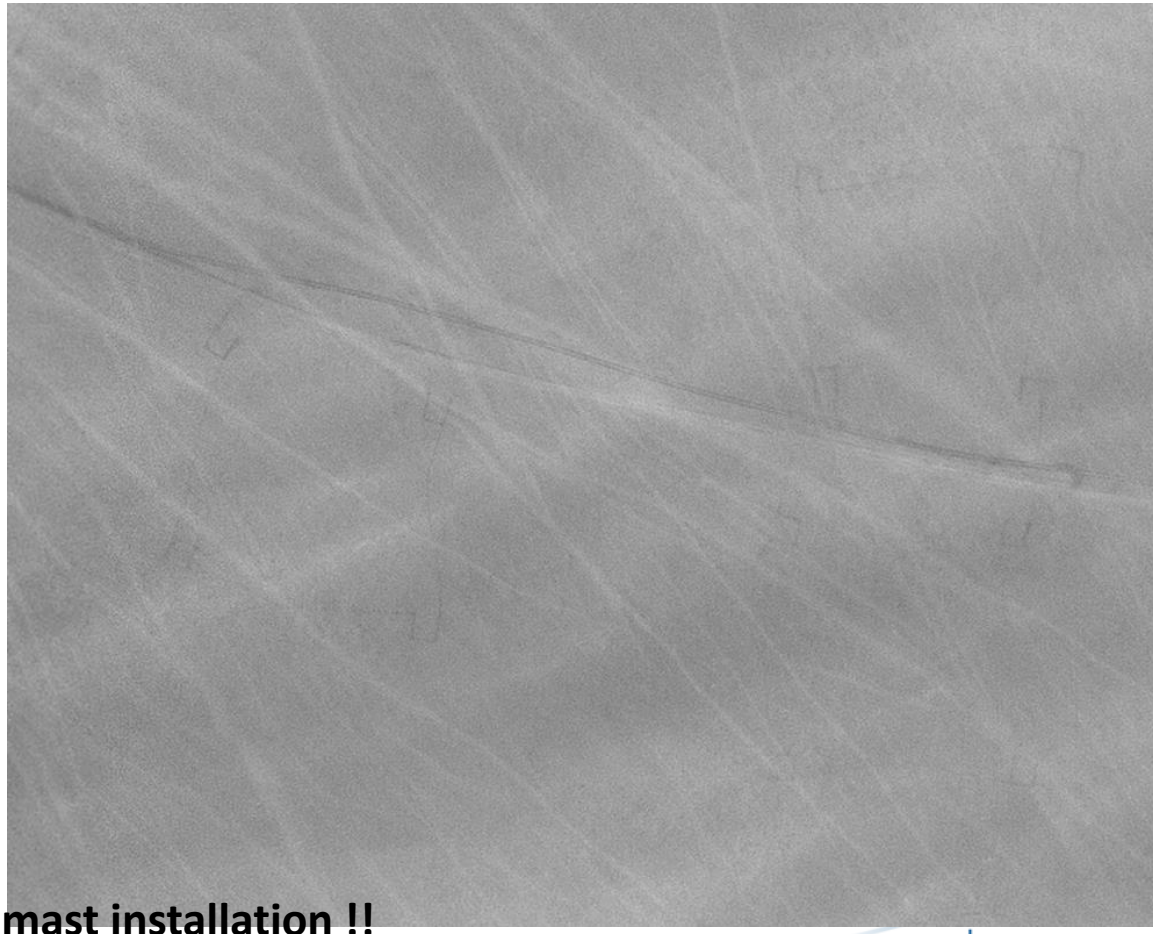
Campaign impact – PLEIADES 70cm - December 2016



Be careful for mast installation !!

Conclusion

Location of the site:

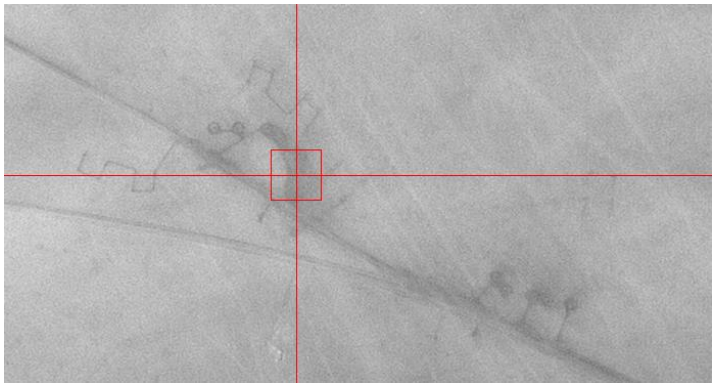
- Determination of the precise location of the future RadCalNet site - 23°36’ S, 15°7’9” E
- Confirmation on the ground of what satellite data had showed : very good spatial homogeneity from very high to coarse resolution

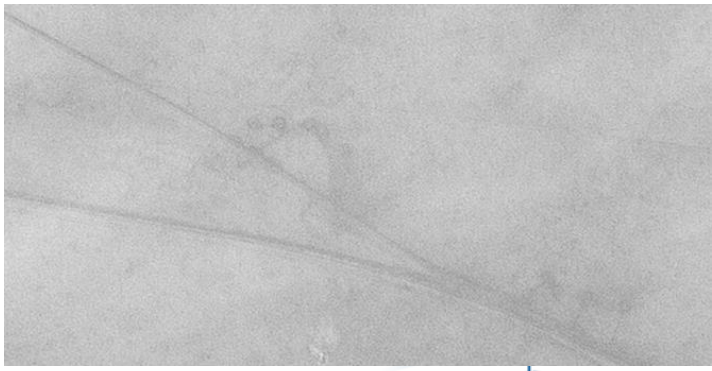
Surface characterization

Still preliminary results: more work to be done:

- to validate the Spectralon reflectance
- to derive a valid uncertainty budget
- to analyze the ground reflectance behavior
- to establish the long-term impact on the site

Dec. 18th 2015





Mar 6th 2016