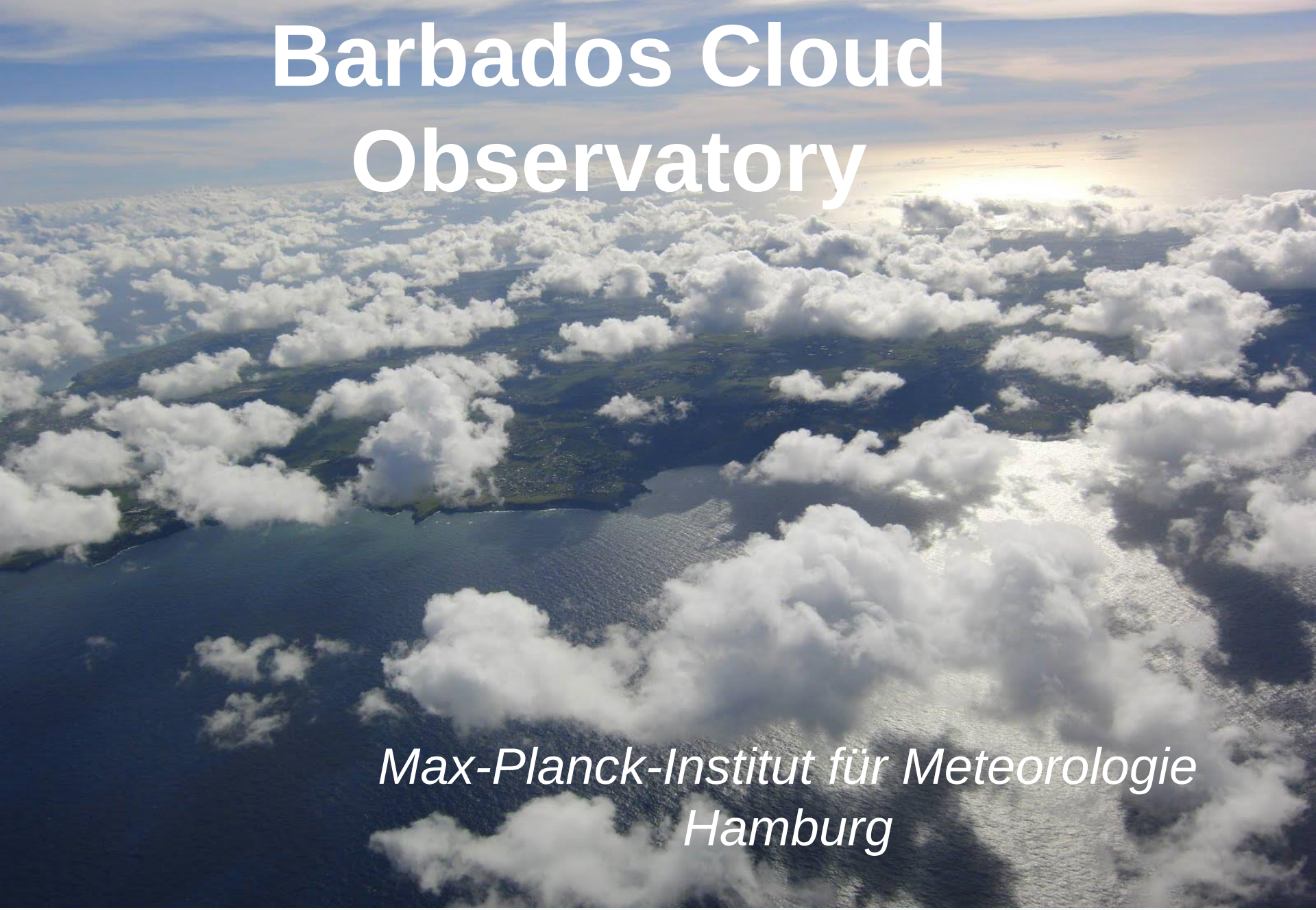
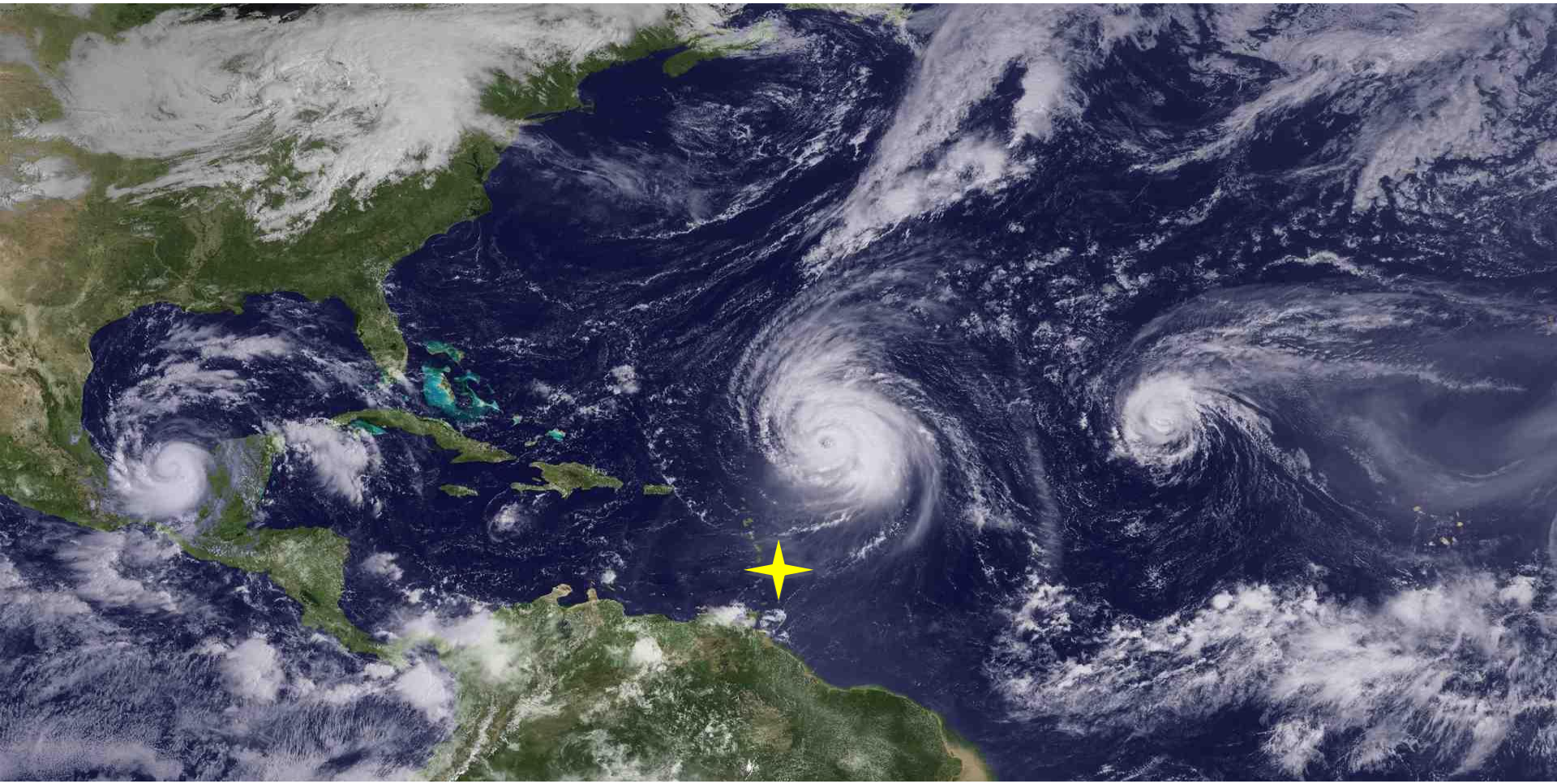
Barbados Cloud Observatory



Max-Planck-Institut für Meteorologie
Hamburg

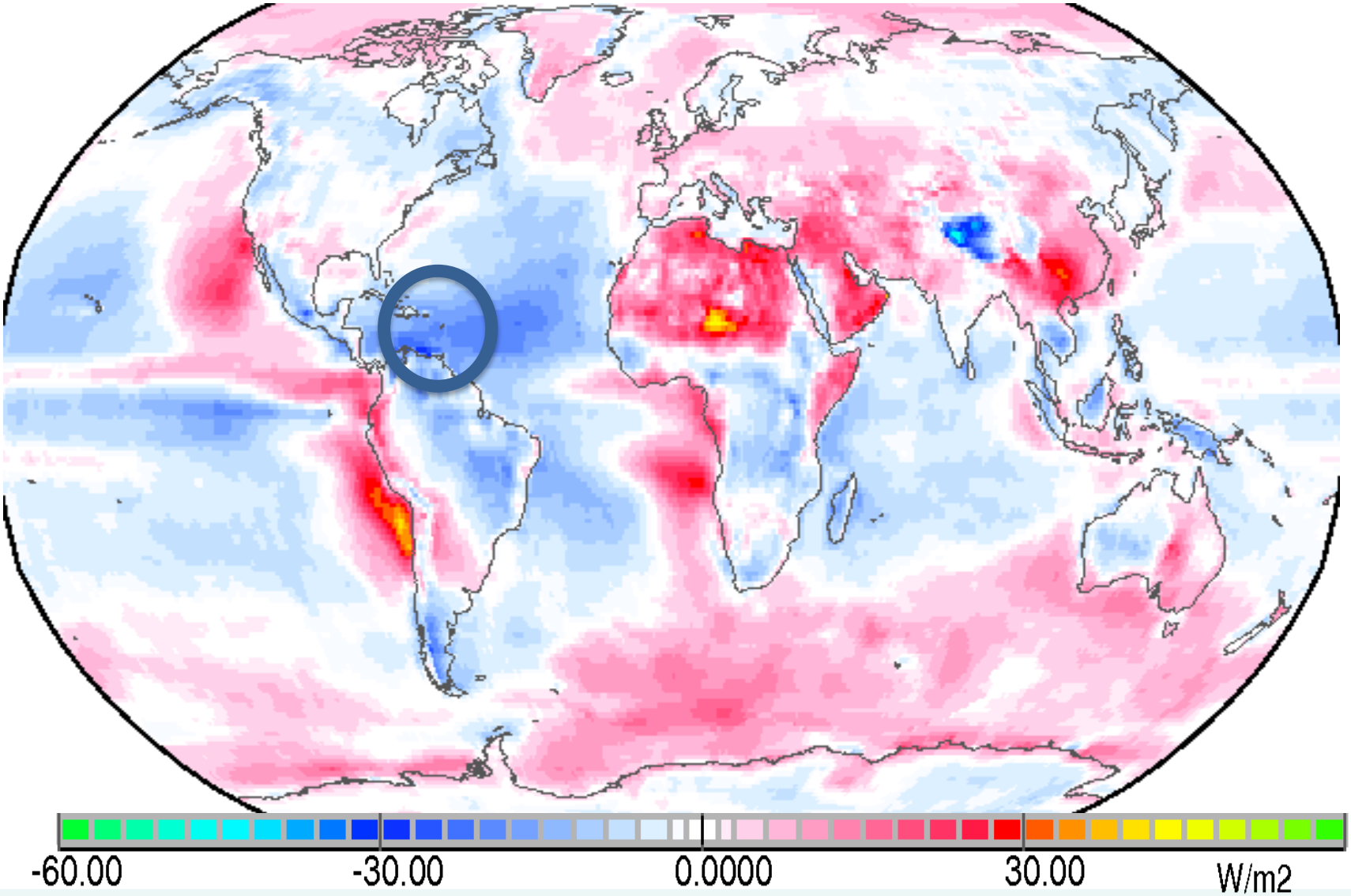
Barbados ?

in the tropics over the oceans !



objective: **long-term obs. of trade-wind cumulus**

model biases in TOA budget

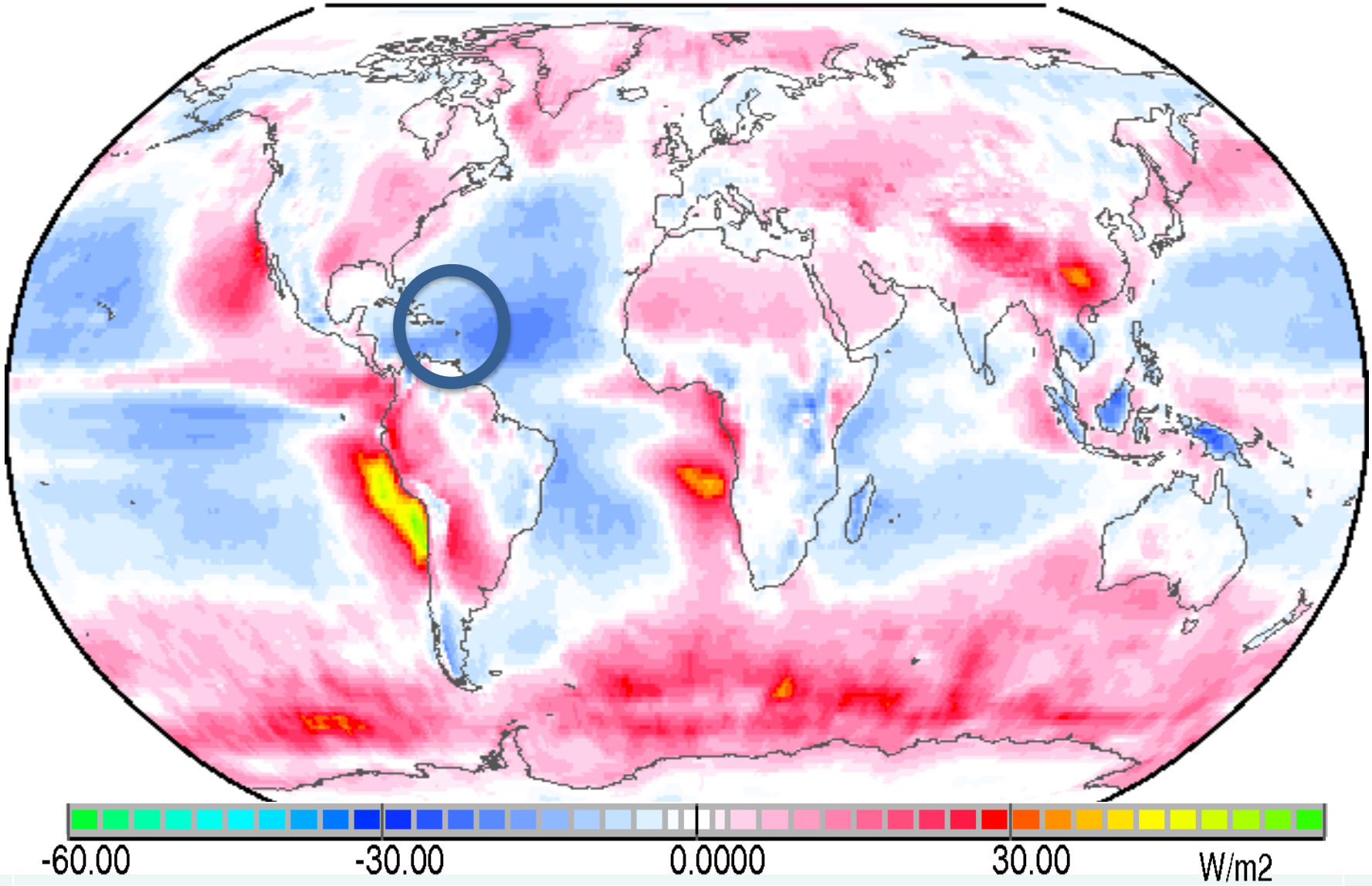


← MORE energy losses to space LESS →

clouds in global modeling

- **larger problems over oceans** (fewer obs)
- **mainly a low altitude cloud problem**
- **underestimates** of cloud rad. effects
  - **stratocumulus** off west continents (cold waters)
  - **high latitudes (SH!)** *(- lack of supercooled water)*
  - over **central China**
- **overestimates** of cloud rad. effects
  - over tropical oceans (e.g. **trade wind cumulus**)

more losses? clouds too bright !



← brighter clouds darker →

trade-wind cumulus

- **short lifetime** (hours)
- **often optically thin**
- **often top sheared**

what is being done

- **better models**
  - **higher resolution** (still +50km in global models)
  - **improved parameterizations from process understanding with high res. local models**

    → ***need for better & detailed data***
- **new observations**
  - **active remote sensing (radar and lidar)**
    - **from space (Cloudsat, Calispso, EarthCare …)**
    - **long-term ground observations (DOE & Barbados)**

The MPI-Barbados ‘colony‘

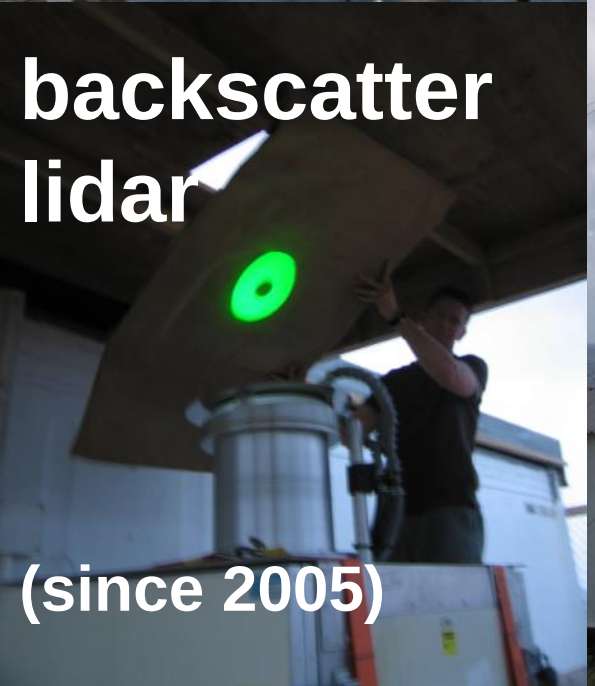
Barbados - cloud & environment monitoring

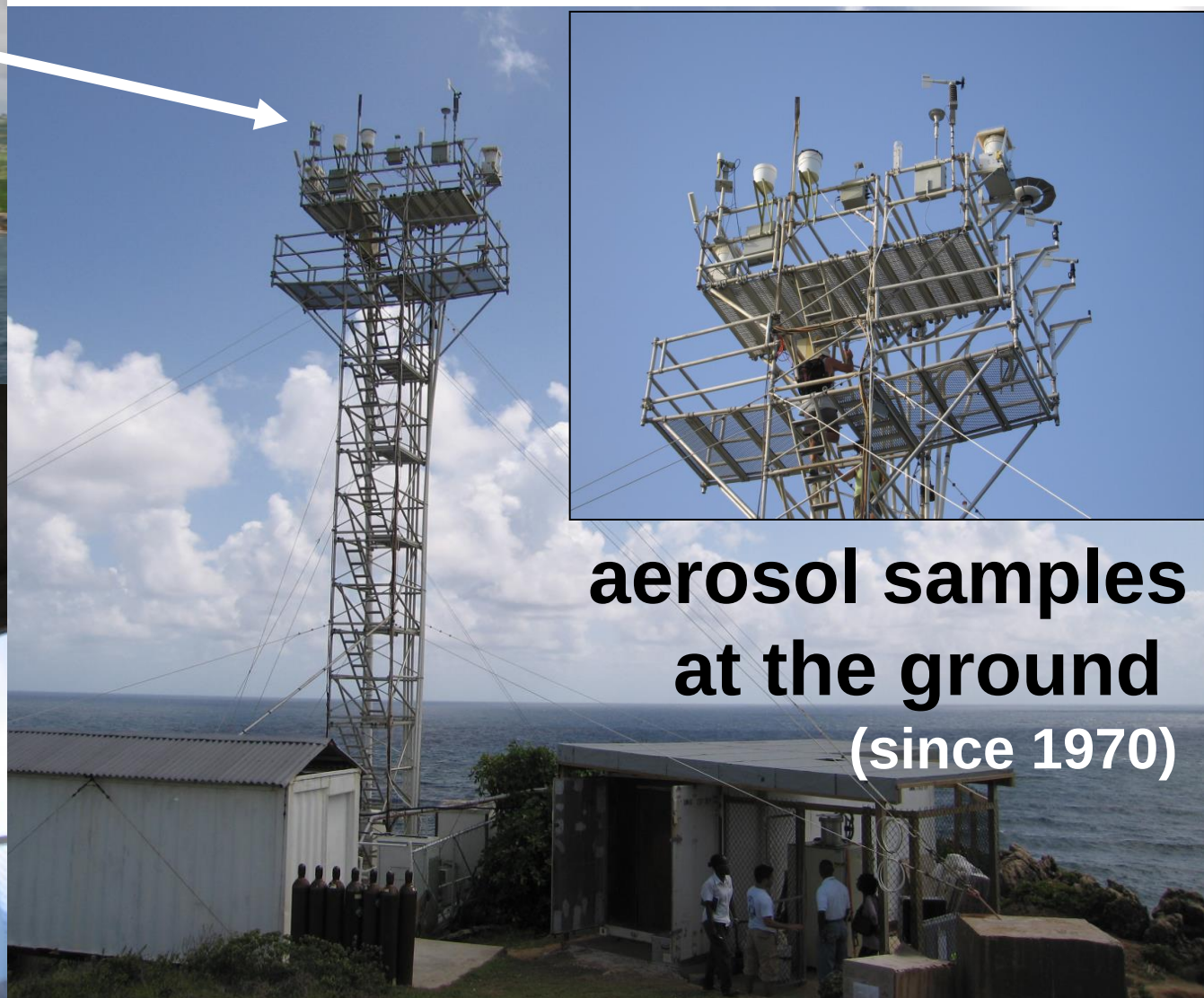
- **35 GHz radar** (vertical, no scan anymore)
- **RAMAN lidar** (aerosol, T, vapor-night)
- **wind lidar** (vertical wind)
- **microwave rain radars**
- **ceilometer** (Jen-Optik)
- **cloud camera**
- **BB-radiation** **(since 2015)**

- plus existing instruments at ‘Ragged Point’
  - AERONET sun-photometer, MPL-lidar, tower, ground in-situ sampling (40yrs dust deposition)

‘ragged point’ site

NOAA / NASA





Barbados site (BCO)

in operation since April 2010

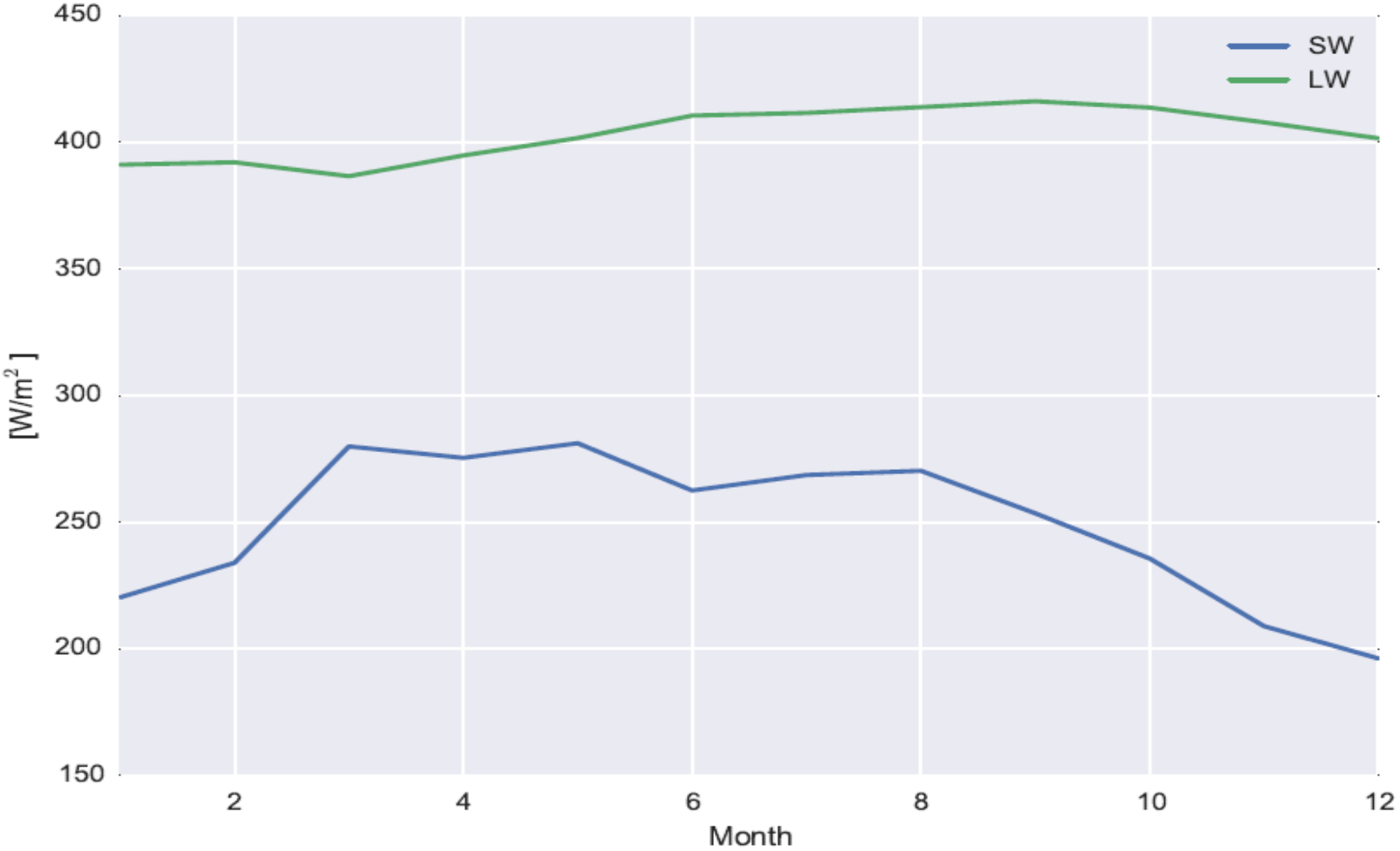
Barbados Cloud and radiation Observatory

BB radiation

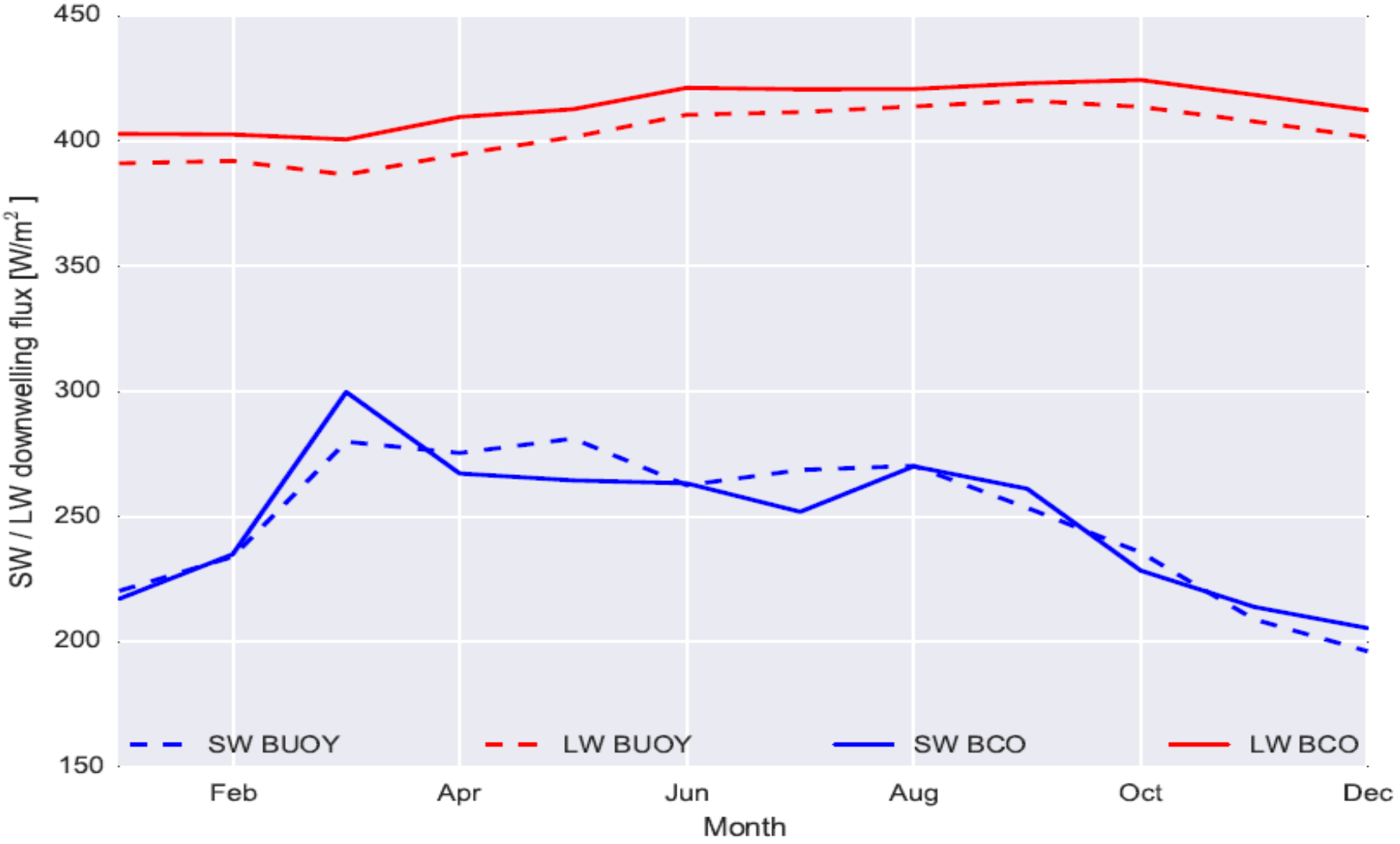
- std KIPP and ZONEN instrumentation
  - pyrheliometer
  - pyranometer
  - pyranometer shaded
  - pyrgeometer

- now (Apr 2016) data for an entire year
  - compare monthly averages !

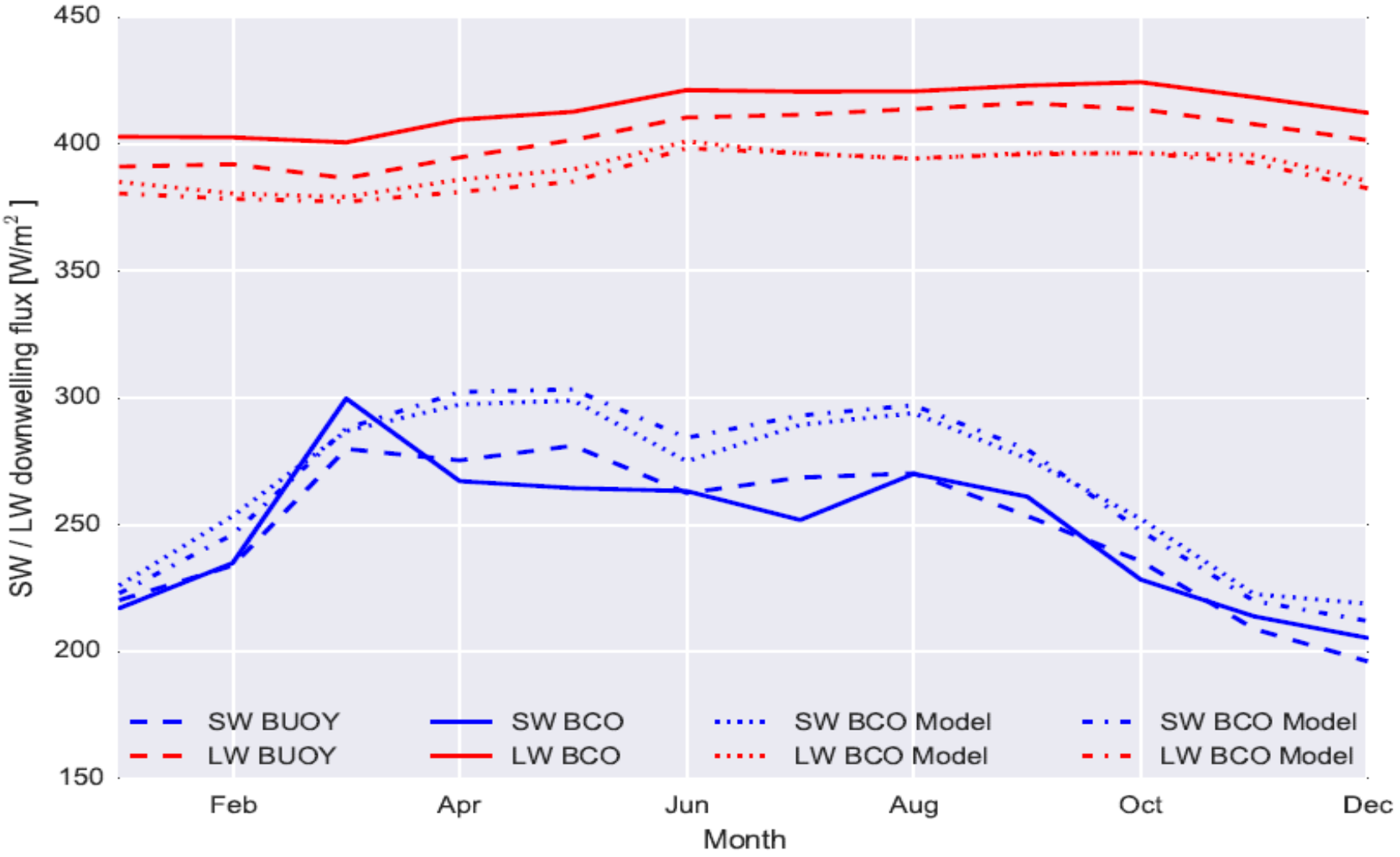
NOAA (15N / 51W)



NOAA vs Barbados (BCO)



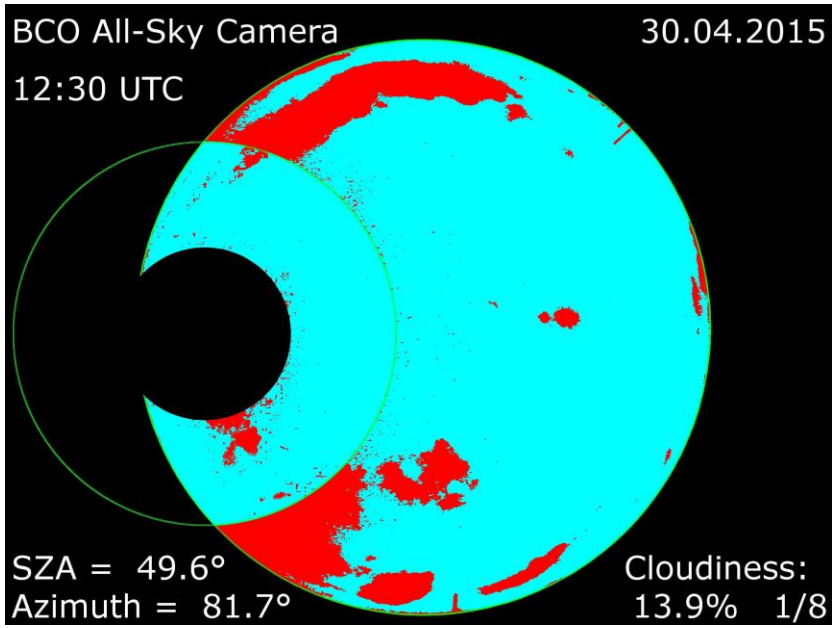
NOAA and BCO vs simple modeling



clouds and radiation

identify clouds (outside sun direction)

… and link observed cloud-fields to radiation



Curren


BCO All-Sky Camera
30.04.2015
14:10 UTC
SZA = 25.5°
Azimuth = 83.2°
Cloudiness:
0.8% 0/8
2015:04:30 14:10:06
SZA = 54.3°
Azimuth = 279.0°
Cloudiness:
70.2% 6/8
2015:04:30 19:39:06
Max-Planck-Institut für Meteorologie

Altitude in m
Global Irrad. in W/m²
Cloudiness in %
UTC Time
10:03
11:03
12:03
13:03
14:03
15:03
16:03
17:03
18:03
19:03
20:03
21:03

Barbados: a BSRN site ? !

- site name
  - site description info (barbados.zmaw.de) ?
  - naming of site (suggest '**BCO**') ?
- data
  - how to prepare data (conversion) ?
  - how quickly available (within days? months?)
  - regular calibration,,, if yes: how?
  - ancillary data (met data …) ?