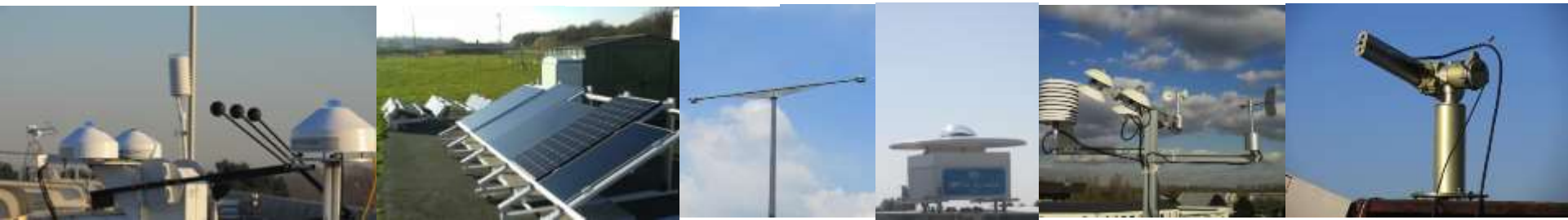
BSRN Meeting, 28 Apr 2016, Canberra

# On the representativeness and uncertainty of irradiance measurements

Jordi Badosa

Contributors: Martial Haeffelin, Jean-Charles Dupont, Marie-Christine Gonthier, Aurélien Faucheux, Christophe Boitel, Marc-Antoine Drouin, Florian Lapouge.
LMD/IPSL, Ecole Polytechnique

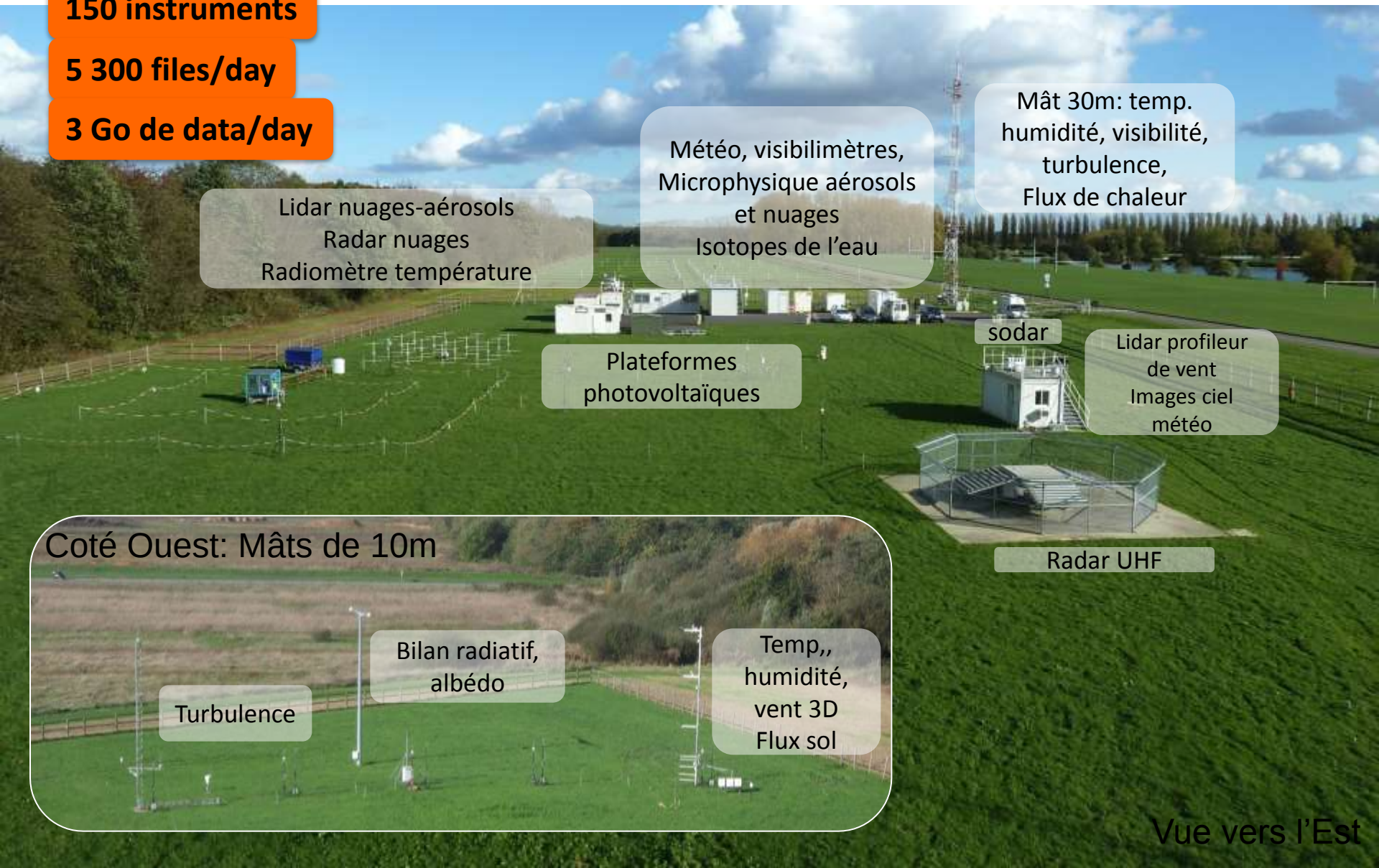


# A multi-parameter site (www.sirta.fr)

**150 instruments**

**5 300 files/day**

**3 Go de data/day**



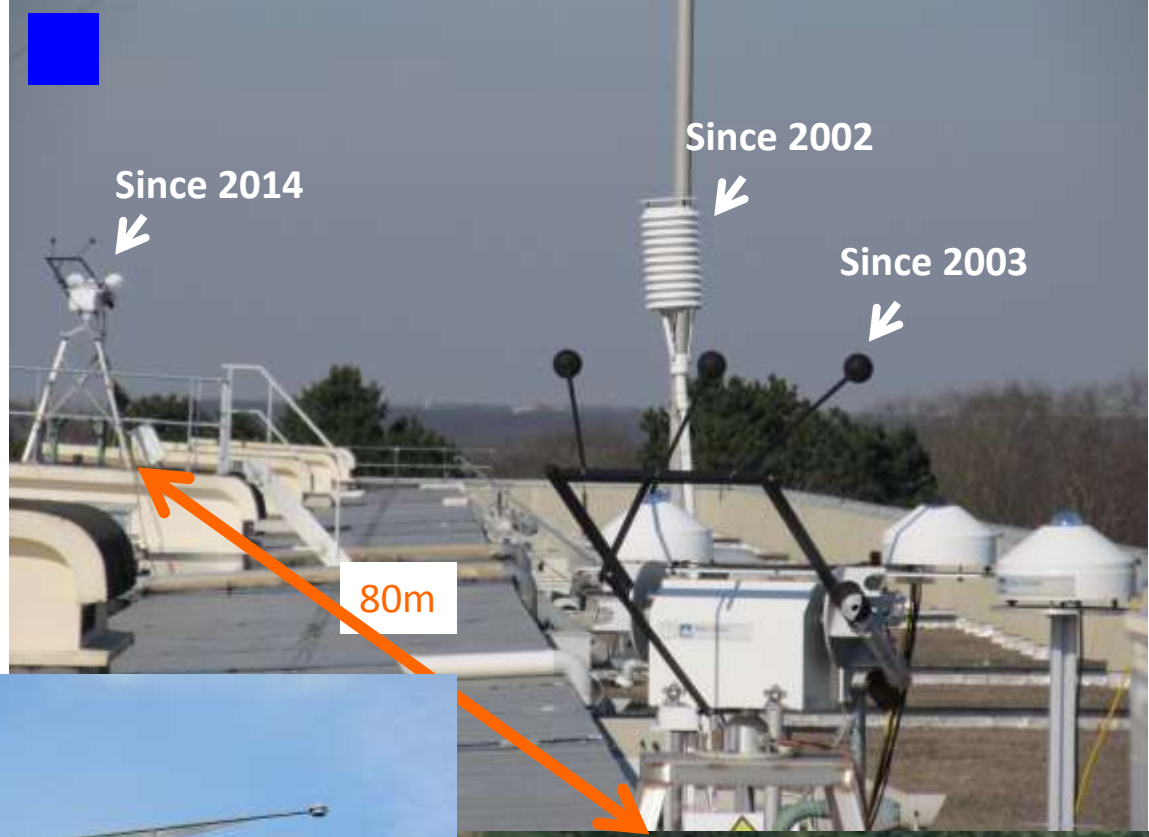
# Station PAL, Paris region, France


Contribution to BSRN since 2003.

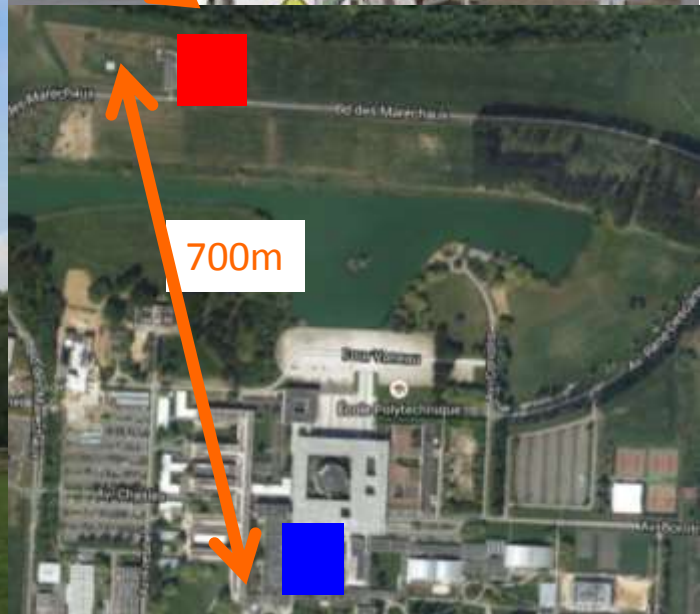
Current available parameters in BSRN archive :

- SWDn (DIF, DIR, GLO), LWDn
- Air temperature, RH, pressure

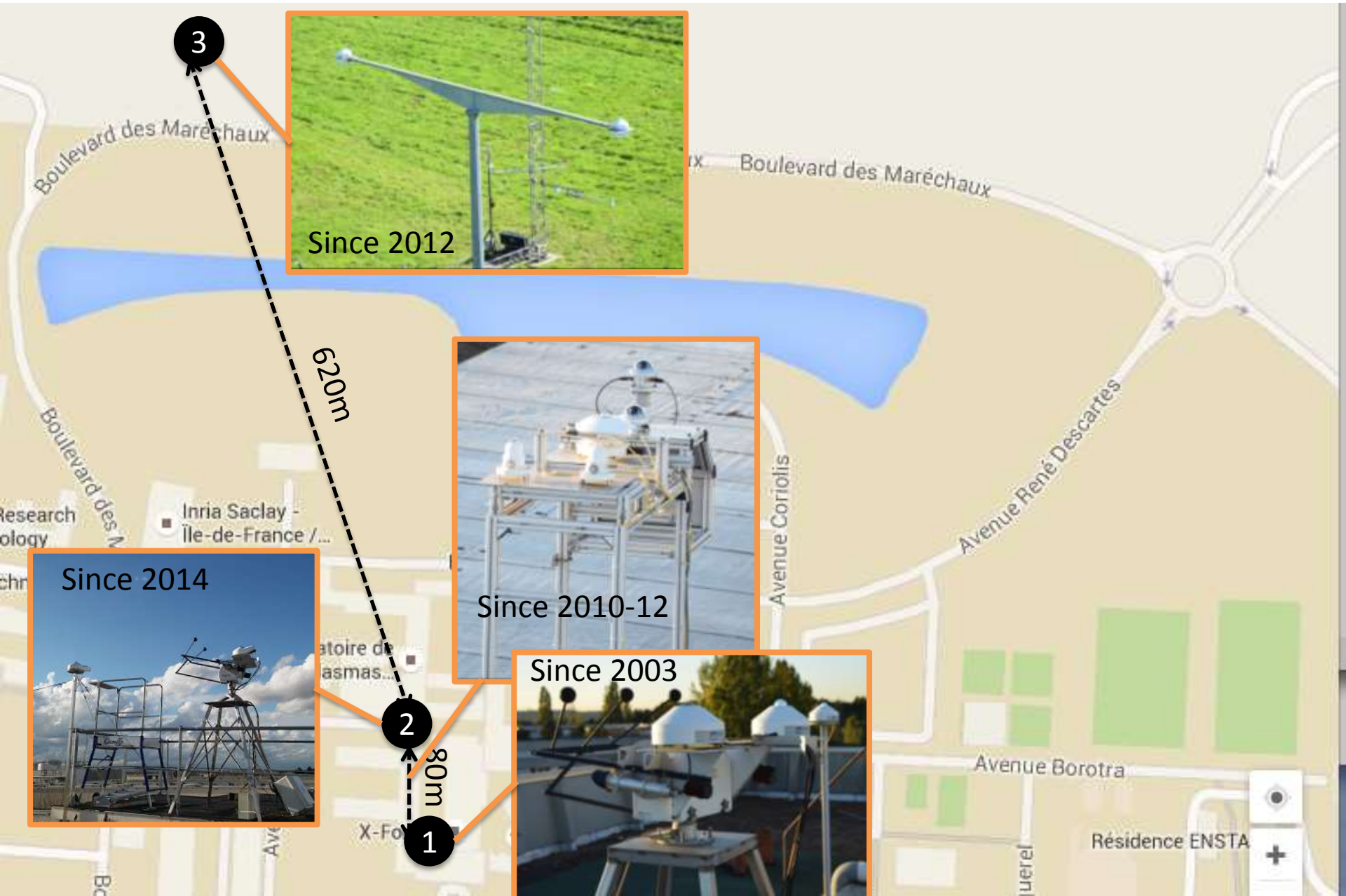
The new installation in 2014 will become reference for the site.







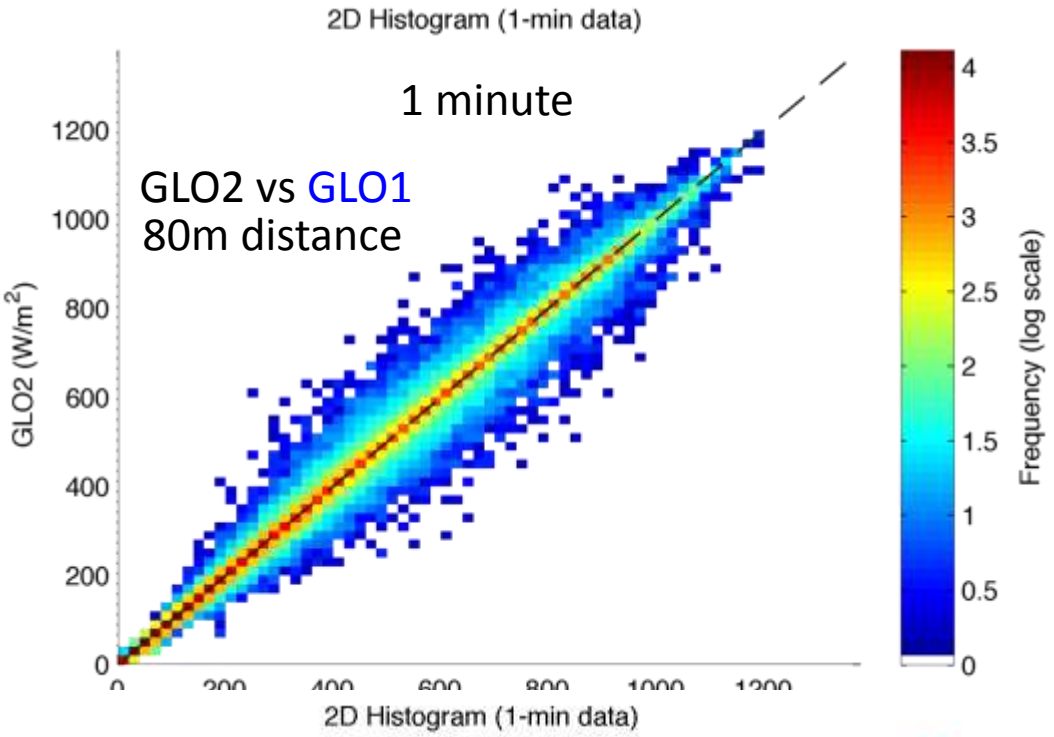
# Radiative measurement locations at SIRTA

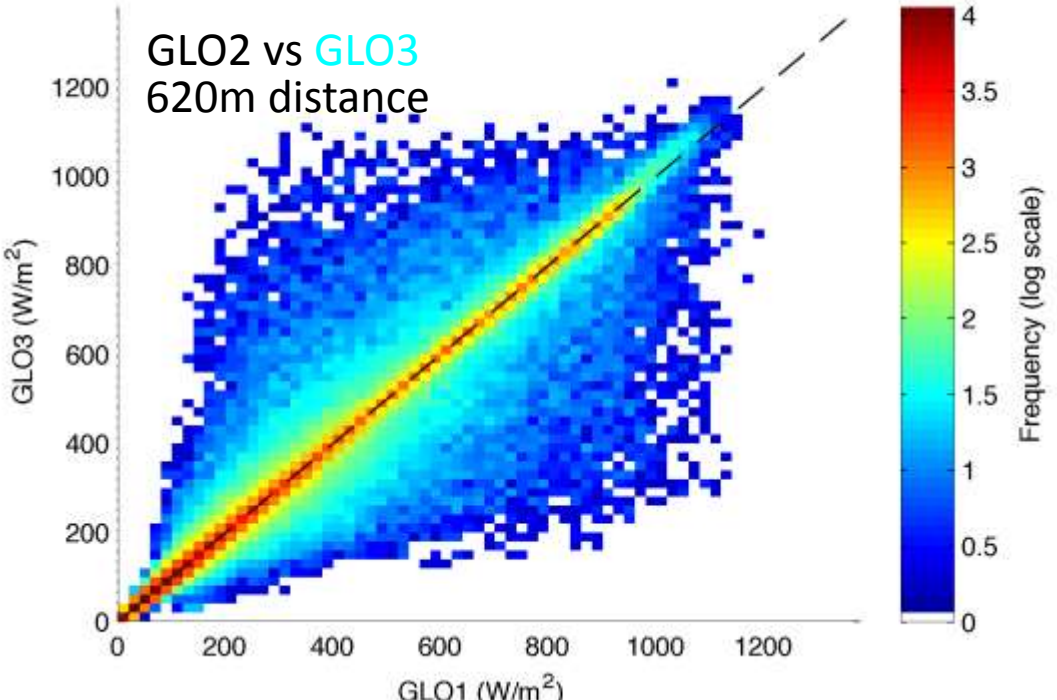


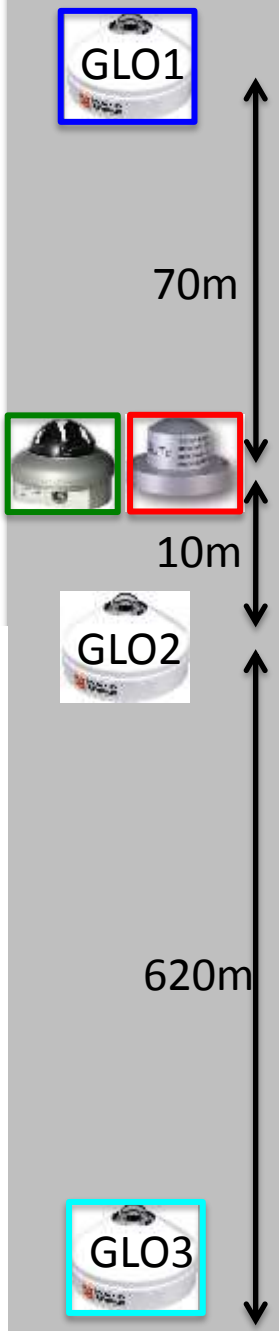
# Questions motivating the presentation

- What is the spatial representativeness of the radiative measurements?
- How the measurements from different instruments compare?
- How CMP22 global measurements compare?
- What kind of sources of uncertainty do we detect from operating conditions and what are their impacts ?

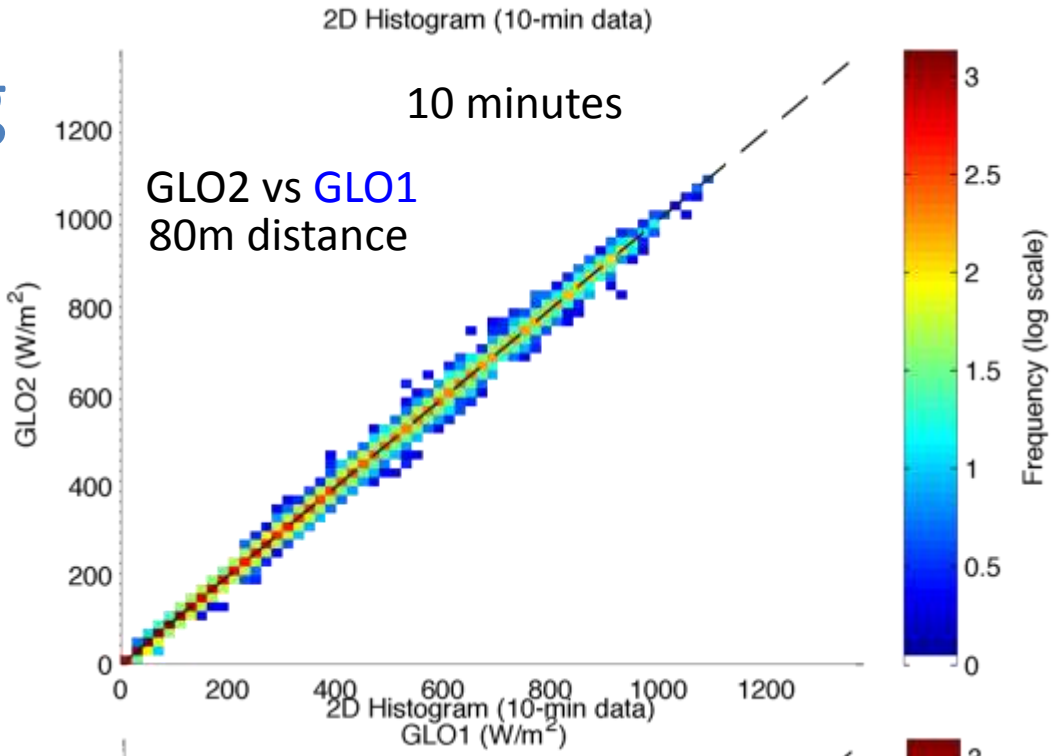
# Downwelling SW irradiance comparison (2015)

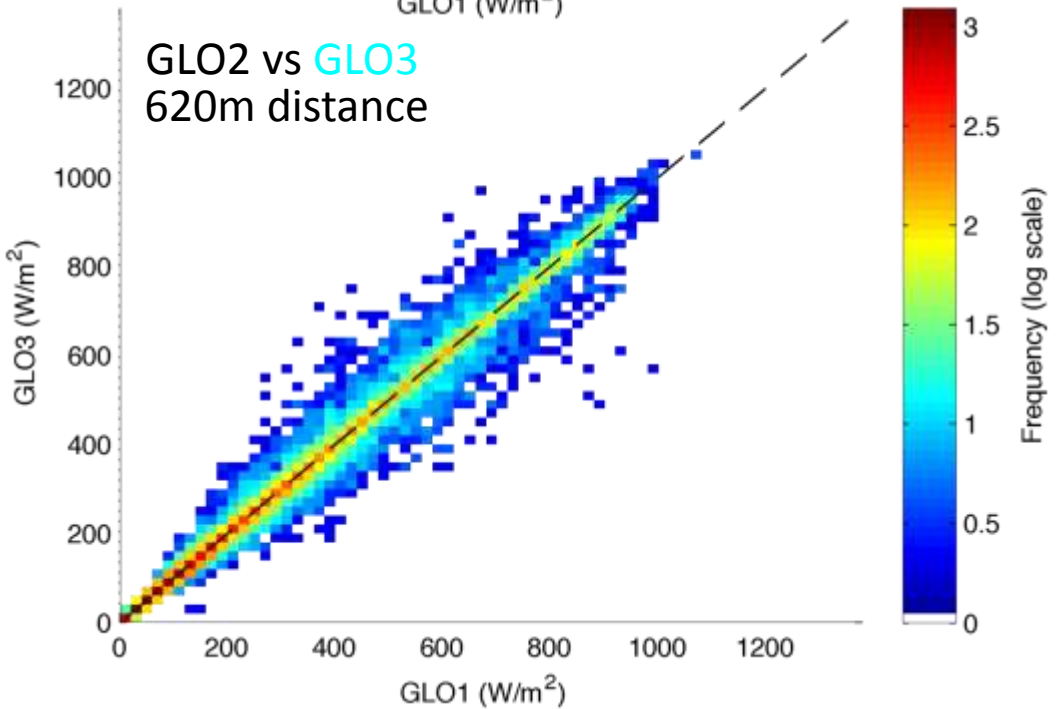


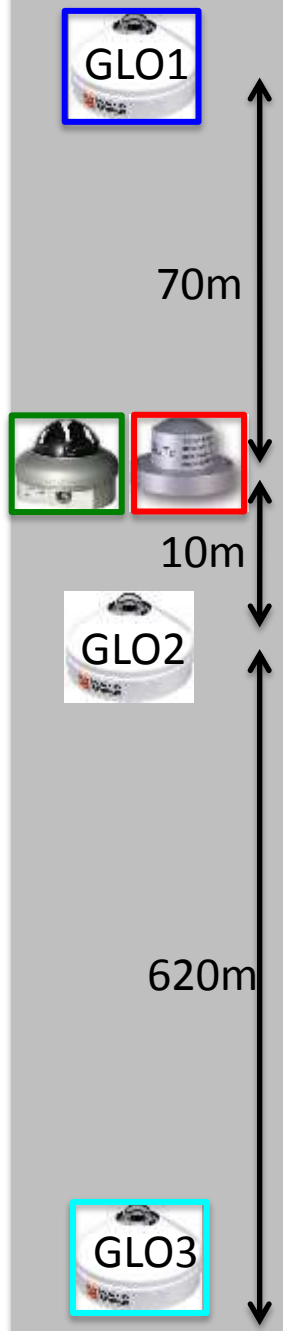



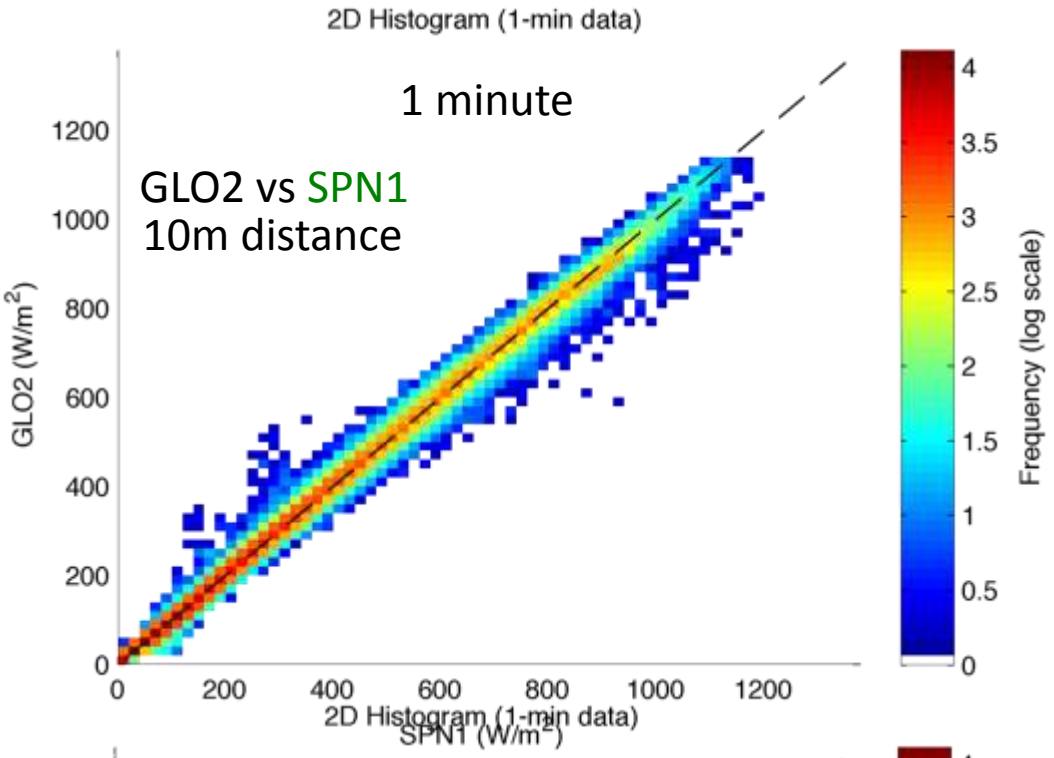
# Downwelling SW irradiance comparison (2015)

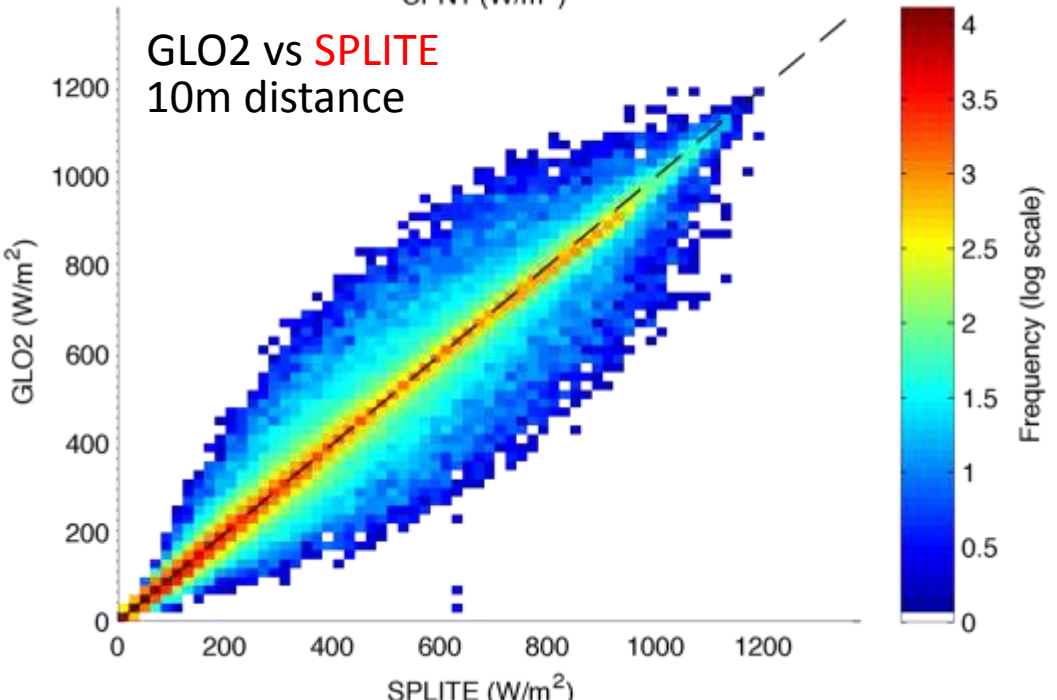


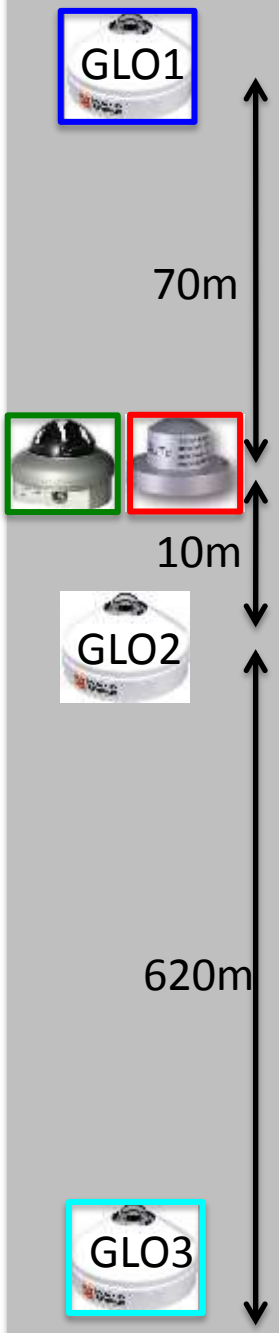



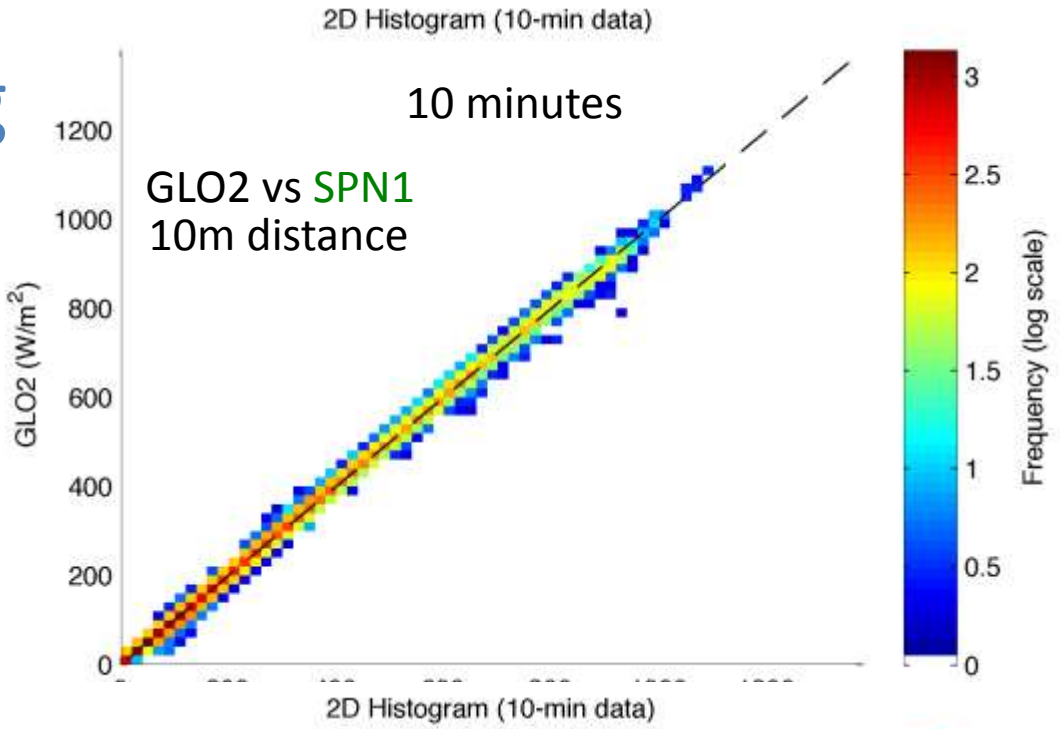
# Downwelling SW irradiance comparison (2015)

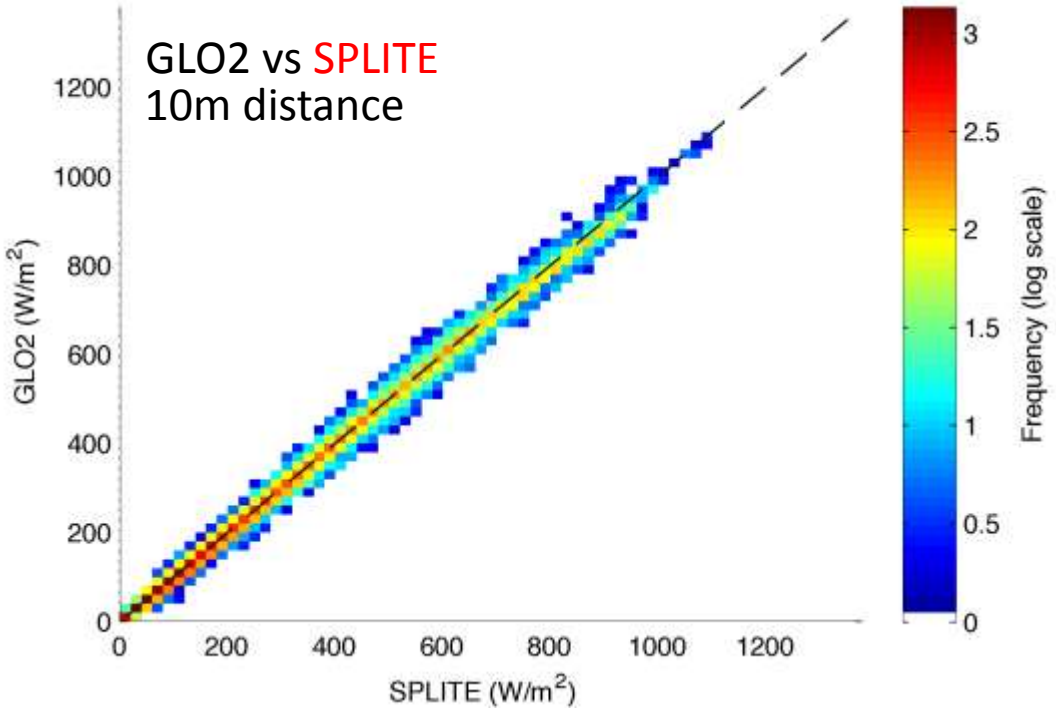


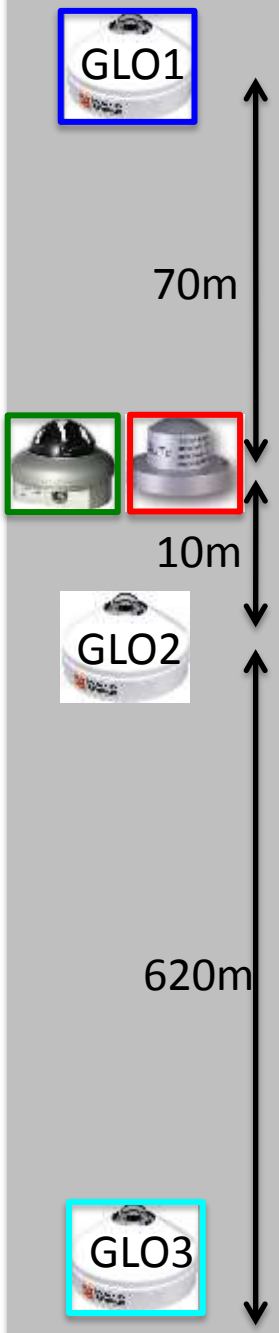



# Downwelling SW irradiance comparison (2015)

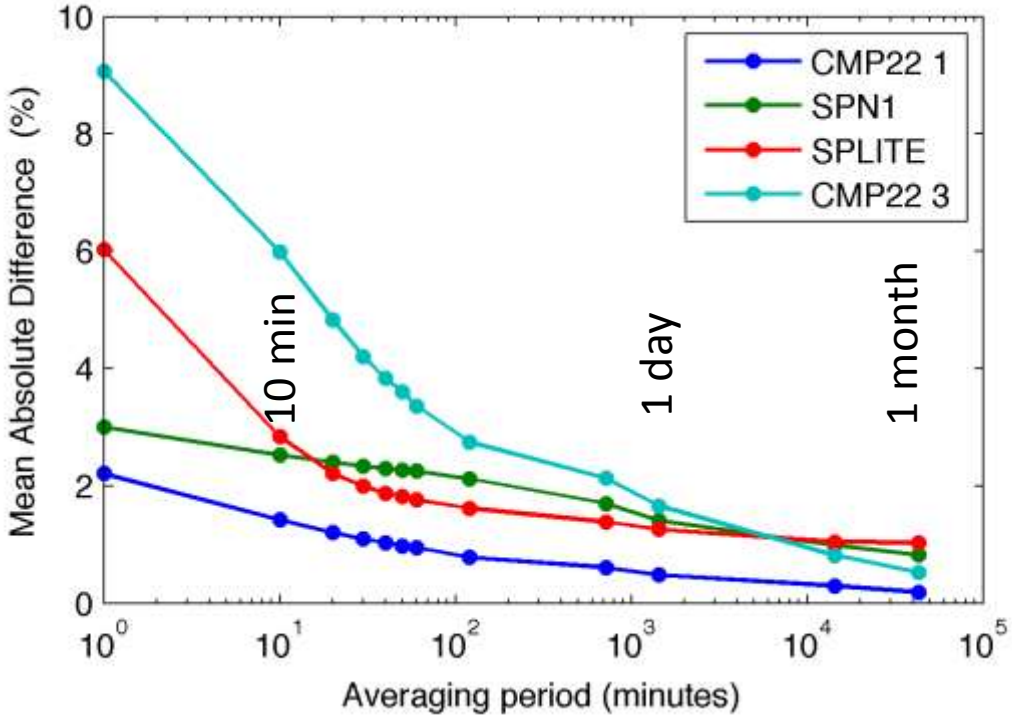


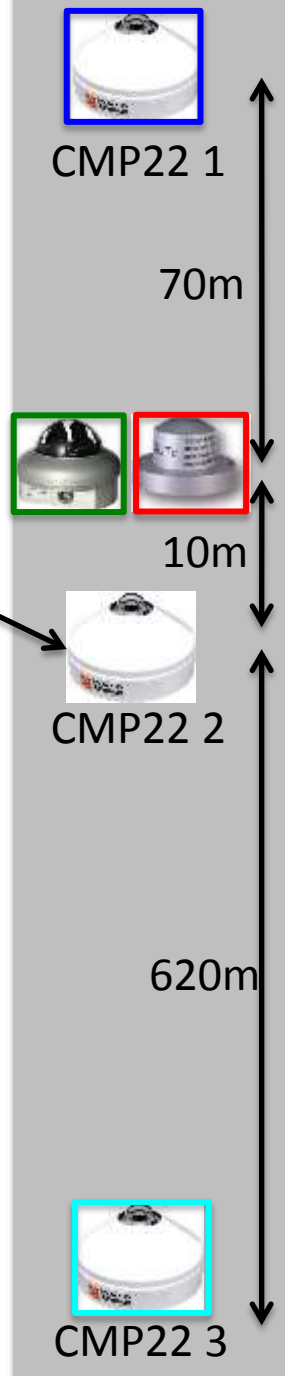



# Downwelling SW irradiance comparison (2015, SZA<85º)

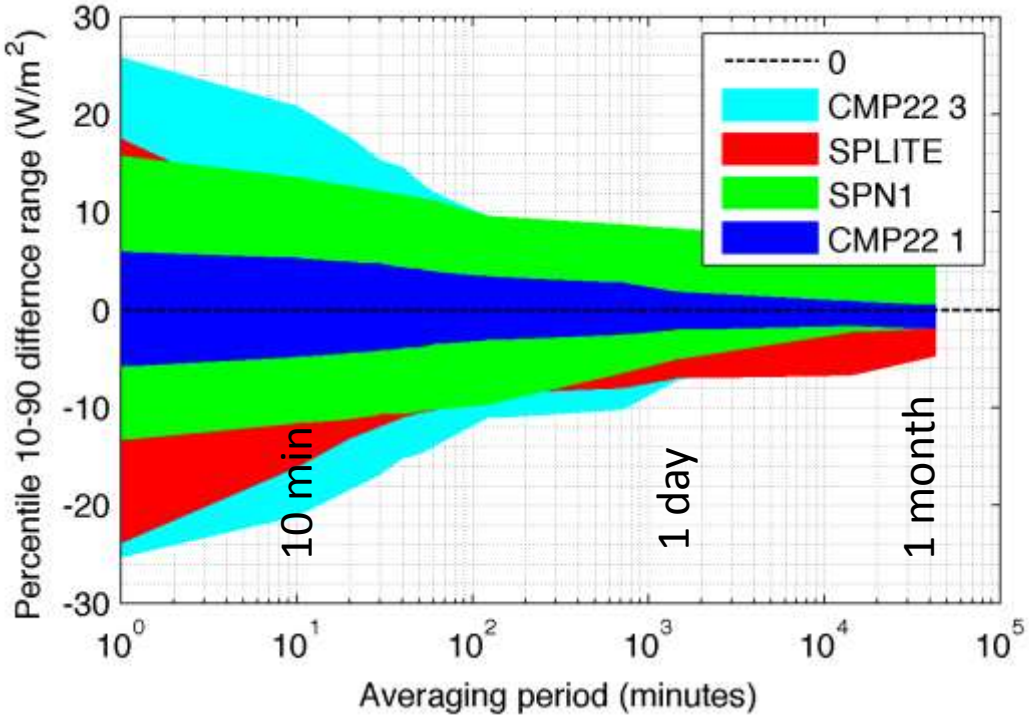
Mean absolute difference with respect to CMP22 2

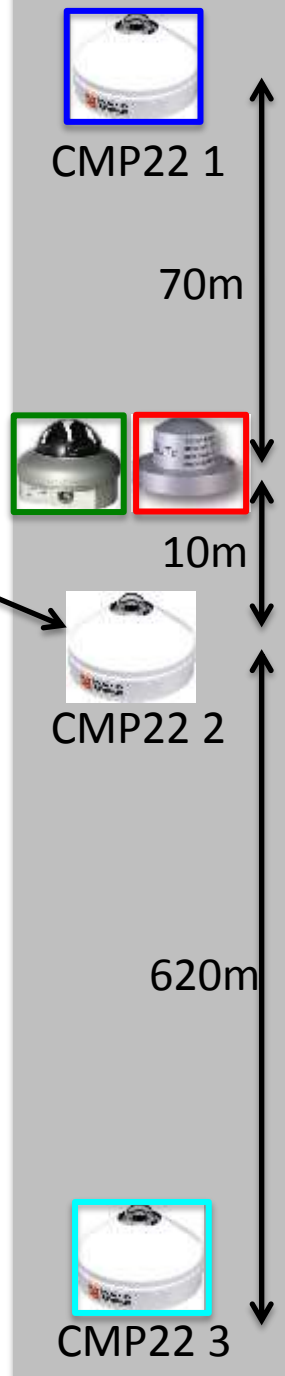


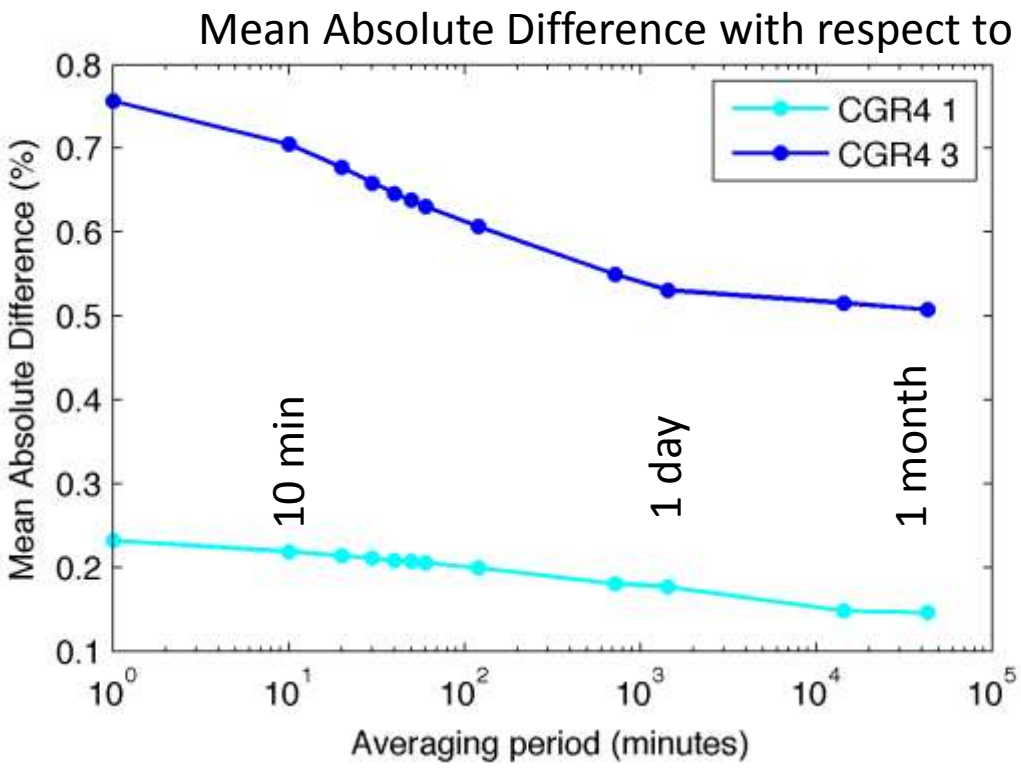
# Downwelling SW irradiance comparison (2015, SZA<85º)

P10 and P90 of differences with respect to CMP22 2



# Downwelling LW irradiance comparison (2015)





CGR4 1

80m

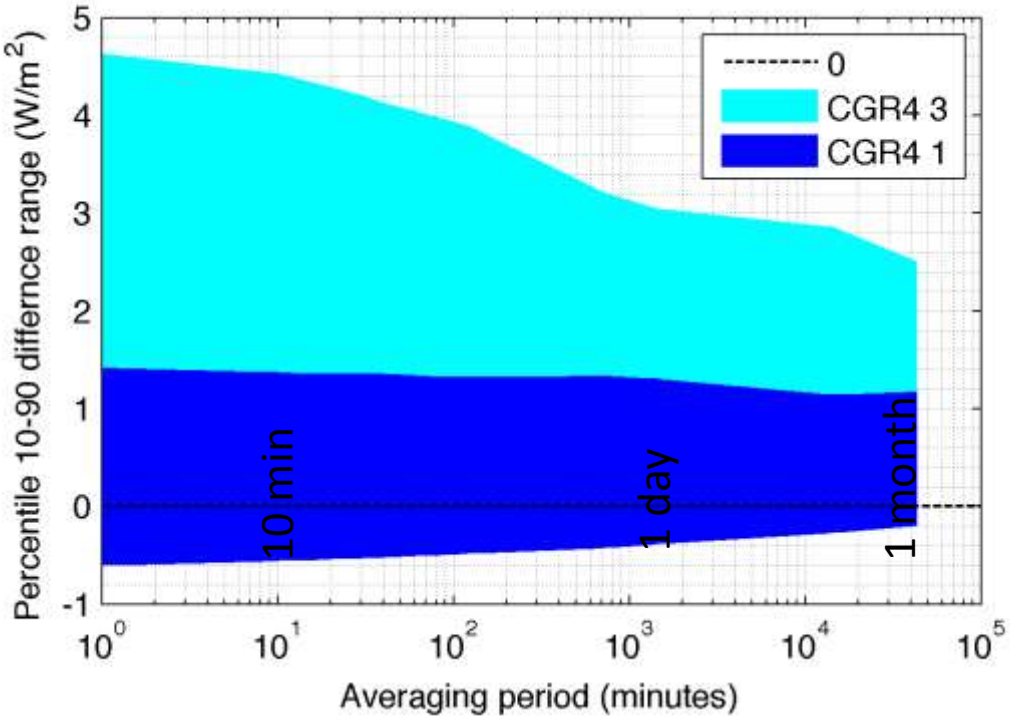

CGR4 2

620m

CGR4 3

# Downwelling LW irradiance comparison (2015)

P10 and P90 of differences with respect to CGR4 2




Altitudes:
CGR4 1 17m agl
CGR4 2 17m agl
CGR4 3 10m agl


CGR4 1

80m


CGR4 2

620m

CGR4 3

# Conclusions

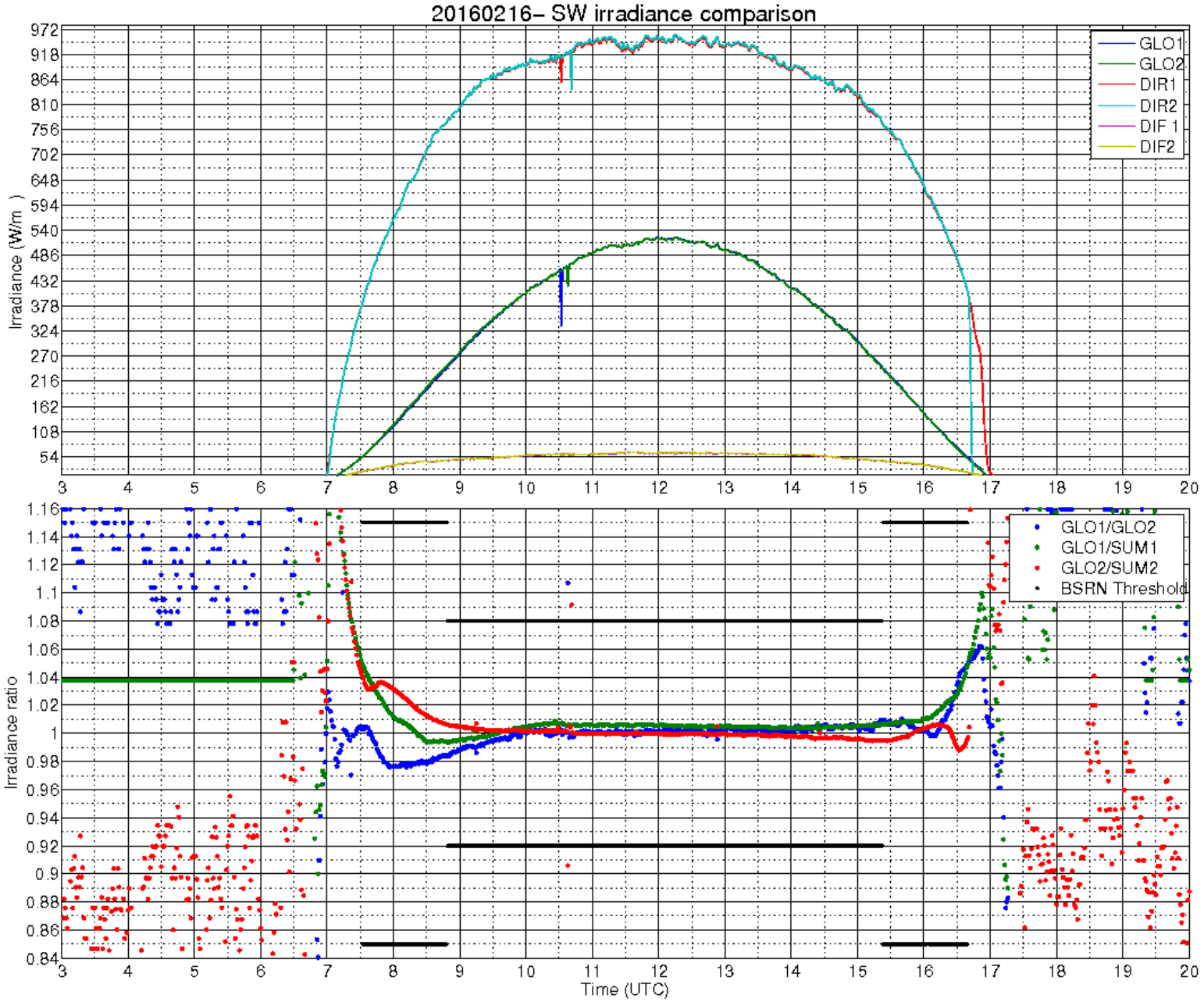
- At 1-min scale, CMP22 global measurements compare within ±5W/m$^2$ (80m) or ±25W/m$^2$ (620m). Nearby SPN1 and SPLITE2 measurements compare within ±15W/m$^2$ and ±20W/m$^2$.

- Monthly averages compare within about ±2W/m$^2$ for all CMP22 and the SPLITE2 and about the double for SPN1.

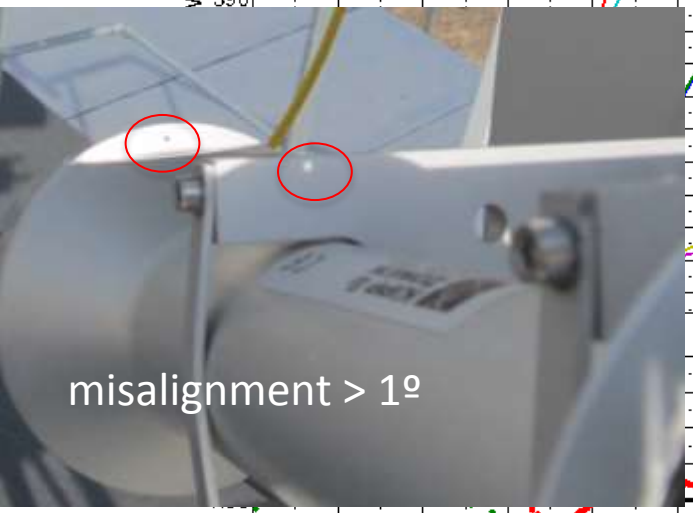
- LW downwelling measurements show closer agreement with low dependency on time averaging, showing larger spatial representativeness.

# Examples of measurement issues

# Clear-sky day



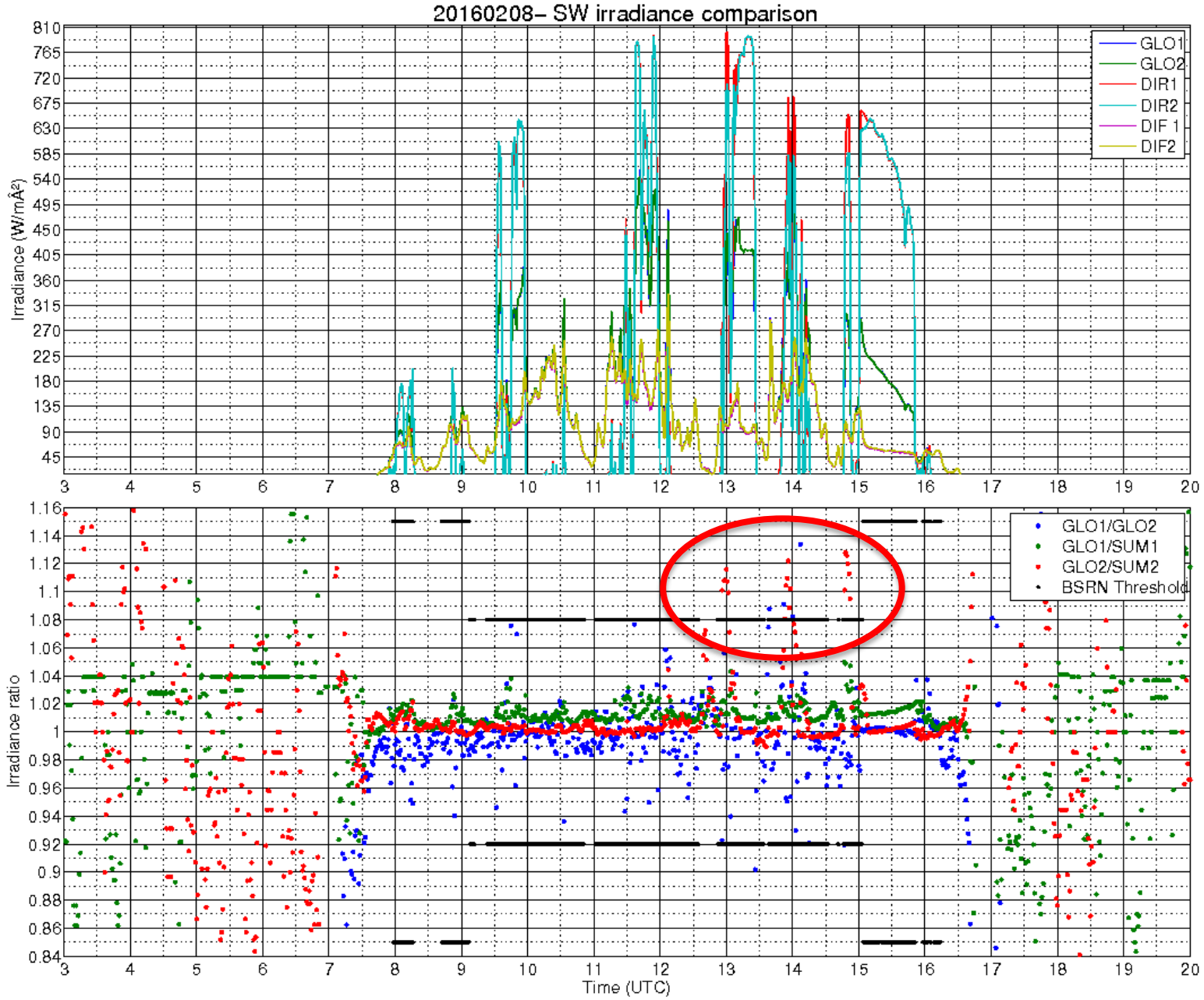
# Alignment of solar tracker



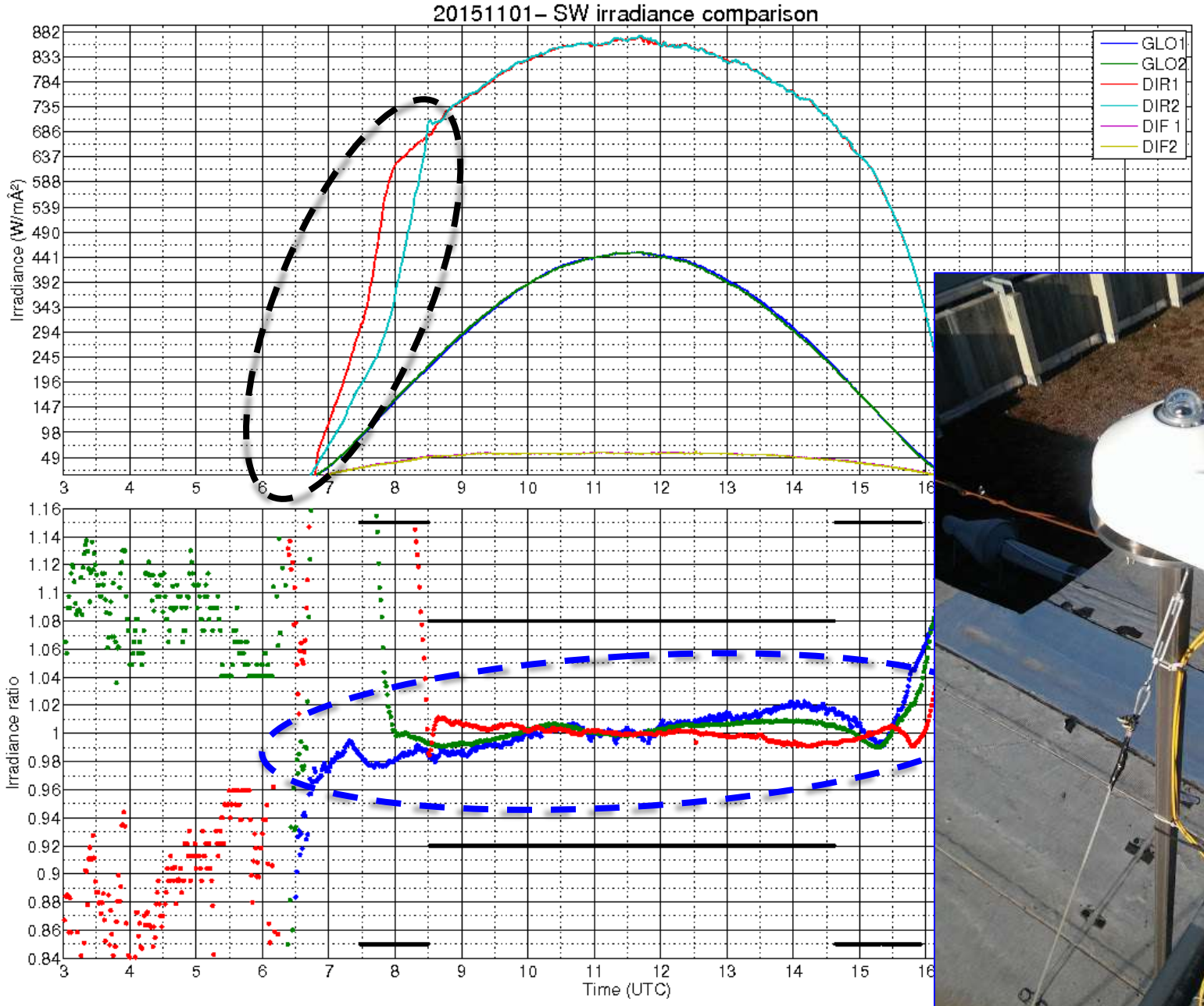
# Alignment of solar tracker

# Alignment of solar tracker : hypothesis and solution

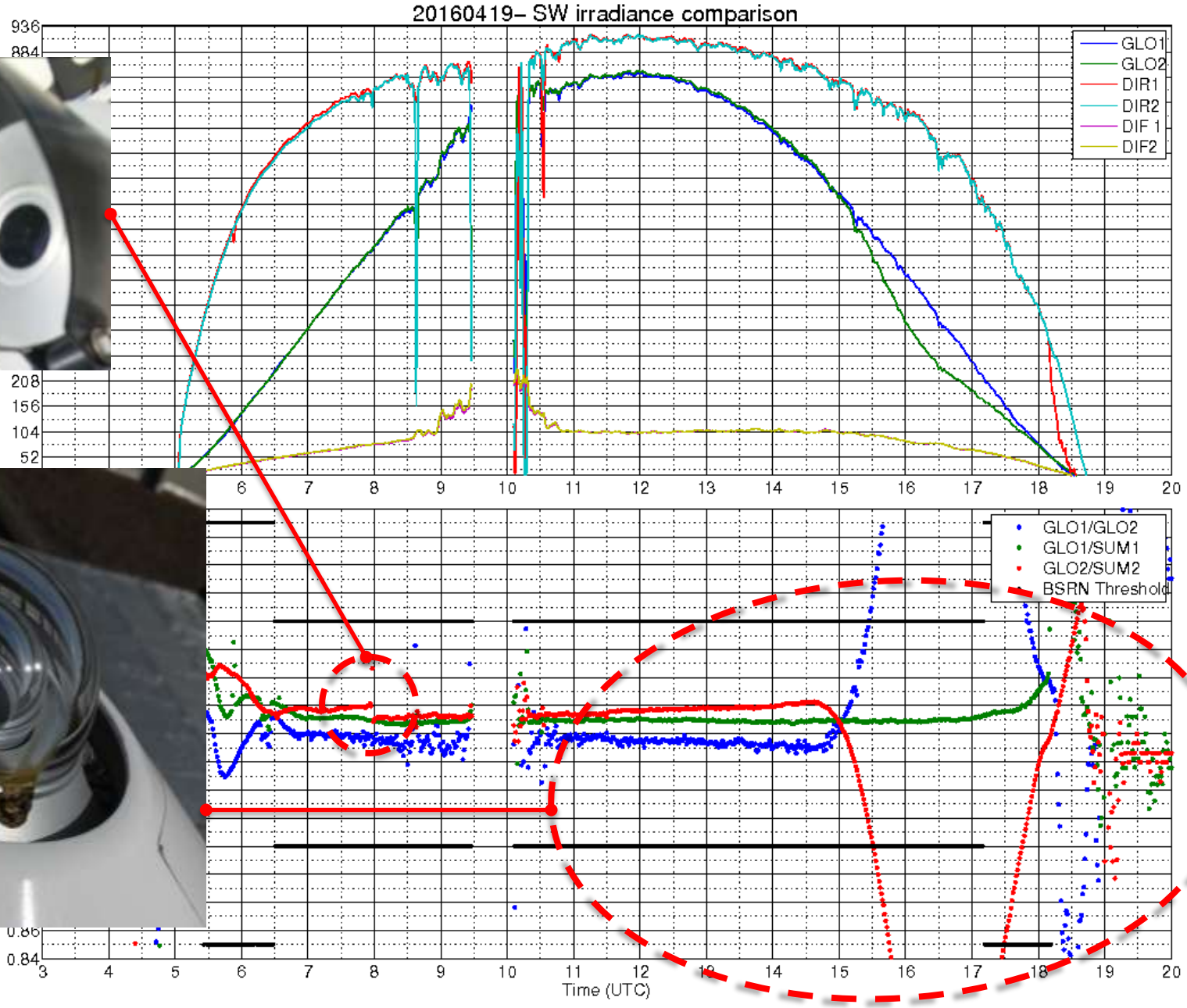
# Inconsistencies when it rains



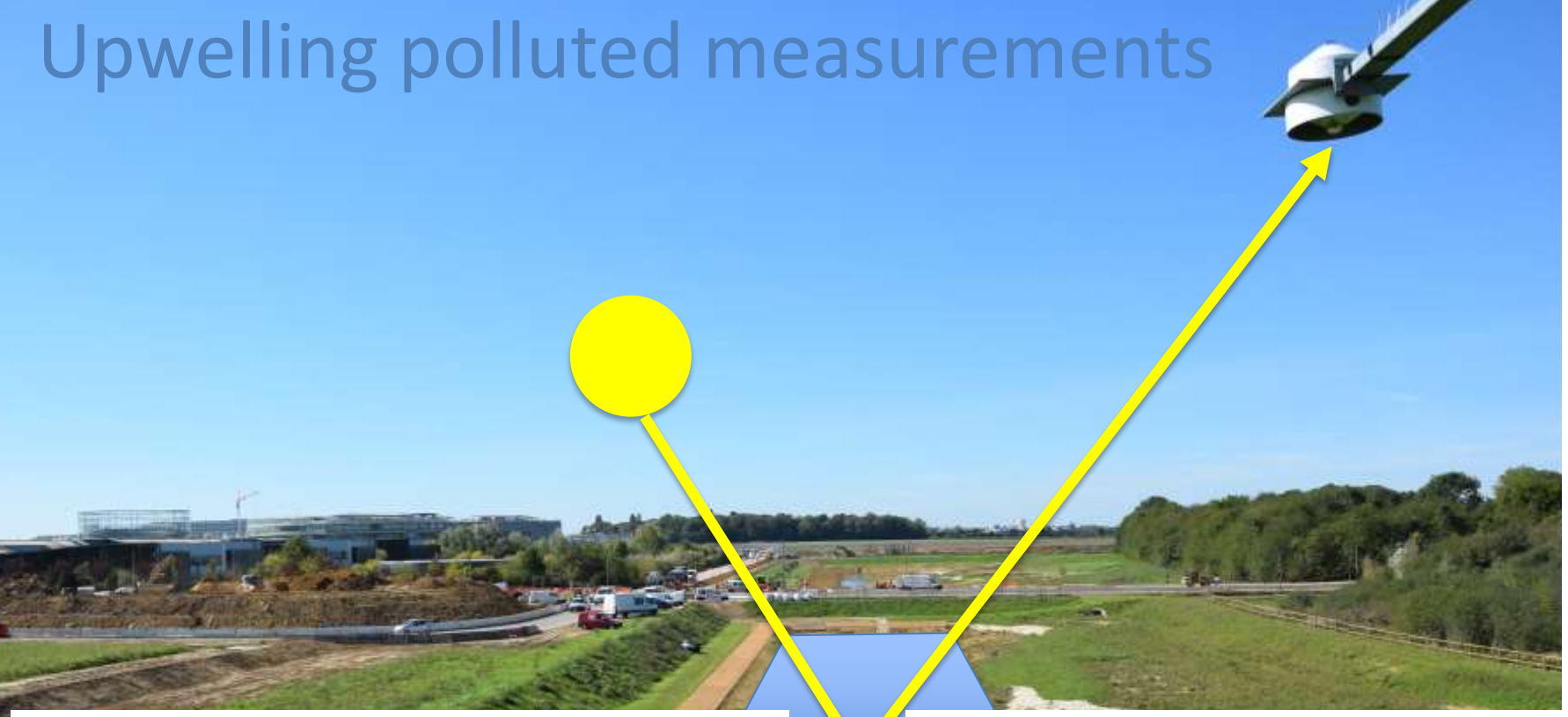
# Dew and leveling

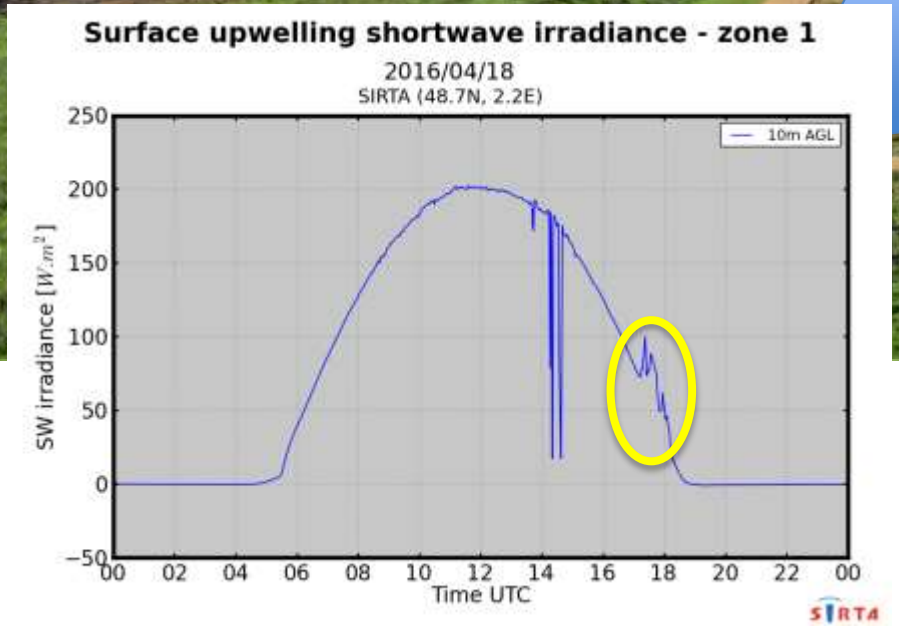


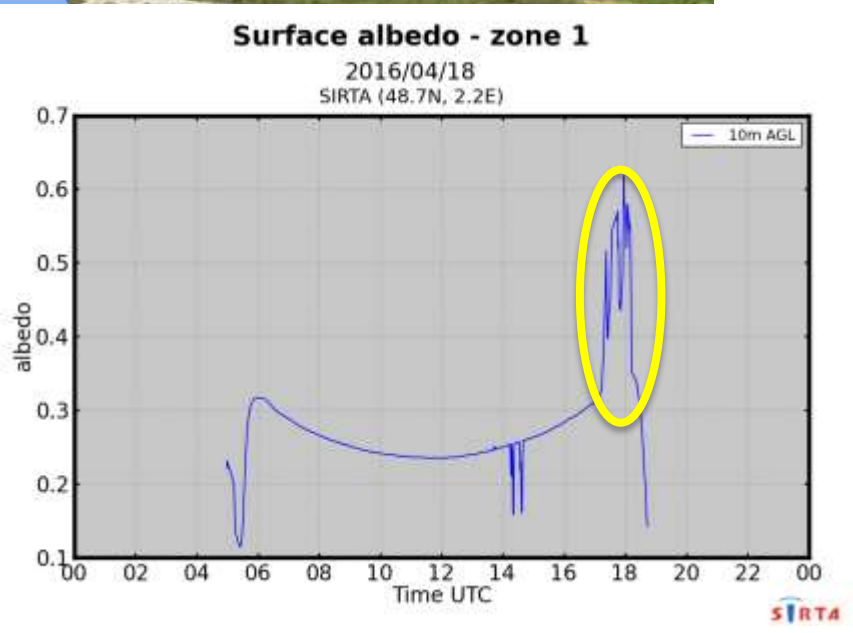
# Soiling-cleaning effects



# Upwelling polluted measurements





# 2 stations producing measurements for LR0100

station 1


vs

station 2


What data submit to BSRN archive? Approaches:

- Use the best data available in daily basis regardeless the station
- Choose the overall best station and accept missing data (that could be filled with the other station)

What would be your advice ?

# Thanks for your attention

Contacts:

Martial Haeffelin
martial.haeffelin@ipsl.polytechnique.fr

Jordi Badosa
jordi.badosa@lmd.polytechnique.fr

SIRTA

Institut Pierre Simon Laplace

LMD

TRENDX