

A suntracker at La Réunion Island for monitoring surface solar radiation under tropical maritime climate conditions: towards a new BSRN site?

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Introduction



A Research Unit of the University of Reunion Island

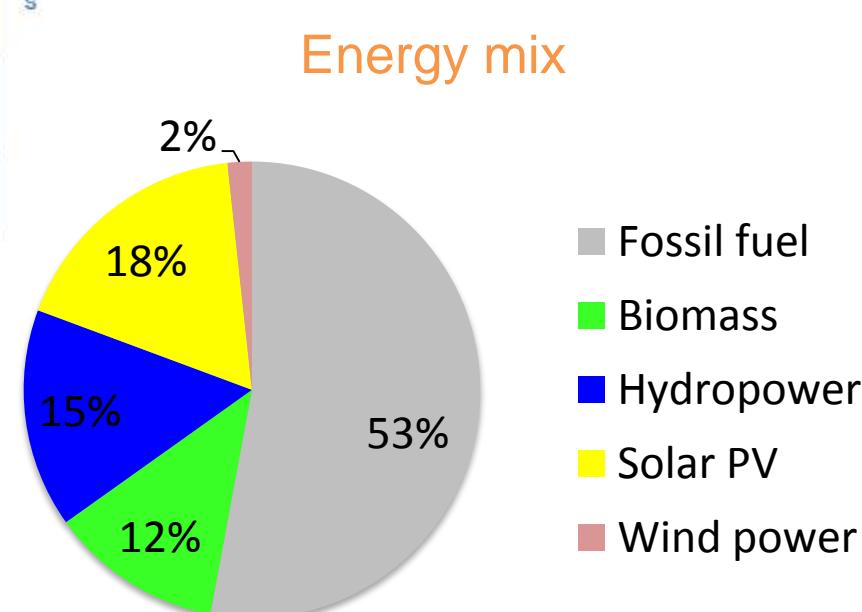
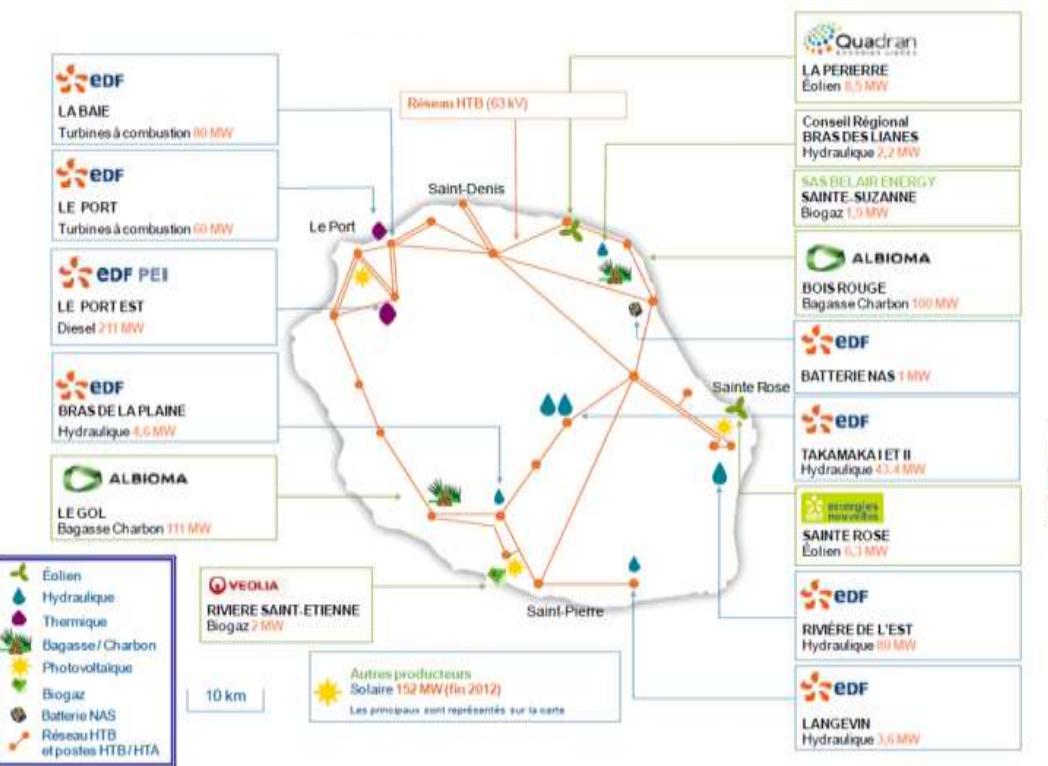
- Permanent Staff: 12,5
12 (Pr. + Ass. Pr.) + 2.5 (Admin. + Eng. + Tech. Ass.)
- Non Permanent Staff (2015): 32
18 (PhD Students) + 2 (Post-Doc) + 12 (Admin. + Eng. + Tech. Ass.)

Introduction



Introduction

Electricity distribution grid over Reunion



Introduction

Smart management of solar energy

Topic 1 – Solar resource variability

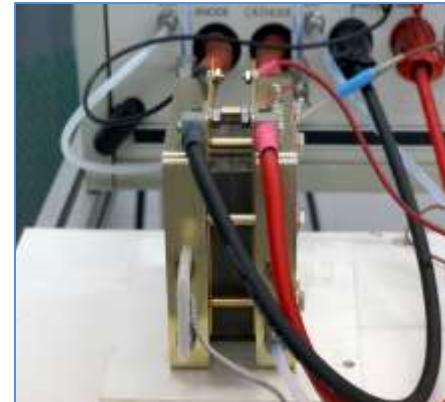
Topic 2 – Energy conversion and storage

Topic 3 – Energy optimization

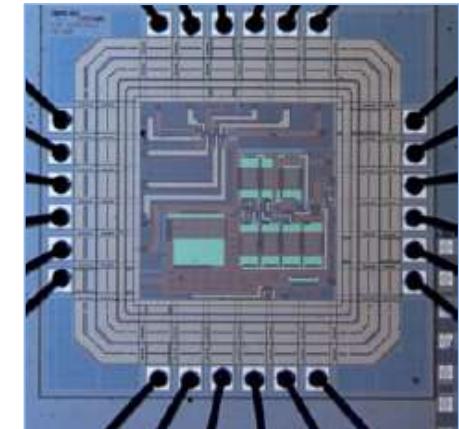
radiative assessment



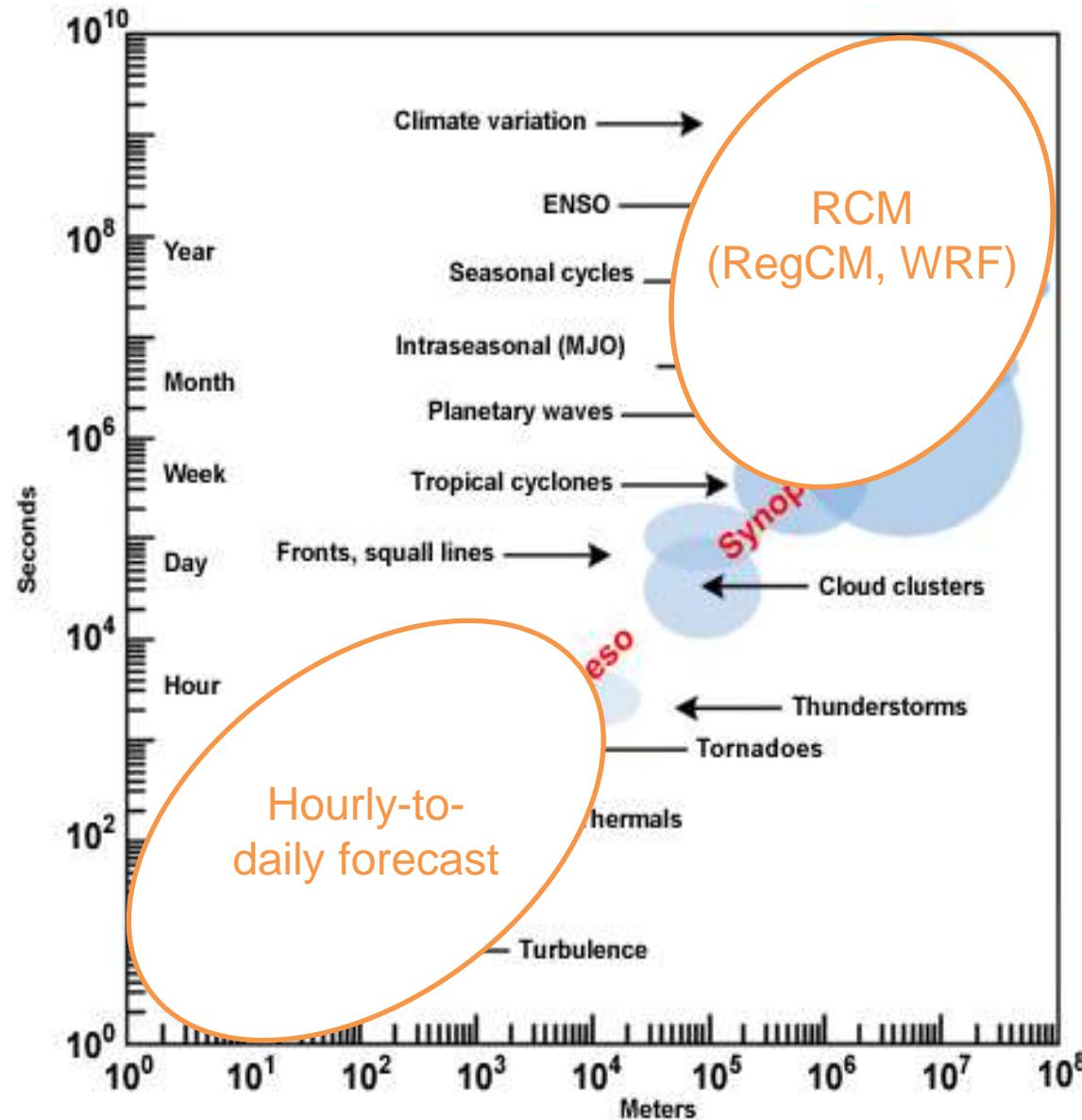
fuel cell hybrid system



WSN

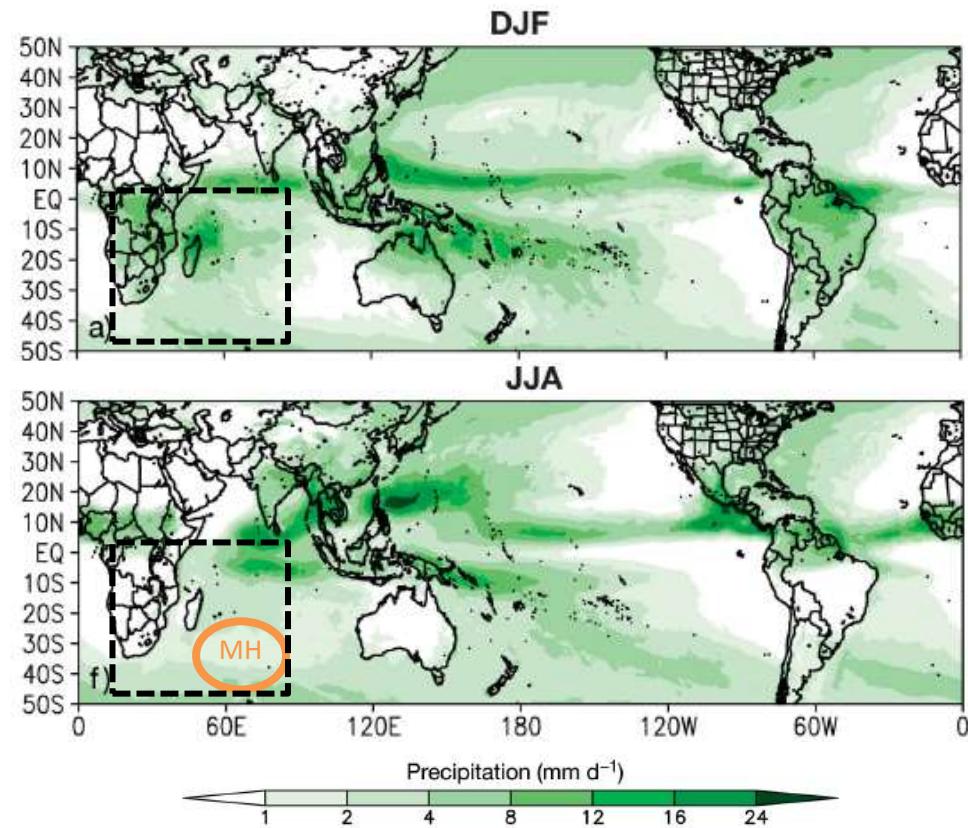


Introduction



Cloudiness variability: SWIO

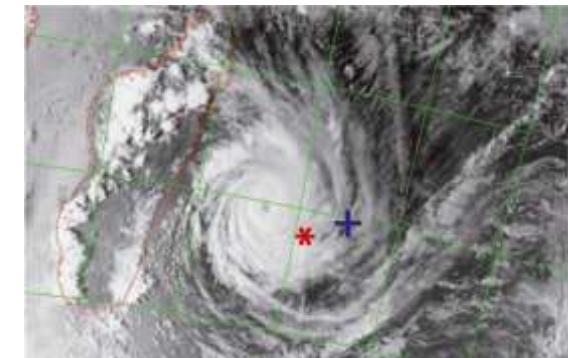
- **Seasonal:** fluctuations of the location and intensity of the ITCZ and the trade winds



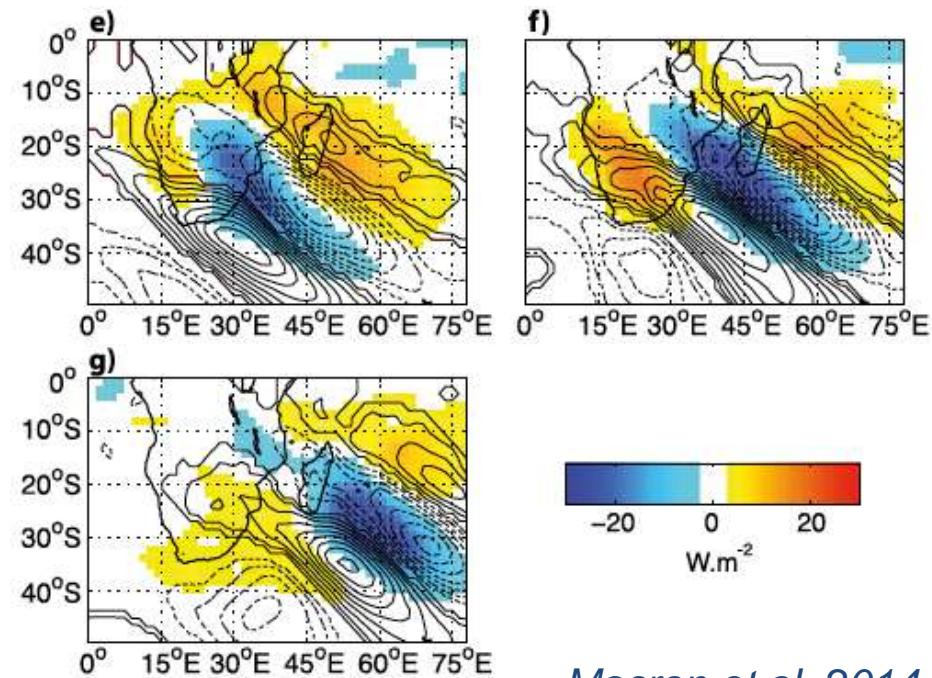
Coppola et al. 2012

Cloudiness variability: SWIO

- **Seasonal:** fluctuations of the location and intensity of the ITCZ and the trade winds
- **Synoptic:** tropical cyclone, tropical temperate trough



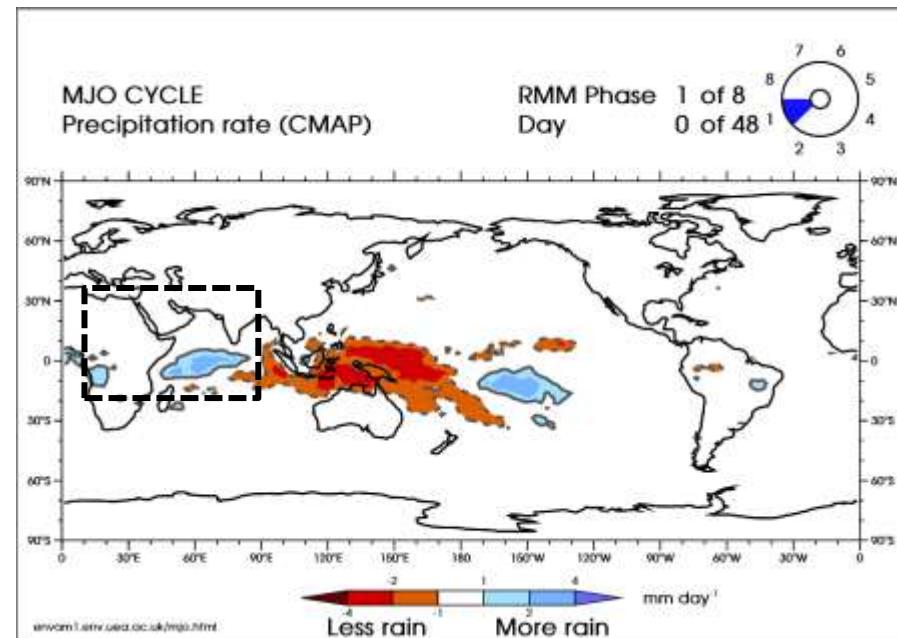
Morel et al. 2014



Macron et al. 2014

Cloudiness variability: SWIO

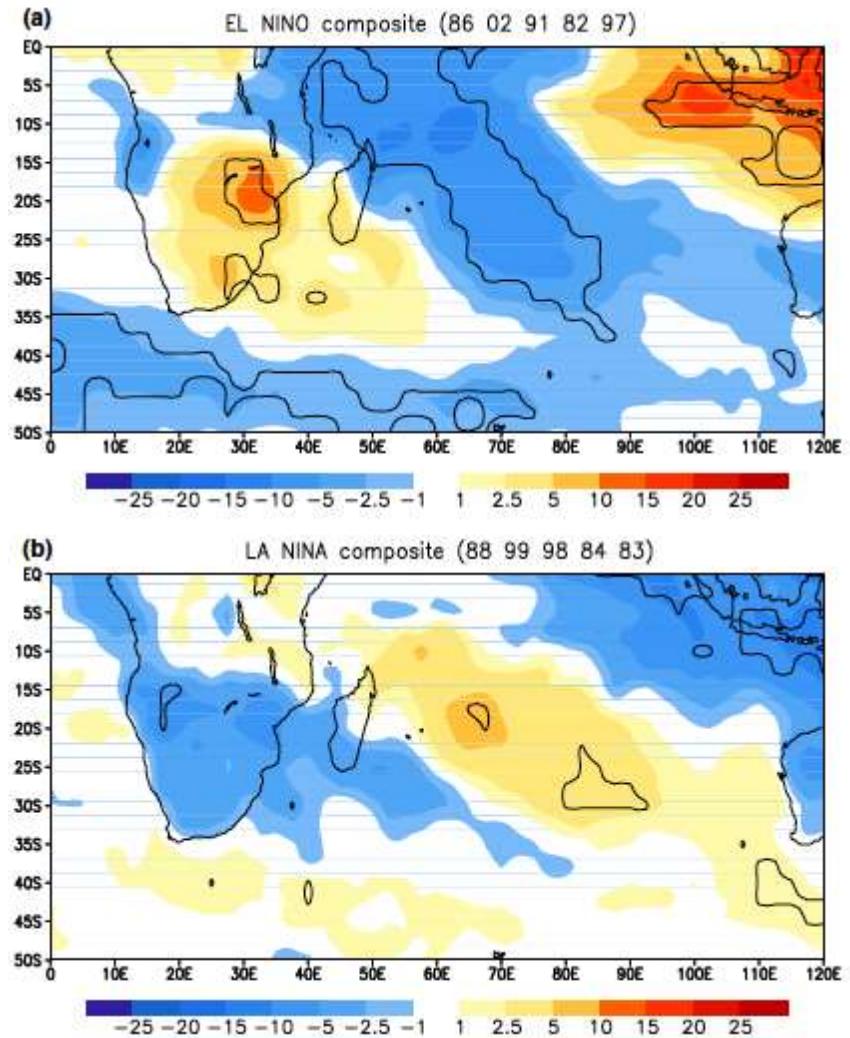
- **Seasonal:** fluctuations of the location and intensity of the ITCZ and the trade winds
- **Synoptic:** tropical cyclone, tropical temperate trough
- **Intraseasonal:** MJO



MJO animation from Adrian Matthews

Cloudiness variability: SWIO

- **Seasonal:** fluctuations of the location and intensity of the ITCZ and the trade winds
- **Synoptic:** tropical cyclone, tropical temperate trough
- **Intraseasonal:** MJO
- **Interannual:** ENSO



Faucherau et al. 2009

Cloudiness variability: Reunion

- meteorology driven by a combination of large/meso-scale and local-scale processes (land-sea breezes, slope winds, ...)

→ 3 typical weather situations
 1. dry trade-wind regime



Cloudiness variability: Reunion

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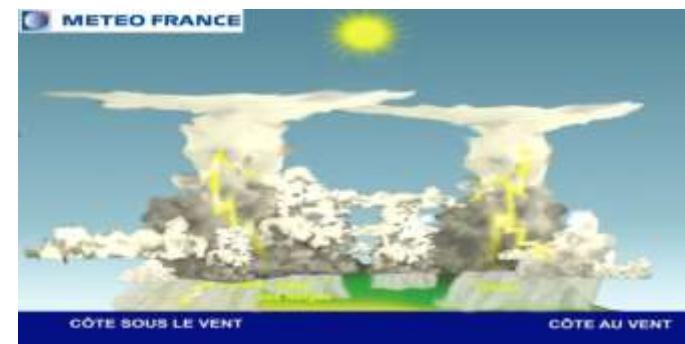
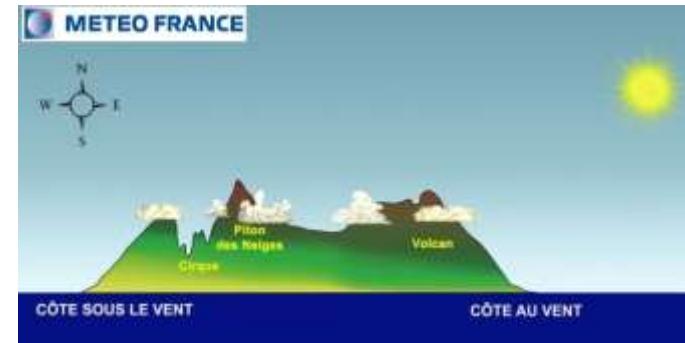
- 3 typical weather situations
 1. dry trade-wind regime
 2. humid trade-wind regime



Cloudiness variability: Reunion

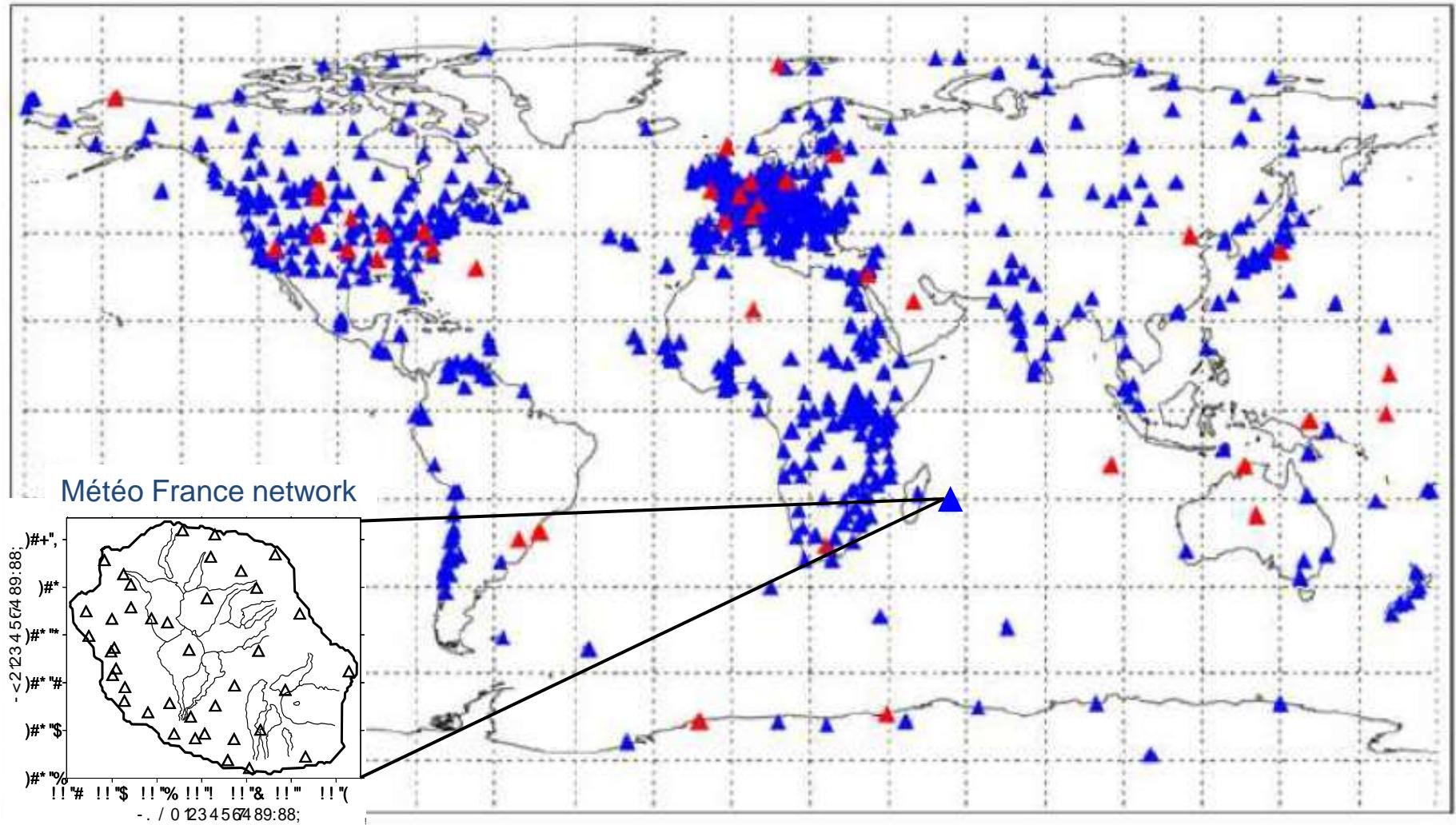
- meteorology driven by a combination of large/meso-scale and local-scale processes (land-sea breezes, slope winds, ...)

- 3 typical weather situations
1. dry trade-wind regime
 2. humid trade-wind regime
 3. convection over the topography



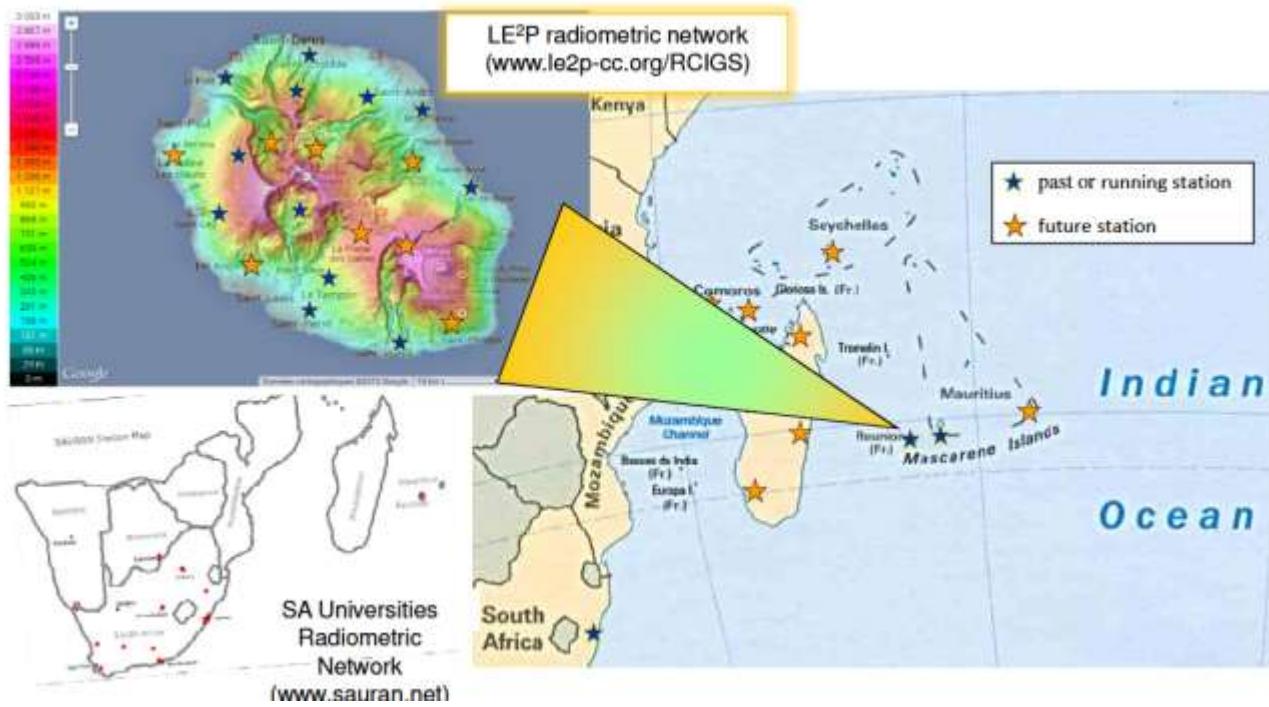
Surface radiative fluxes observations

GEBA and BSRN observation sites (Wild et al. 2013)



LE²P radiometric network

A typical station



basic station: global and diffuse solar irradiances (SPN1) + weather data (WXT520) every mn

location with altitude	2008	2009	2010	2011	2012	2013	2014	2015	2016											
	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4
Saint-Denis, campus (North, 90 m)																				
Saint-Denis, EDF site (North, 340 m)																				
Saint-André, EDF site (North East, 200 m)																				
Bras-Panon (East, 30 m)																				
Sainte-Rose (South East, 65 m)																				
Fournaise volcano (South East, 2585 m)																				
Saint-Joseph (South, 35 m)																				
Saint-Pierre, EDF site (South West, 75 m)																				
Le Tampon (Center, 555 m)																				
Cilaos (Center SW, 1215 m)																				
Saint-Leu, EDF site (West, 235 m)																				
Maido OSUR Observatory (Center W, 2165 m)																				
Le Port (North West, 20 m)																				
La Possession, EDF site (North West, 15 m)																				
South-Africa, Durban, UKZN campus																				
Maurice Island, MRT site																				
Rodrigues Island, MMS site																				
Mayotte Island																				
Central Africa (Congo basin)																				

set-up of 1st SPN1

LE²P ground-based solar stations

set-up of suntracker

station belonging to BIRA-IASB

SAURAN network station

SAURAN network station

SAURAN network station

2017

Quality Control

Calibration

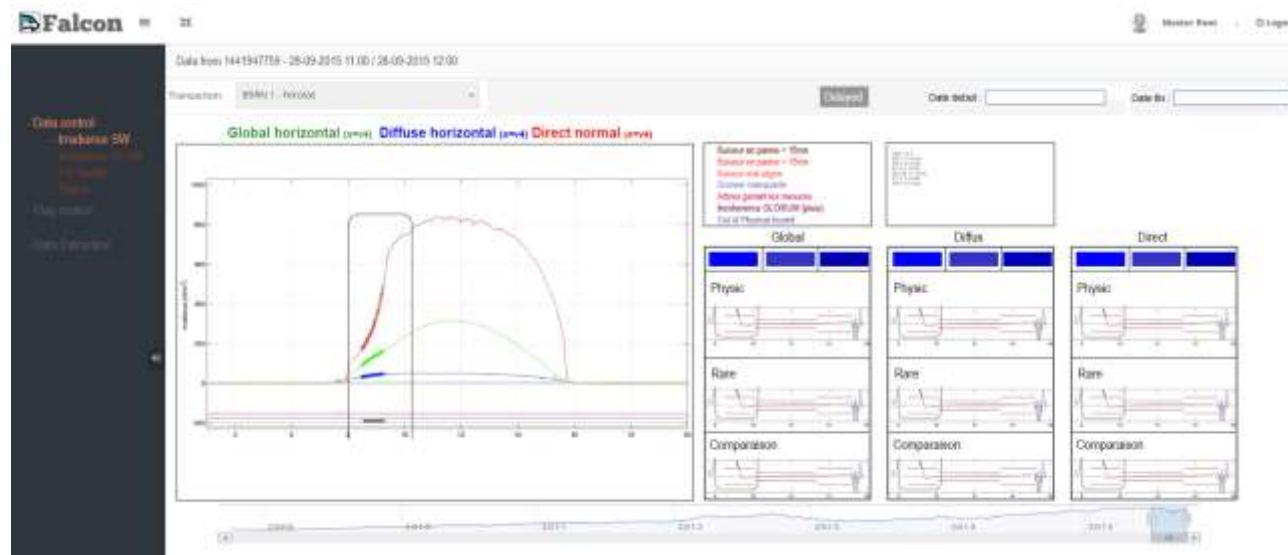


9060/9846/9847/17025

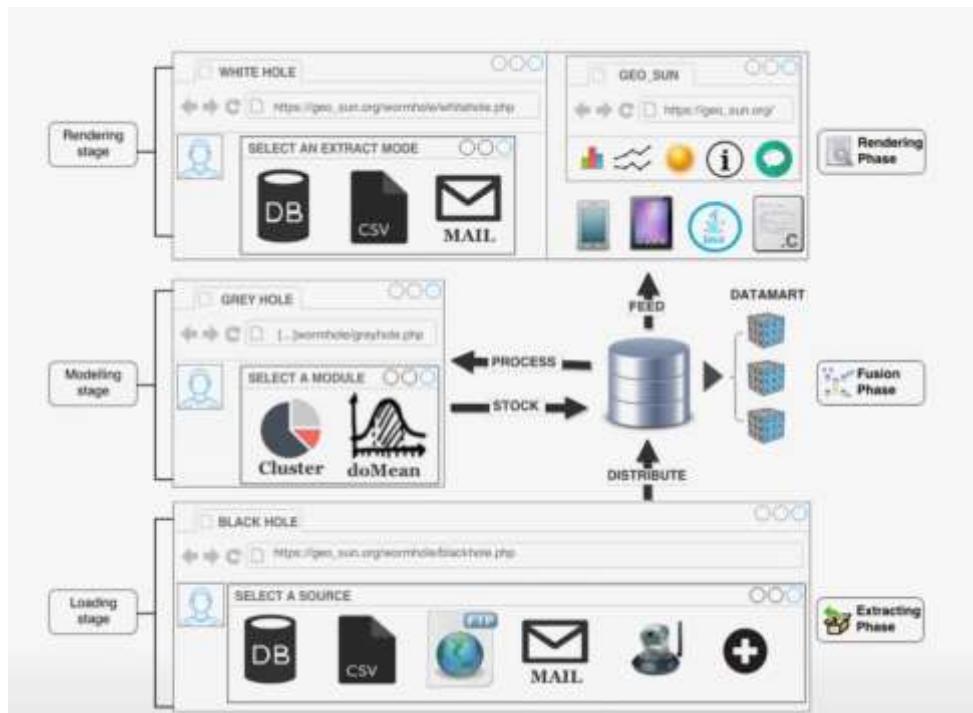


Indoor calibration

Outdoor calibration



DWH





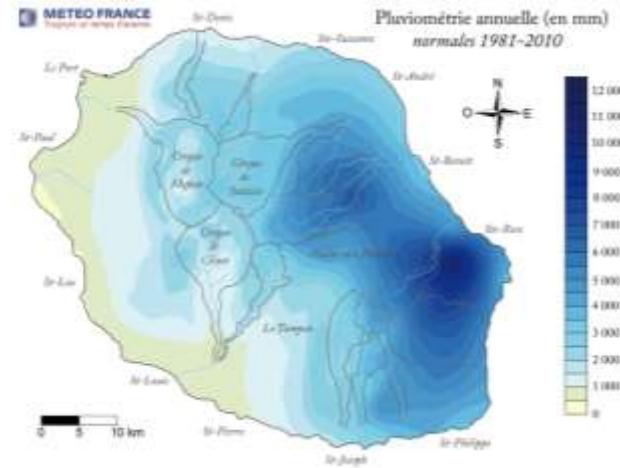
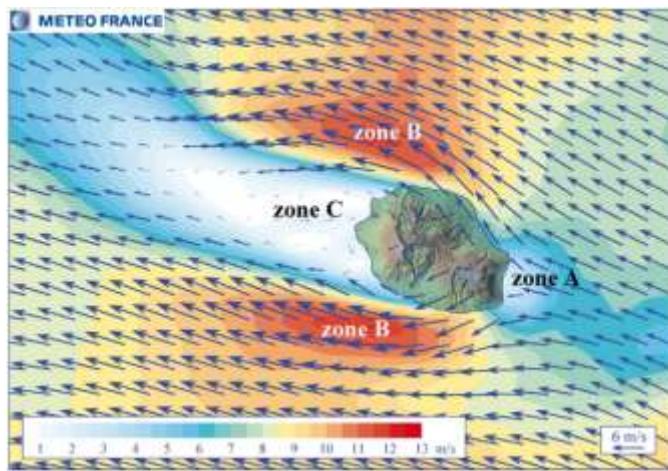
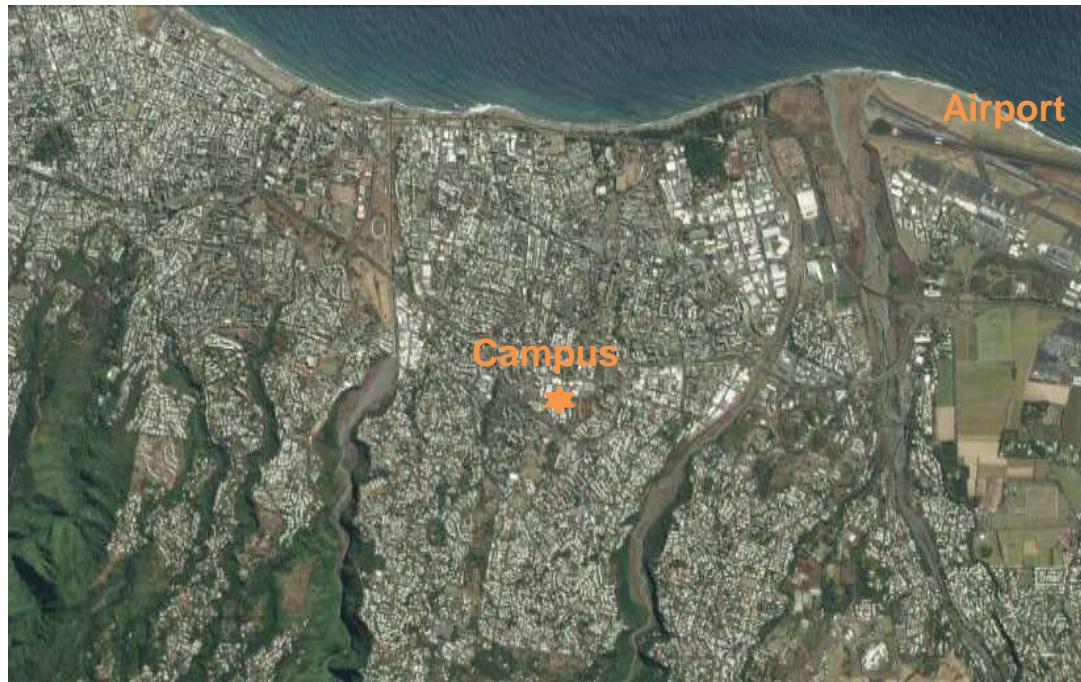
SOLYS Gear Drive

New BSRN site proposal

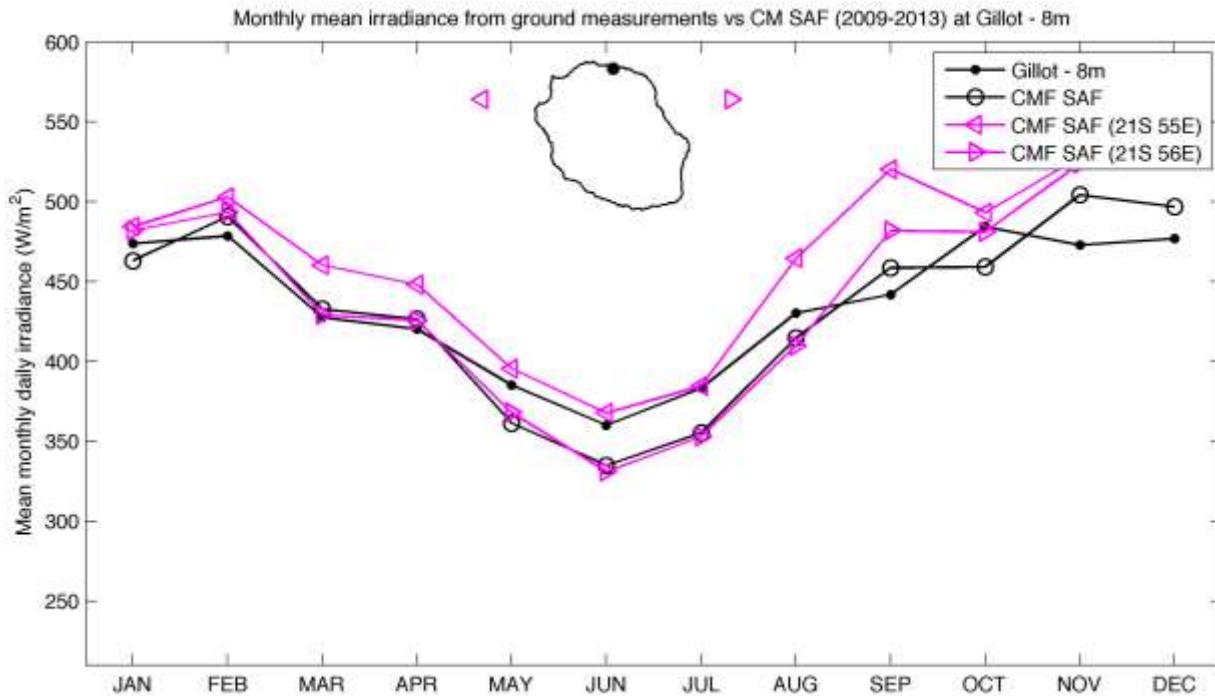


SW **245°** **W** **295°** **NW** **N** **NE** **65°** **E** **115°** **SE**
7.4° **3.3°** **6.3°**

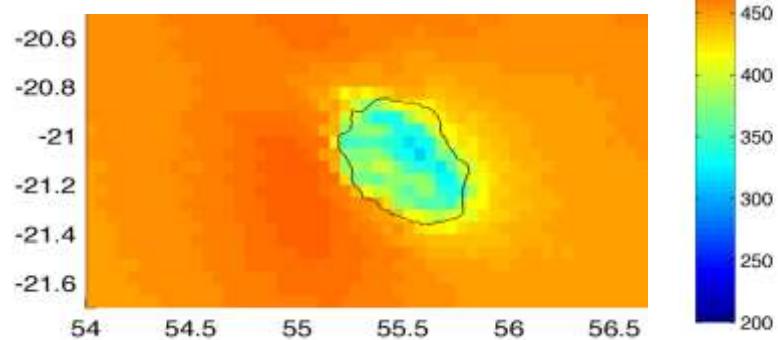
New BSRN site proposal



New BSRN site proposal

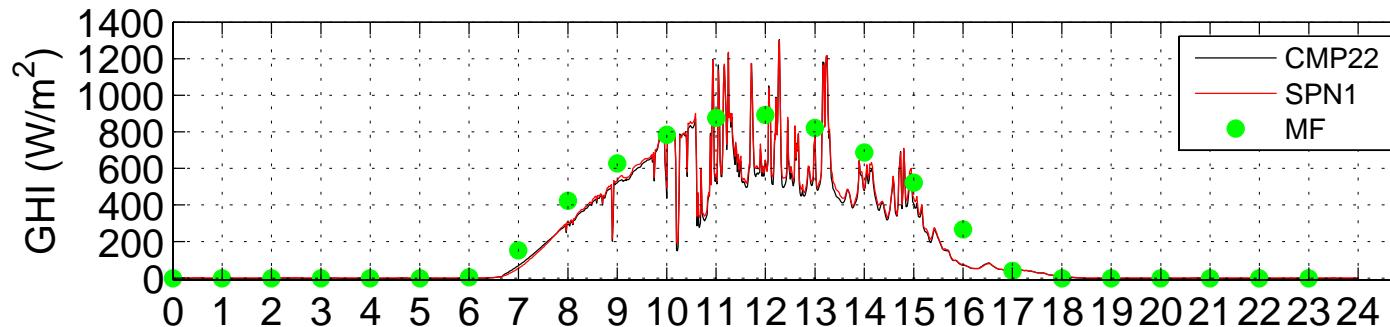


CM SAF annual mean irradiance (W/m² from hourly mean values) for 2009-2013

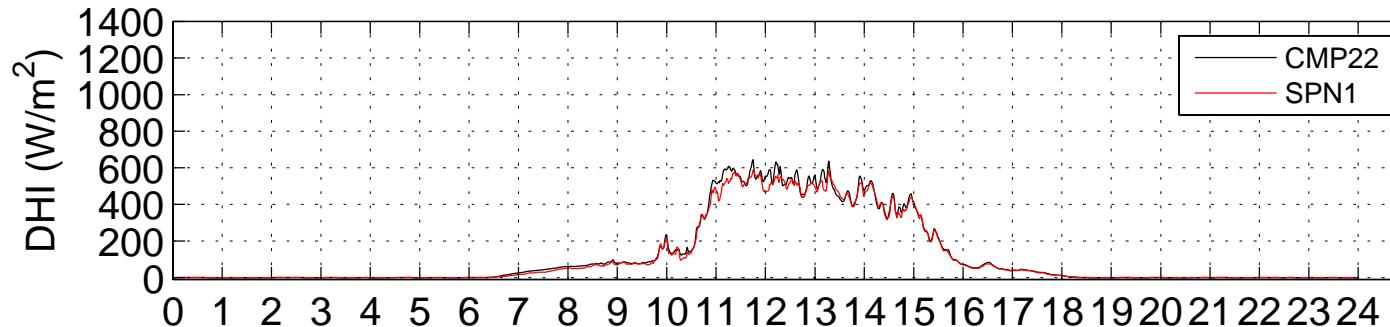


Very first measurements...

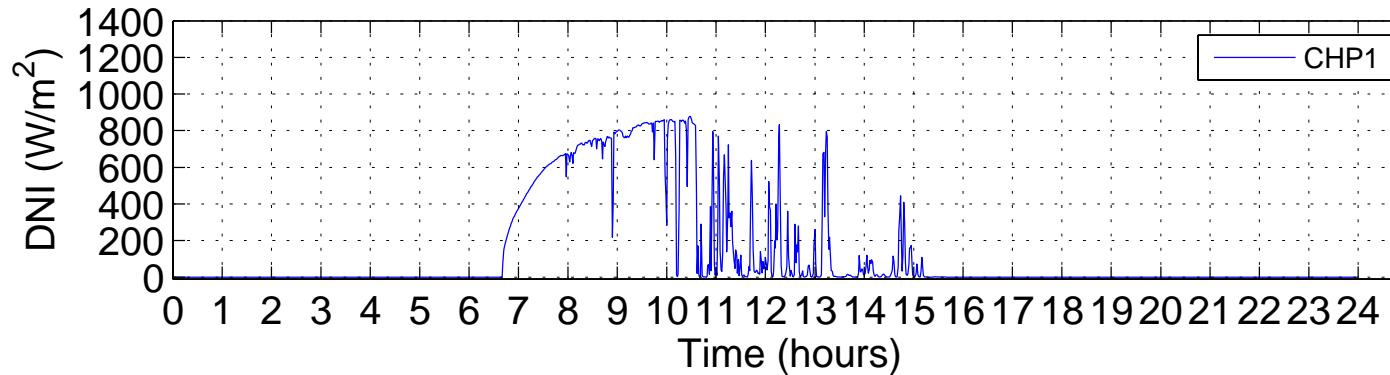
April 11, 2016



mean bias = -3.6%



mean bias = +5.2%



Conclusion and perspectives

- Proposed measurement site at (21°8'S;55.5°E) in a climatic zone not covered by existing operational sites
- Proposed measurement site collocated with routine upper-air soundings and basic meteorological instrumentation (OPAR – Météo France)
- Very first measurements performed that need to be carried on; installation of CGR4
- Extension of the station? European Regional Development Fund project BSRN@Reunion

