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

- **Non Permanent Staff (2015):** 32
  - 18 (PhD Students) + 2 (Post-Doc) + 12 (Admin. + Eng. + Tech. Ass.)
Introduction
Introduction

Electricity distribution grid over Reunion

Energy mix:
- Fossil fuel: 53%
- Biomass: 18%
- Hydropower: 15%
- Solar PV: 12%
- Wind power: 2%
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

Long-term variations

RCM (RegCM, WRF)

Hourly-to-daily forecast
Cloudiness variability: SWIO

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

http://www.meteofrance.re/climat/pedagogie/situations
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

http://www.meteofrance.re/climat/pedagogie/situations
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

http://www.meteofrance.re/climat/pedagogie/situations
Surface radiative fluxes observations

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

LE2P radiometric network

**LE2P ground-based solar stations**

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<td>Sainte-Rose (South East, 65 m)</td>
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<td>Le Tampon (Center, 555 m)</td>
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<td>Cilaos (Center SW, 1215 m)</td>
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<td>Central Africa (Congo basin)</td>
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- **set-up of 1st SPN1**
- **set-up of suntracker**

- station belonging to BIRA-IASB
- SAURAN network station
- SAURAN network station
- SAURAN network station

**Note:** The table shows the setup of LE2P ground-based solar stations from 2008 to 2016, with each row representing a different location and each column representing a year. The setup details are indicated by different colors and symbols.
Calibration

Indoor calibration

Outdoor calibration

Quality Control

DWH
New BSRN site proposal
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°8S;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