

# The climate monitoring SAF at RMIB: current and future activities

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# What are we going to talk about...

## Overview

Introduction

RMIB contribution

In the future

Acknowledgments

- ★ Introduction, the CMSAF:
  - ▶ why,
  - ▶ what,
  - ▶ who, and
  - ▶ how ?
- ★ RMIB contribution:  
*the CMSAF TOA "pipes".*
- ★ In the future.



# Why ? The CMSAF goal.

Overview

Introduction

❖ why

❖ what

❖ who

❖ how

RMIB contribution

In the future

Acknowledgments

Providing data to monitor and study climate changes.  
(as simple as it is named...)

# What (kind of data is relevant) ?

Overview

Introduction

❖ why

❖ what

❖ who

❖ how

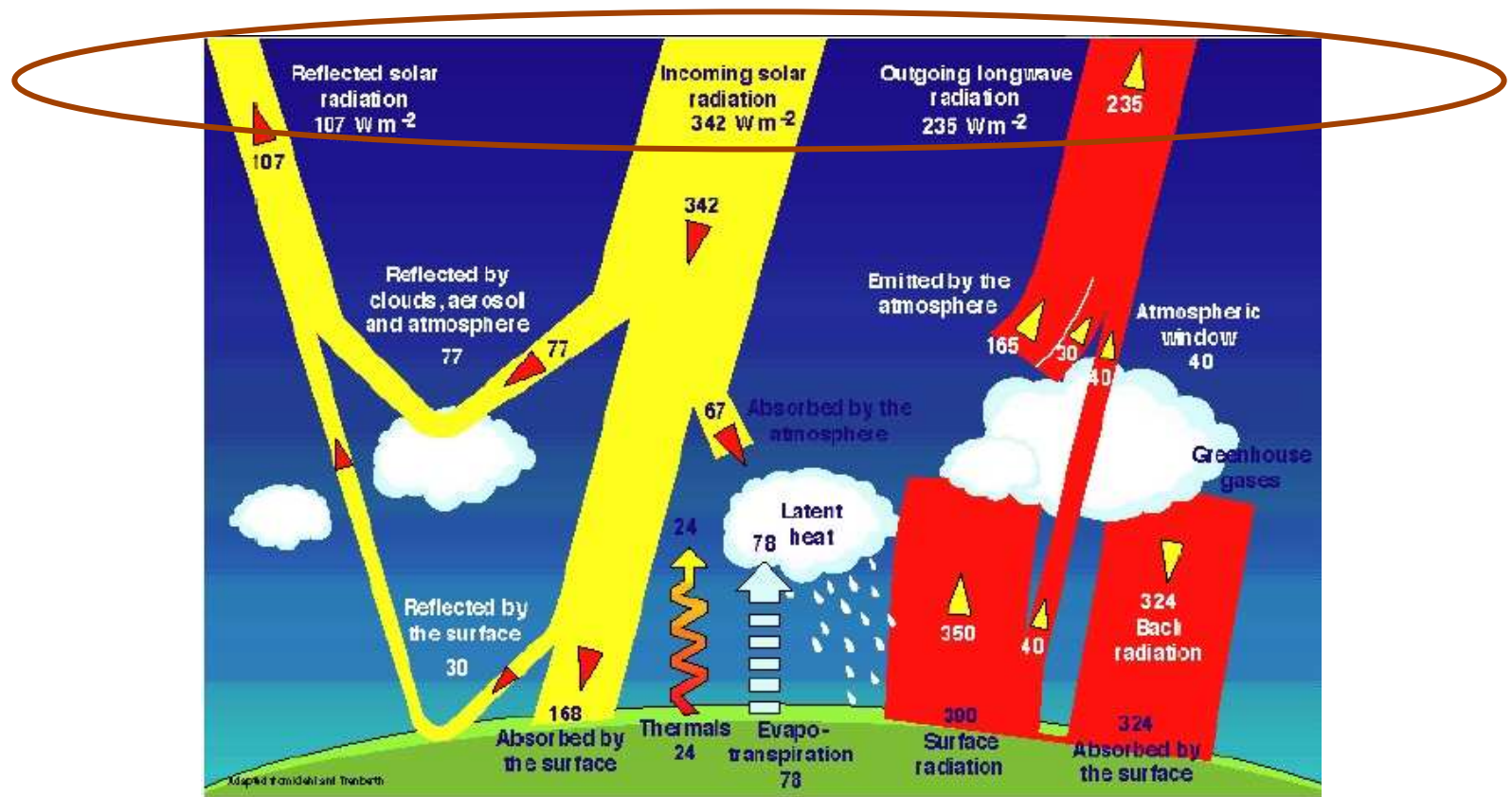
RMIB contribution

In the future

Acknowledgments

## Top of the Atmosphere Radiation

### Incoming Solar Radiation, Outgoing Reflected and Emitted Radiations



# What (kind of data is relevant) ?

Overview

Introduction

❖ why

❖ what

❖ who

❖ how

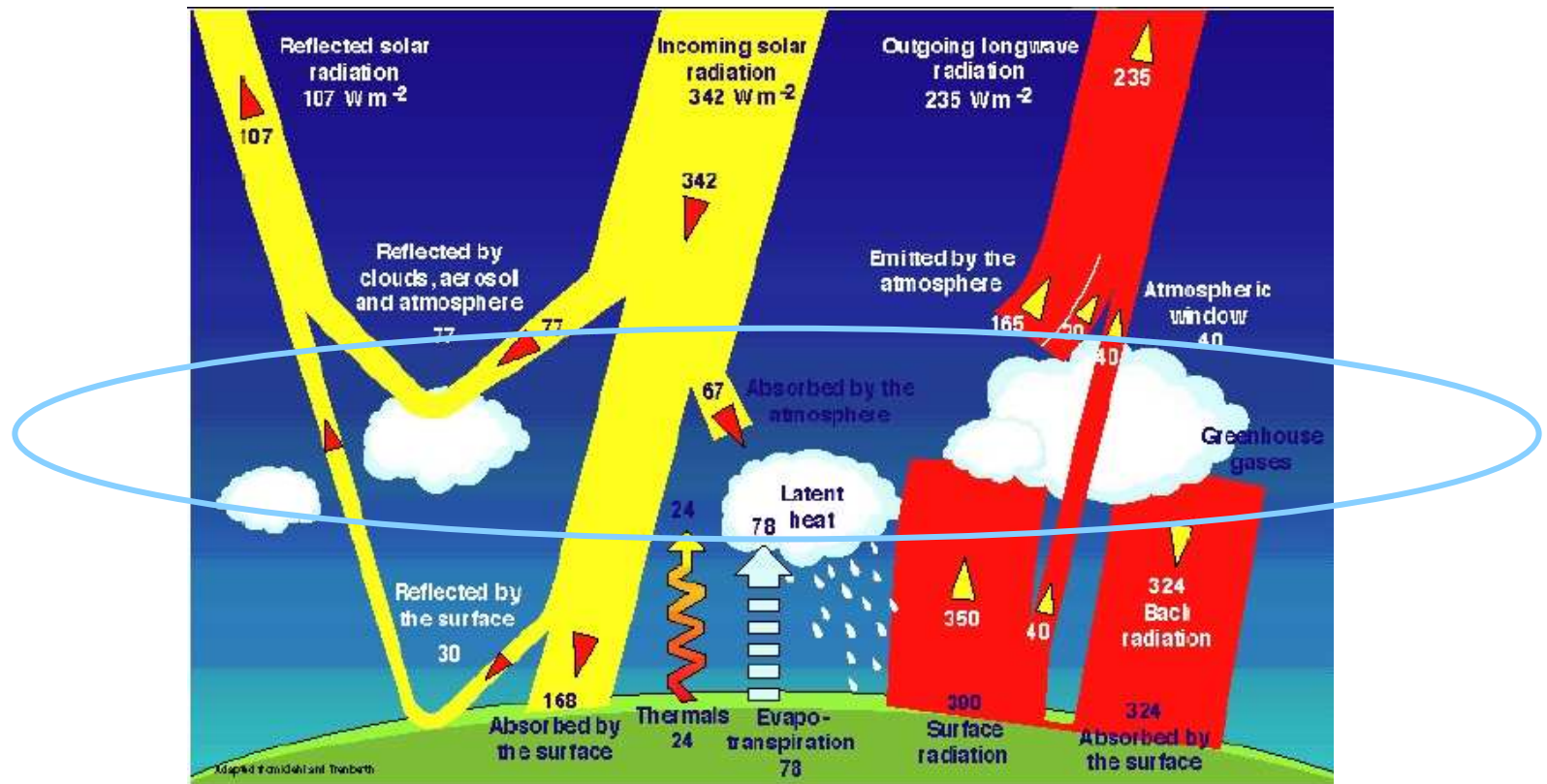
RMI contribution

In the future

Acknowledgments

## Atmosphere Interactions

Could Properties, Relative Humidity...



# What (kind of data is relevant) ?

Overview

Introduction

❖ why

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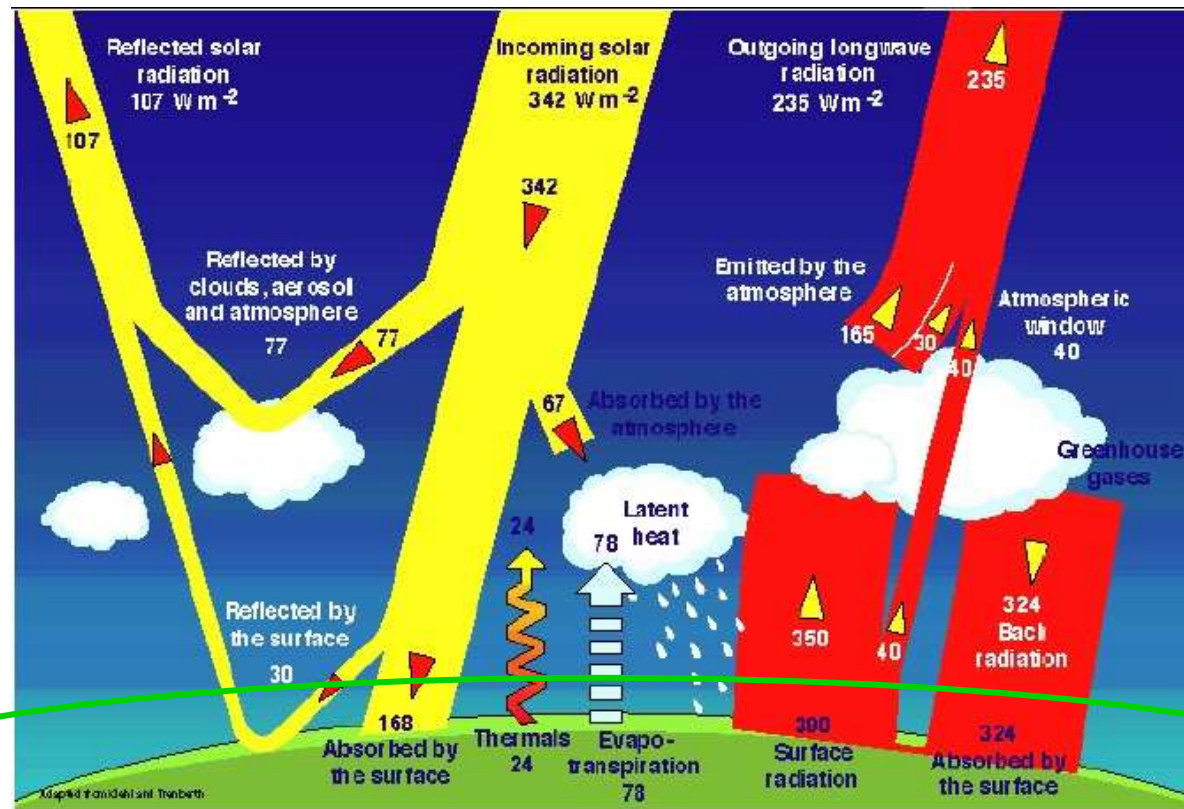
RMIB contribution

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Acknowledgments

## Surface Radiations

### Albedo, Incoming and Outgoing Radiations, Budget...



# Who (are the CMSAF members)?

Overview

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Introduction

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❖ why

❖ what

❖ who

❖ how

RMI contribution

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In the future

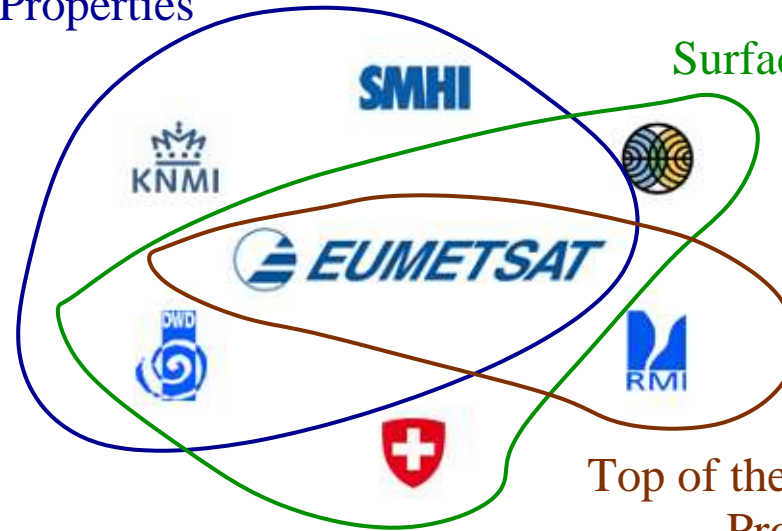
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Acknowledgments

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Cloud Properties

Surface Properties



Top of the Atmosphere Properties

# How (do we get data) ?

Overview

Introduction

- ❖ why
- ❖ what
- ❖ who
- ❖ **how**

RMIB contribution

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Acknowledgments

Data are coming from satellite measurements:

- ★ Surface Properties/Radiations:  
SEVIRI/MSG, AVHRR/NOAA, GERB/MSG
- ★ Clouds Properties:  
SEVIRI/MSG , AVHRR/NOAA, ATOVS/NOAA
- ★ TOA Properties:  
GERB/MSG, SEVIRI/MSG, CERES/TERRA,  
DIARAD/SOHO.



# RMIB contribution (in details): the CMSAF TOA "pipes"

Overview

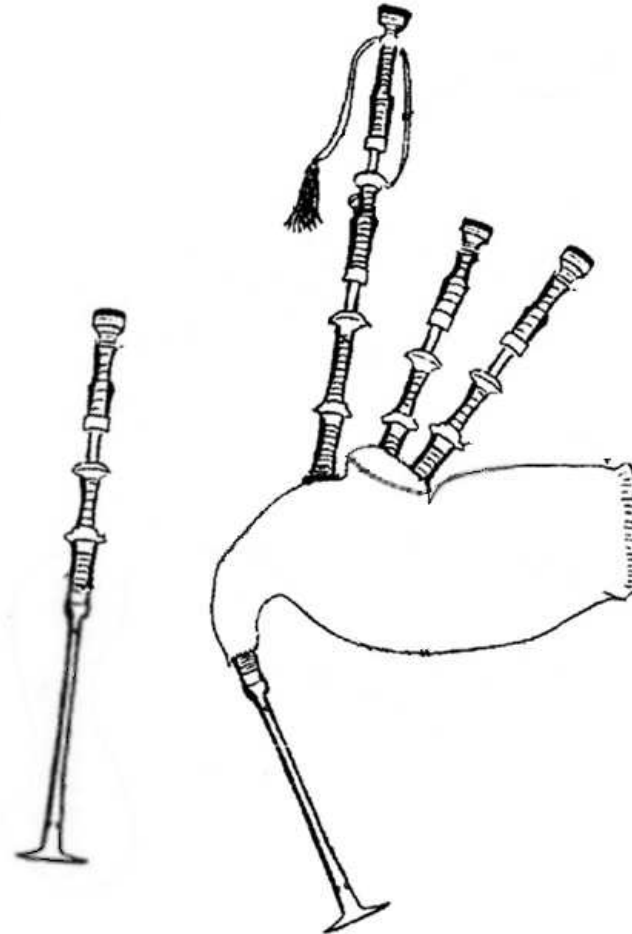
Introduction

**RMIB contribution**

- ❖ measurements
- ❖ time resolution
- ❖ TIS
- ❖ TET/TRS
- ❖ missing data
- ❖ Projection
- ❖ Merger

In the future

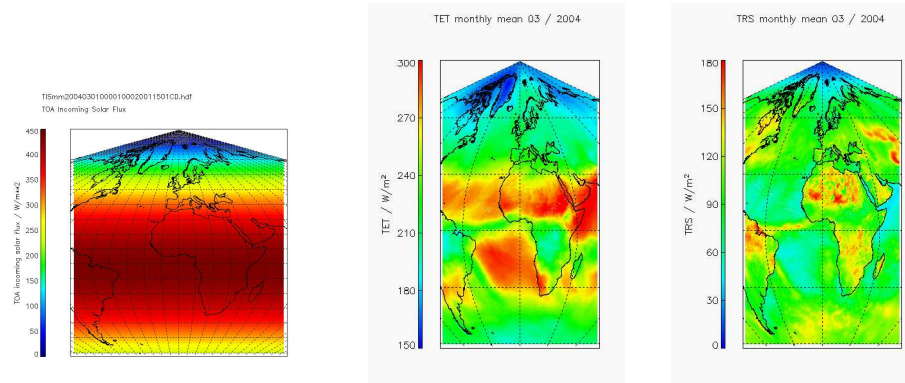
Acknowledgments



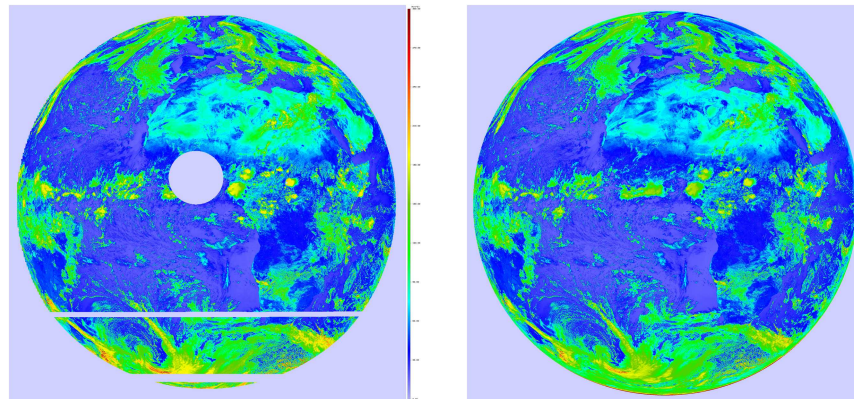
# What kind of data are we providing ?

We provide:

- ★ 3 main products: Total Incoming Solar (TIS), Total Emitted Thermal (TET) and Total Reflected Solar (TRS) radiations.



- ★ 2 inter-CMSAF data: albedo at the TOA from GERB and GERB-like data (Meteosat-8 resolution)



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# What kind of data are we providing ?

Overview

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RMIB contribution

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❖ **time resolution**

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In the future

Acknowledgments

Data are provided according 3 time averages:

- ★ Monthly Mean (MM)
- ★ Daily Mean (DM)
- ★ Monthly Mean Diurnal Cycle (MD)

# Let's play TIS (Total Incoming Solar) radiations

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RMIB contribution

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❖ TET/TRS

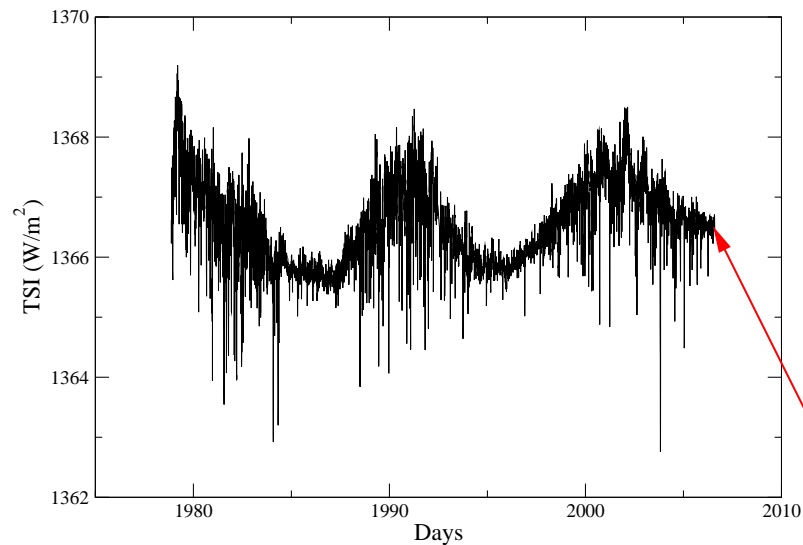
❖ missing data

❖ Projection

❖ Merger

In the future

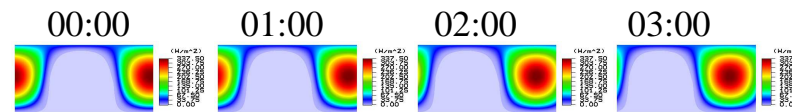
Acknowledgments



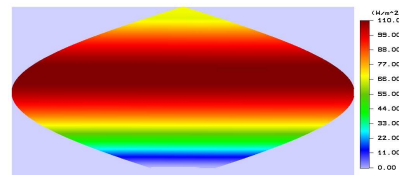
TSI serie

1 measurement a day

20th April 2006



Intermediate process on Lat/Lon grid



Monthly Mean April 2006

# And now the rest of the band...

Overview

Introduction

RMIB contribution

❖ measurements

❖ time resolution

❖ TIS

❖ **TET/TRS**

❖ missing data

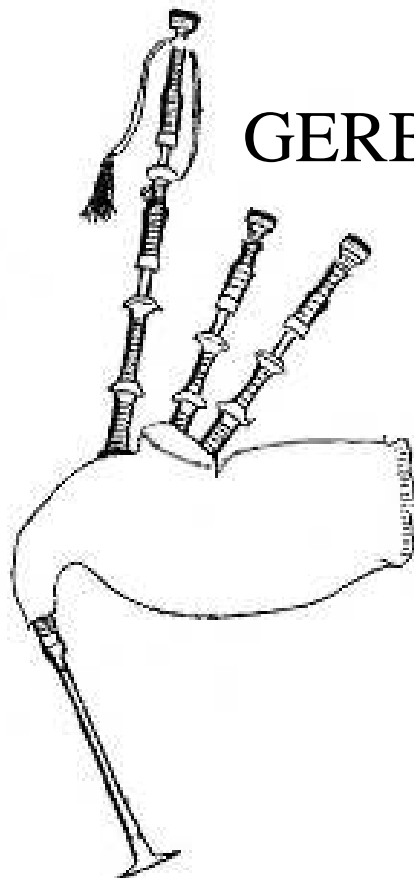
❖ Projection

❖ Merger

In the future

Acknowledgments

CERES



GERB

GERB\_LIKE  
(MSG)

TOA CMSAF

# GERB data

Overview

Introduction

RMIB contribution

❖ measurements

❖ time resolution

❖ TIS

❖ TET/TRS

❖ missing data

❖ Projection

❖ Merger

In the future

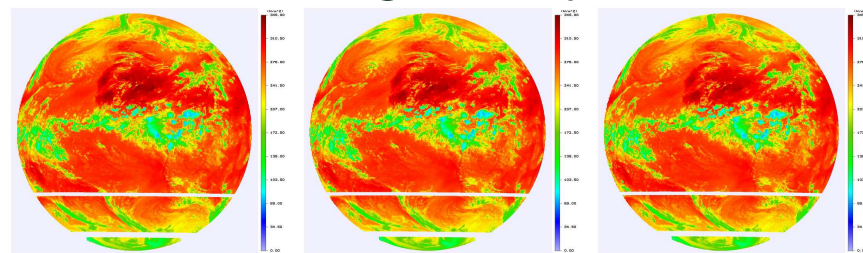
Acknowledgments

GERB (1 or 2) instrument is carried by Meteosat(9 or 8) satellite: geostationary → limited covered area

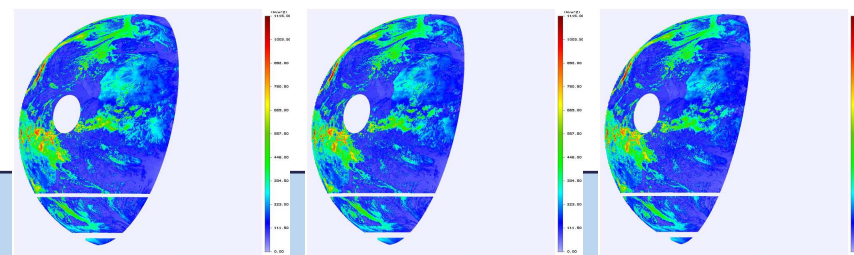


Time resolution: one image every 15 minutes.

Longwave

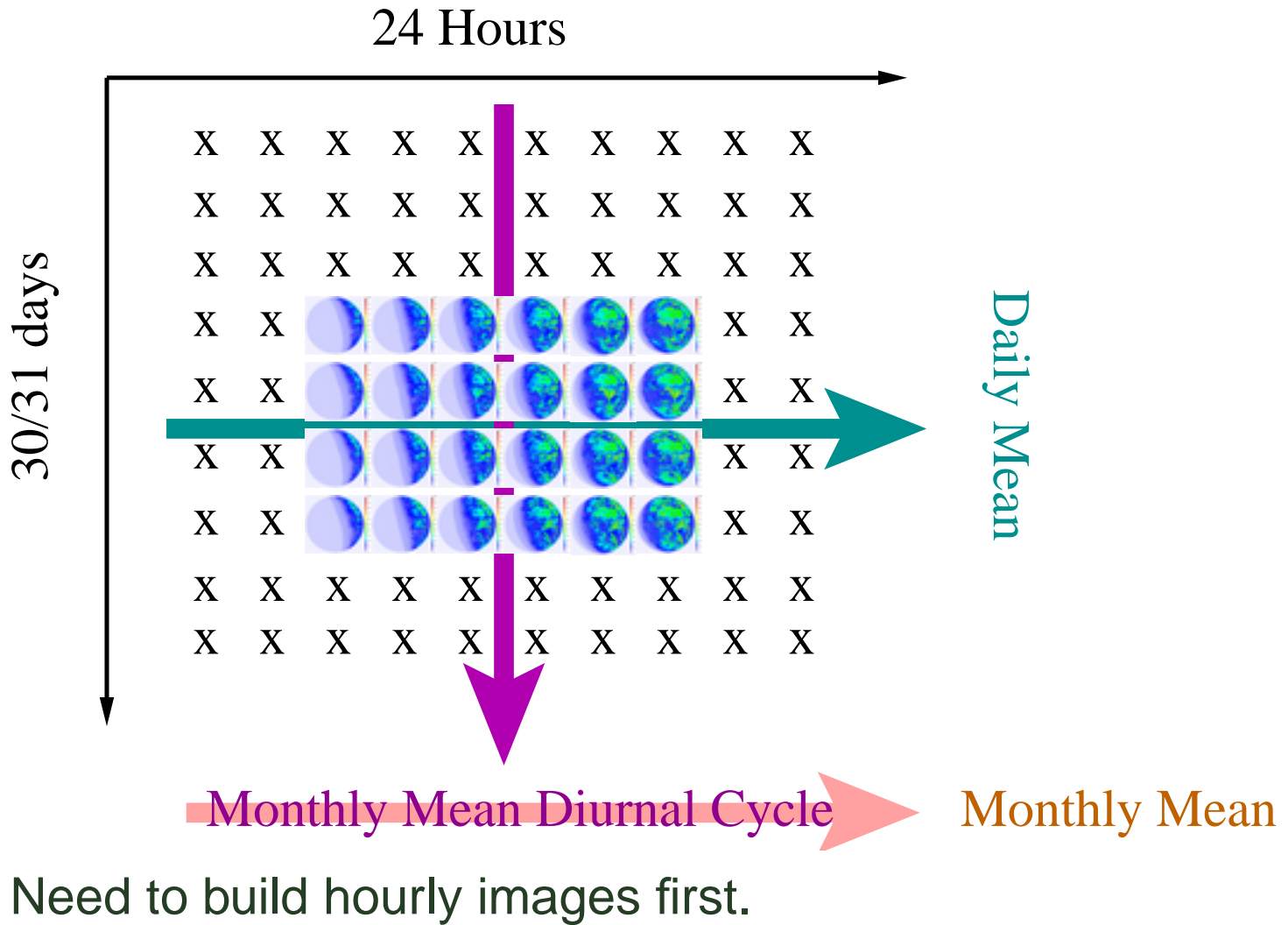


Shortwave



# Averaging

- Overview
- Introduction
- RMIB contribution
  - ❖ measurements
  - ❖ time resolution
  - ❖ TIS
  - ❖ TET/TRS
  - ❖ missing data
  - ❖ Projection
  - ❖ Merger
- In the future
- Acknowledgments



# How to get (proper) hourly data ?

Overview

Introduction

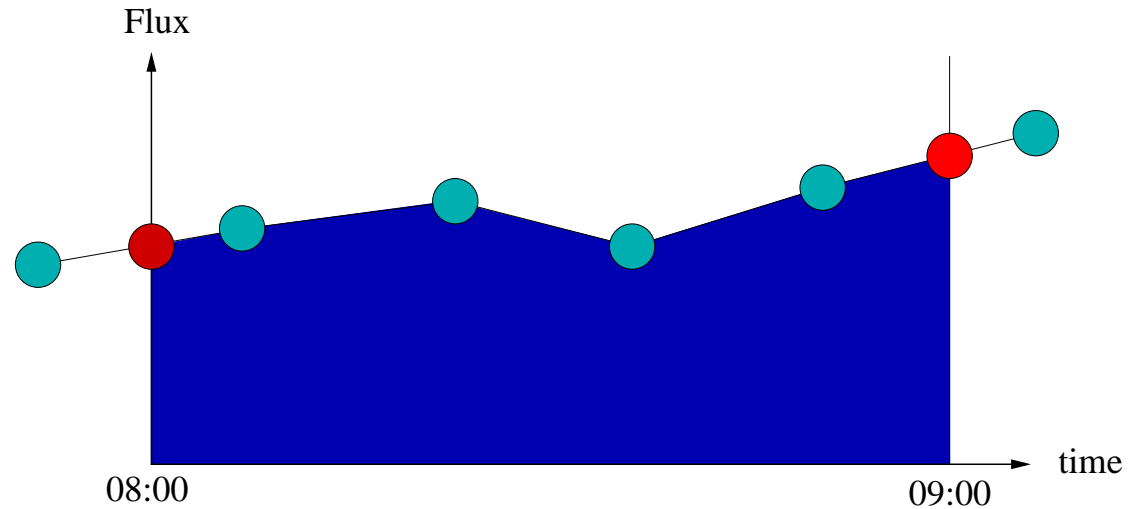
RMIB contribution

- ❖ measurements
- ❖ time resolution
- ❖ TIS
- ❖ **TET/TRS**
- ❖ missing data
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- ❖ Merger

In the future

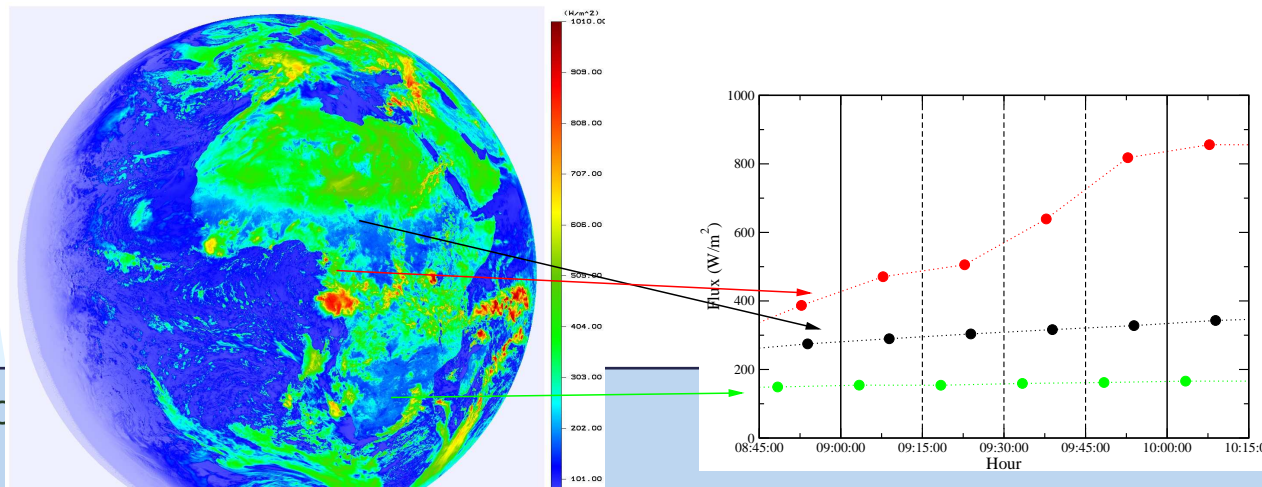
Acknowledgments

As in the textbooks:  $\langle a(t) \rangle = \frac{1}{T} \int_{t_0}^{t_0+T} a(u) du$



Area / 1 hour = mean flux at 08:00

But beware of acquisition time:





# And when data are missing ?

Overview

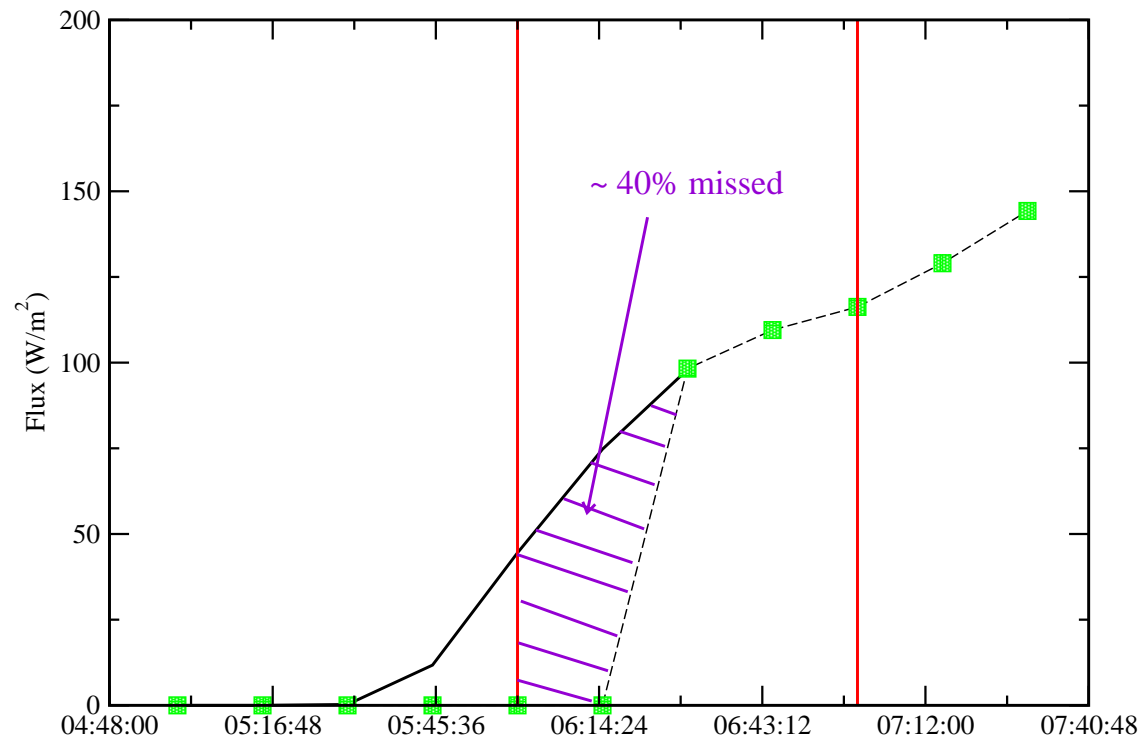
Introduction

RMIB contribution

- ❖ measurements
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In the future

Acknowledgments



Need for other sources of data: modelled, simulated...  
 We use *GERB-like* data.  
 GERB-like = simulated GERB data from SEVIRI/MSG channels



# And when data are missing ?

Overview

Introduction

RMIB contribution

- ❖ measurements
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- ❖ Merger

In the future

Acknowledgments

example on a whole day: 26th of June 2006

# And when data are missing ?

Overview

Introduction

RMIB contribution

❖ measurements

❖ time resolution

❖ TIS

❖ TET/TRS

❖ missing data

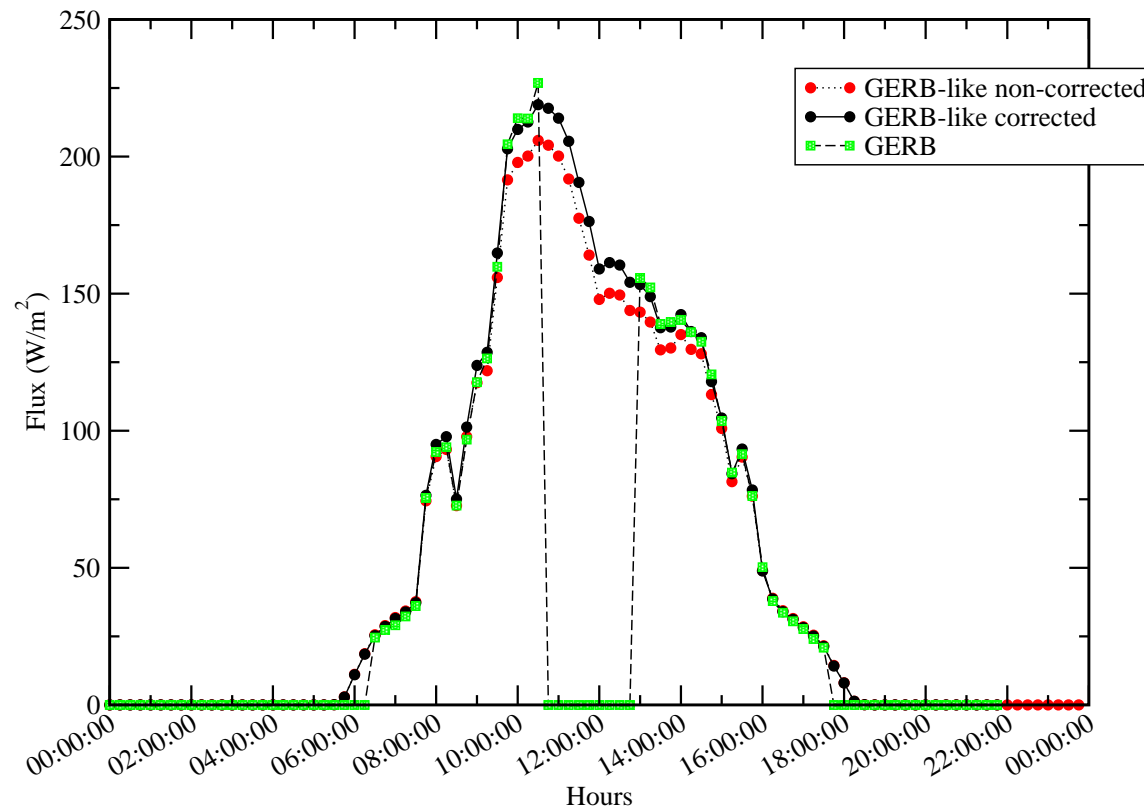
❖ Projection

❖ Merger

In the future

Acknowledgments

example on a whole day: 26th of June 2006



# CERES data

Overview

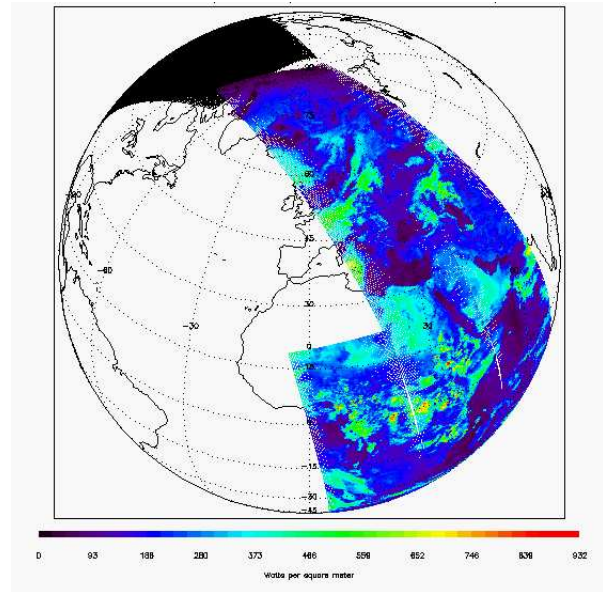
Introduction

RMIB contribution

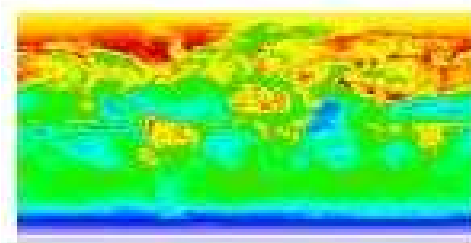
- ❖ measurements
- ❖ time resolution
- ❖ TIS
- ❖ TET/TRS
- ❖ missing data**
- ❖ Projection
- ❖ Merger

In the future

Acknowledgments



Polar satellite covers completely the Earth  
Use of ES9 data: already averaged according to MM, DM,  
MD.



# Projection

Overview

Introduction

RMIB contribution

- ❖ measurements
- ❖ time resolution
- ❖ TIS
- ❖ TET/TRS
- ❖ missing data

**❖ Projection**

❖ Merger

In the future

Acknowledgments

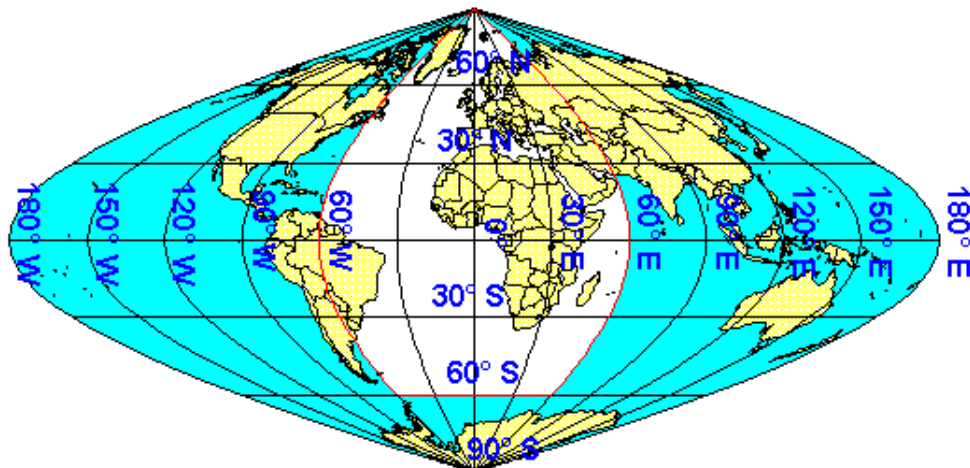
Data are provided on two grids:

Lat Lon with  $0.5^\circ$  (i.e. 55 km on the Equator)

Sinusoidal Equal Area (i.e. each pixel has **exactly** the same area  **$45\text{km} \times 45\text{km}$** )

for a region:

- ▶ from  $60^\circ$  West to  $60^\circ$  East  
and
- ▶ from North Pole to  $60^\circ$  South.



Sinusoidal Equal-Area

# Why do we need both GERB and CERES ?

## Overview

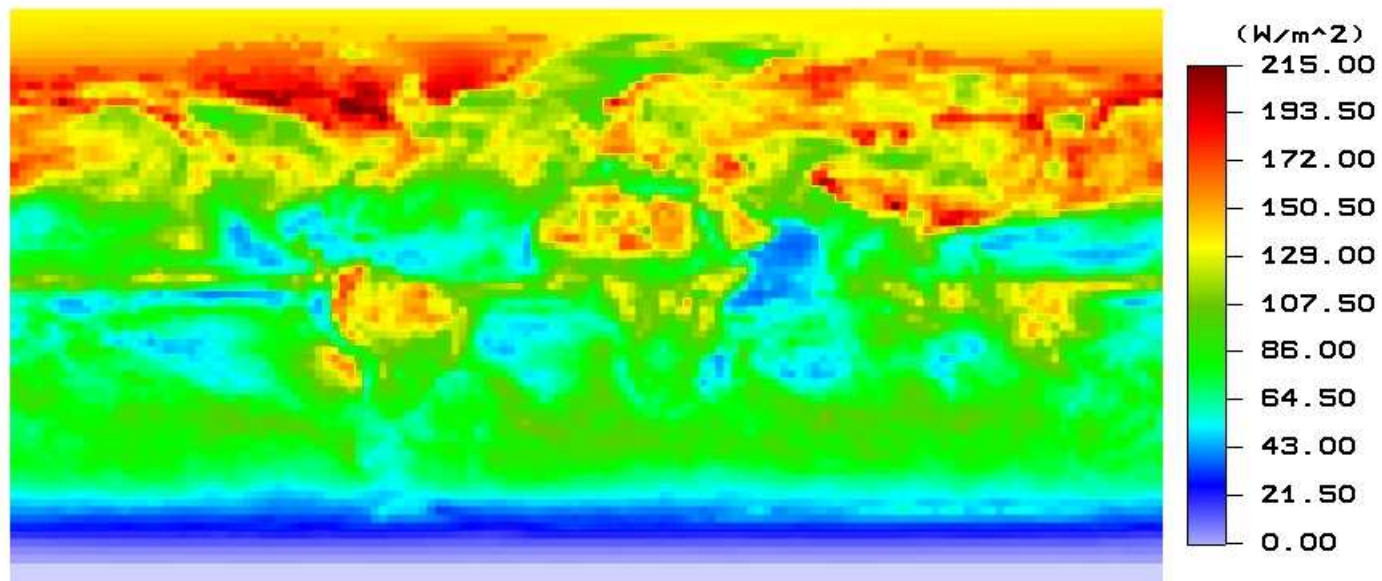
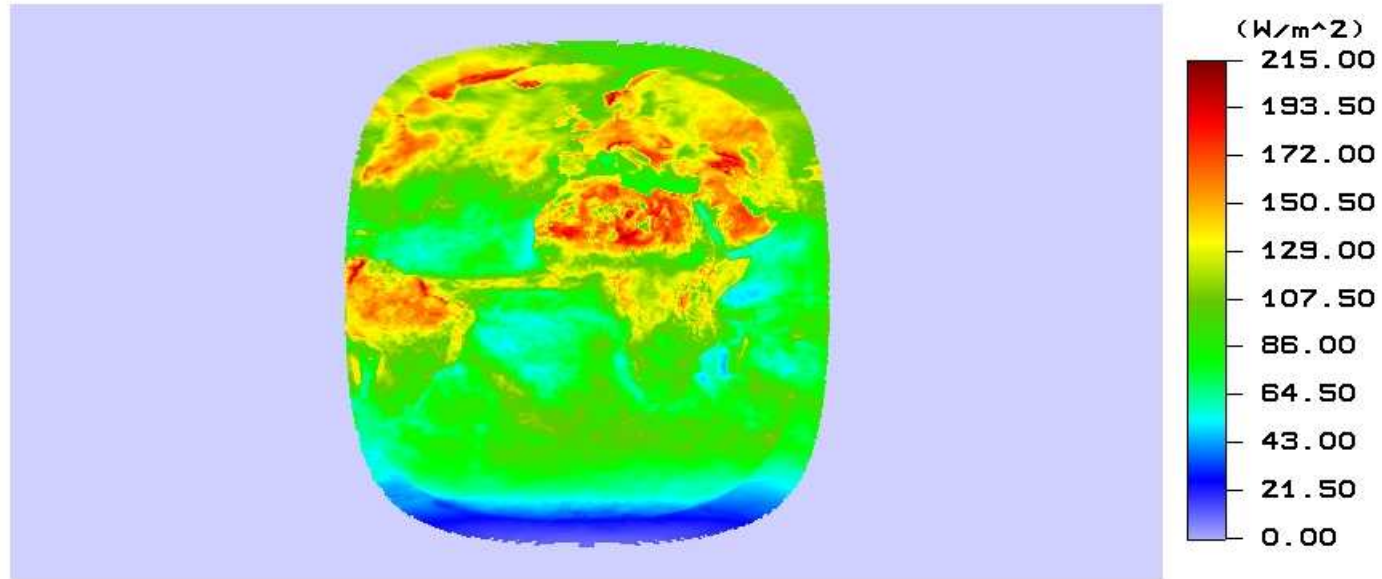
## Introduction

## RMIB contribution

- ❖ measurements
- ❖ time resolution
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- ❖ missing data
- ❖ Projection
- ❖ Merger

## In the future

## Acknowledgments



# How to merge GERB and CERES ?

## Overview

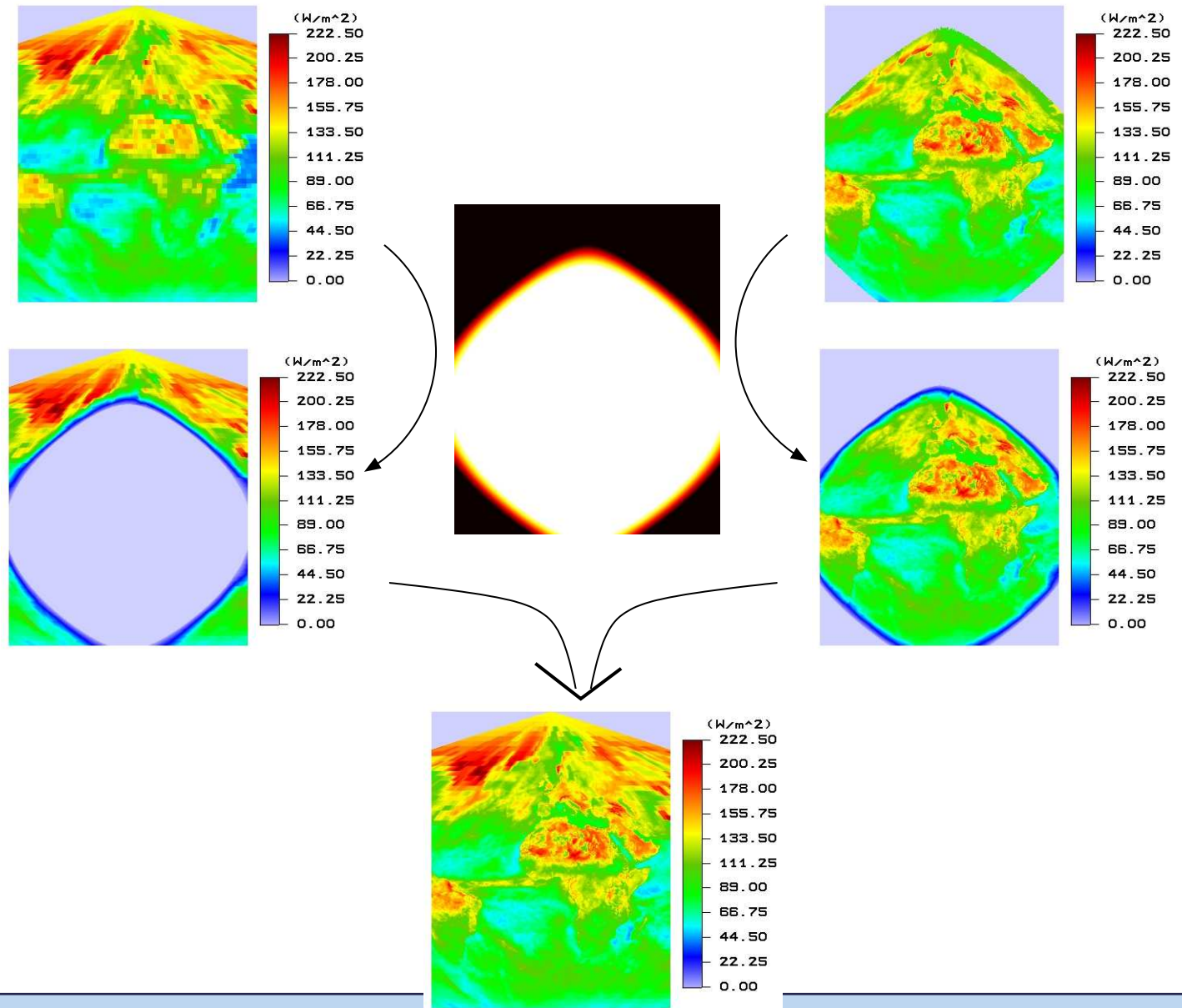
## Introduction

## RMIB contribution

- ❖ measurements
- ❖ time resolution
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- ❖ TET/TRS
- ❖ missing data
- ❖ Projection
- ❖ **Merger**

## In the future

## Acknowledgments



# What's left to do ?

Overview

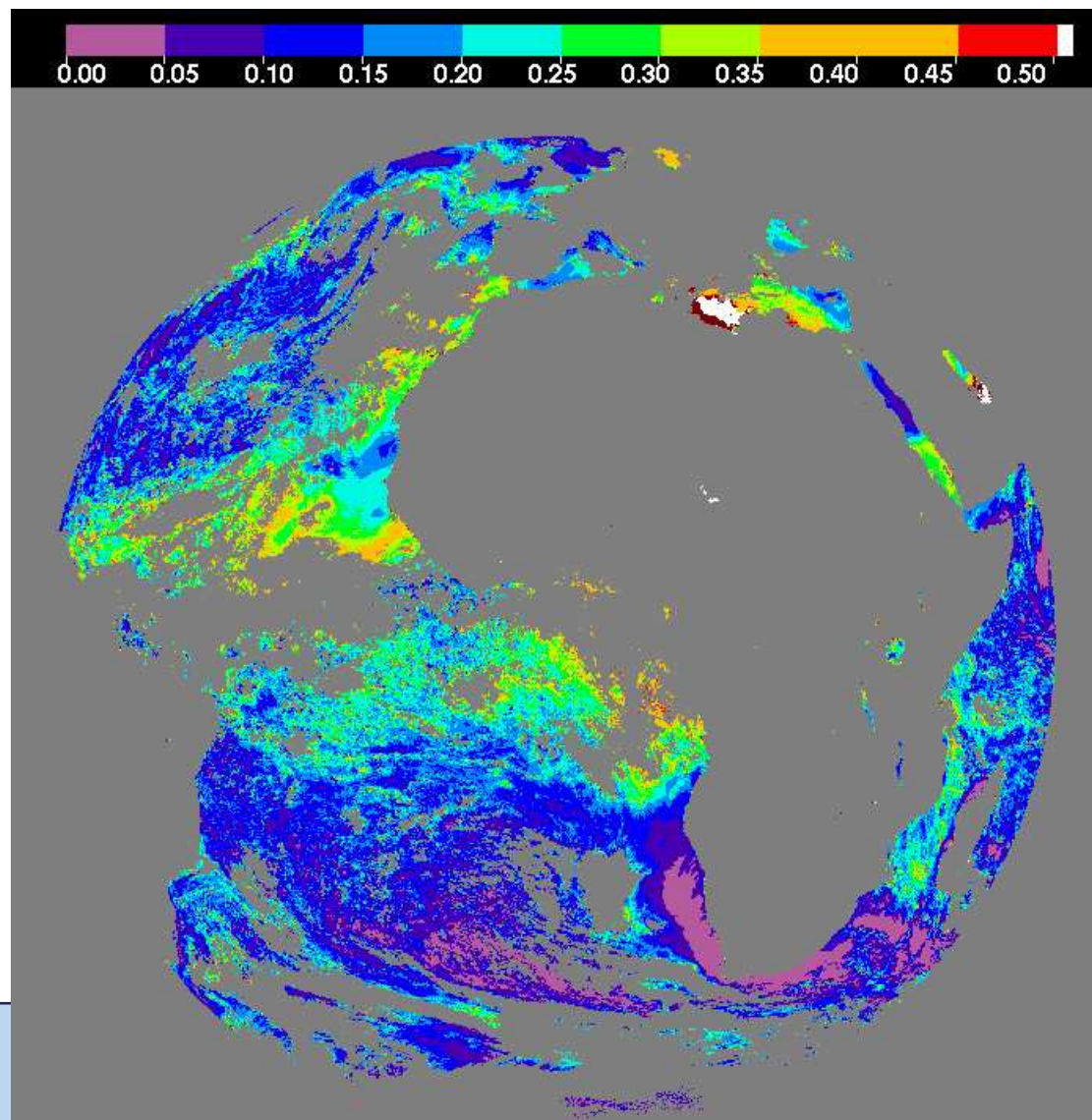
Introduction

RMIB contribution

In the future

Acknowledgments

## Integration of aerosol products







# What's left to do ?

Overview

Introduction

RMIB contribution

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Acknowledgments

Improvement of GERB-like data  
Implementation of global products (?)



Overview

Introduction

RMIB contribution

In the future

**Acknowledgments**

# The RMIB GERB team and Bart De Paepe Steven Dewitte, Nicolas Clerboux and Bogdan Nicolau