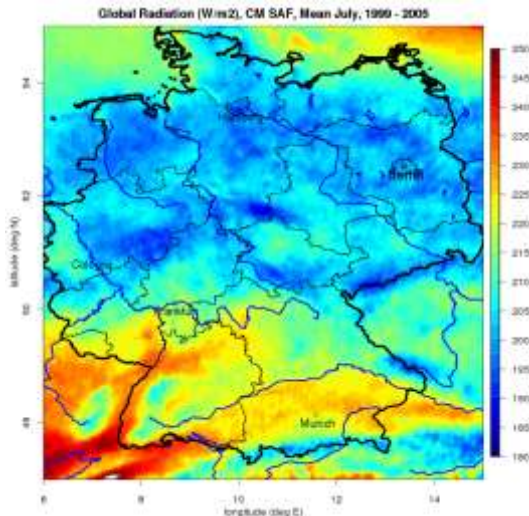


# Software supported by CM SAF

Jörg Trentmann

Satellite Application Facility on  
Climate Monitoring (CM SAF)  
Deutscher Wetterdienst



Are you a registered user of CM SAF?

Yes

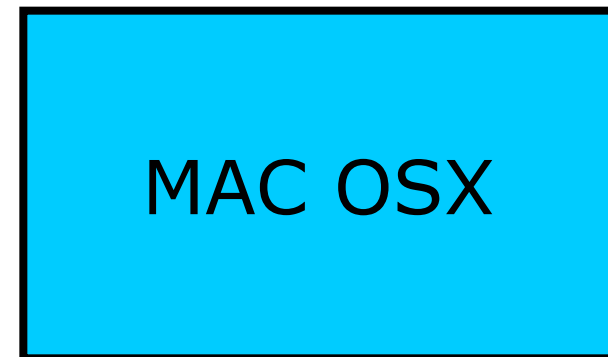
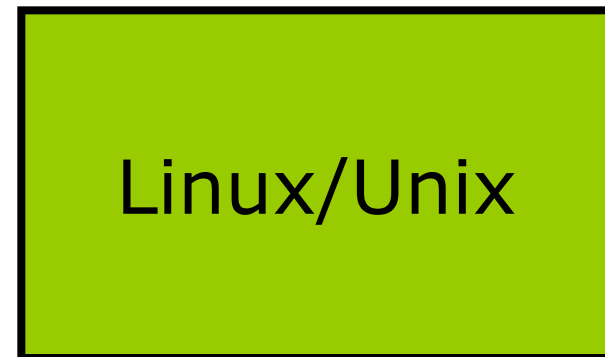
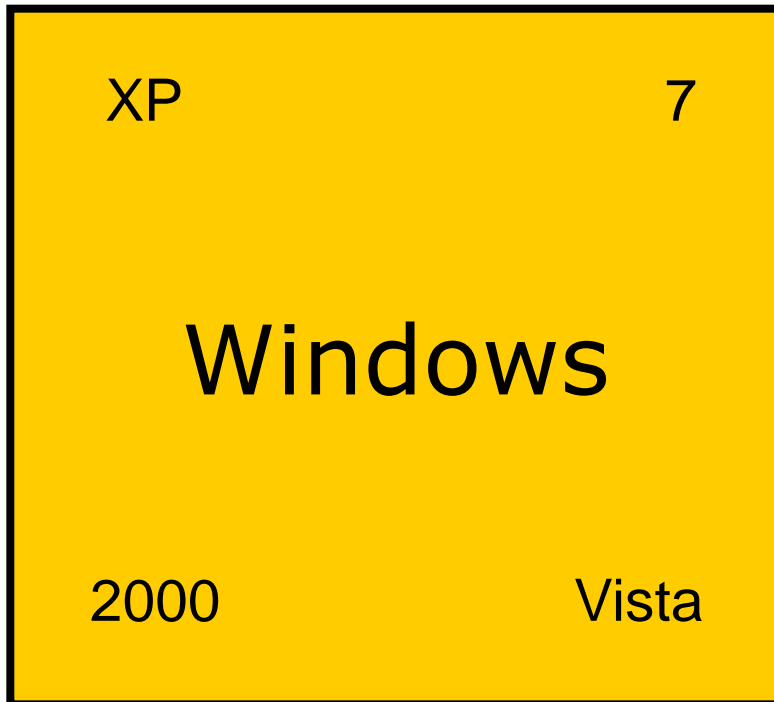
No

Have you already ordered CM SAF data through the Web User Interface (WUI: [www.cmsaf.eu/wui](http://www.cmsaf.eu/wui))?

Yes

No

Which operating system are you using?



Did you visit the CM SAF Community Site?

Yes

No

Have you used the CM SAF Toolbox?

Yes

Very little

No

Which software are you using when  
working with CM SAF data?






[www.cmsaf.eu/wui](http://www.cmsaf.eu/wui)

```
001000110010110
010011011001001
001000110010110
010011011001001
```



- » Home
- » Products
- » User
- » Order
- » Service

DIRECTLY TO

- Documentation 
- User Help Desk 
- Feedback / User Problem Report 

EXTERNAL LINKS






CM SAF WEB USER INTERFACE



Welcome to the  
CM SAF Web User Interface

The Web User Interface (WUI) is the link between our users and the, from satellite data generated, CM SAF products. WUI will help you to order products online. At the moment we distribute our products via CD, DVD, e-mail attachment (small data amounts only) or temporary FTP-Access.

[Data access](#) »



September 2012: Video presentations of WUI available

For all newcomers of this website there are three short video presentations available now that gives a brief introduction into the use of the CM SAF Web User Interface: An [introducing presentation](#), a [presentation on how to search for products](#) and a [presentation on how to order products](#).

[global CM SAF News](#) »

SATELLITE APPLICATION FACILITY ON CLIMATE MONITORING



What is the Satellite Application Facility on Climate Monitoring?

EUMETSAT's Satellite Application Facility on Climate Monitoring (CM SAF) is dedicated to the long-term monitoring of the climate system's state and variability. It generates and archives satellite-derived near-real time climate monitoring products on a continuous basis as well as high-quality validated, homogeneous and consistent time-series. CM SAF is a consortium with contributions of several European meteorological services (FMI, KNMI, MeteoSwiss, RMIB, SMHI) with

Deutscher Wetterdienst (DWD, Germany) as the leading entity.

CM SAF provides data sets of several cloud parameters, surface albedo, radiation fluxes at the top of the atmosphere and at the surface, atmospheric temperature and water vapour profiles as well as vertically integrated water vapour (total, layered integrated).

[more](#) »

EUMETSAT DISCLAIMER



All intellectual property rights of the CMSAF products belong to EUMETSAT.

All intellectual property rights of the CM SAF products belong to EUMETSAT. The use of these products is granted to every interested user, free of charge. If you wish to use these products, EUMETSAT's copyright credit must be shown by displaying the words "copyright (year) EUMETSAT" on each of the products used.

[more](#) »

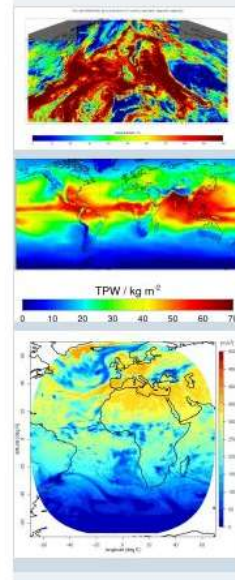
Click here to log on.

[Login](#) »

Your order cart is empty.

[To order cart](#) »

Example products



## **hdf**

(<http://www.hdfgroup.org/HDF5/>)

- + supports additional data compression
- + commonly used in satellite data community
- + provides a standard
- not very common
- only limited software available to access the data
- complex to read data

## hdf

(<http://www.hdfgroup.org/HDF5/>)

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- not very common
- only limited software available to access the data
- complex to read data

## netcdf

(<http://www.unidata.ucar.edu/software/netcdf>)

- + growing number of meteorological / climatological users
- + wider range of software available to access the data, incl. GIS
- + standard for climate data available
- no data compression, larger files



## hdf

(<http://www.hdfgroup.org/HDF5/>)

- + supported by the satellite data community
- + provides a standard
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## netcdf

(<http://www.unidata.ucar.edu/software/netcdf>)

- + wider range of software available to access the data, incl. GIS
- + standard for climate data available
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It is recommended to order CM SAF data in netcdf-format via the Web User Interface (WUI)!

- All **CM SAF Data sets** are provided in netcdf-format, i.e, Meteosat, CLARA, ATOVS, HOAPS, CLAAS  
e.g., PREmm200807010000001130034201GL.nc
- **Operational Products** from CM SAF can be ordered in netcdf-format for user specific regions and spatial resolutions :  
e.g., CFCmm201007010000320UD0023201UD.nc
- CM SAF data files provided through the Web User Interface always contain only one time step!

## Example:

**SISdm200407150000300070017901MA**

..... contains

- the daily mean SIS product
- for 15 July 2004
- from version 300
- derived from Seviri/MSG1 data
- for the MSG full disk
- in 15x15km<sup>2</sup> sinusoidal projection

The free, open-source climate data operators (*cdo*) and the statistical software tool *R* are the main tools supported to analyse CM SAF data. *Panoply* is a very useful viewer for netcdf-data files.



• **Panoply:** <http://www.giss.nasa.gov/tools/panoply>

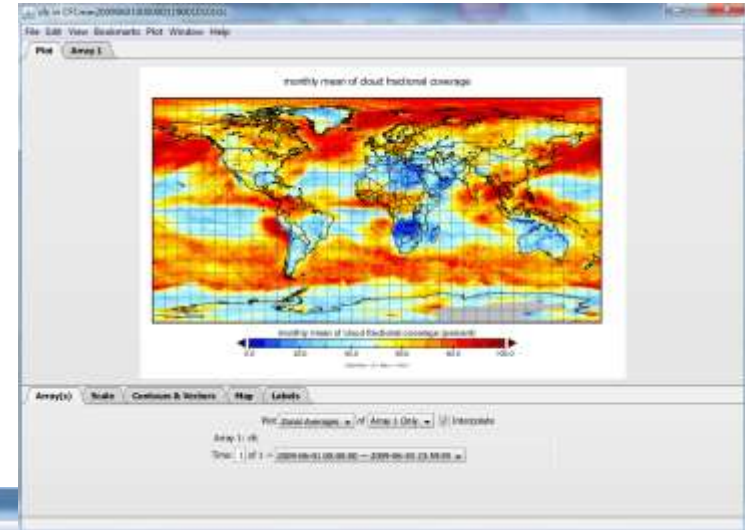
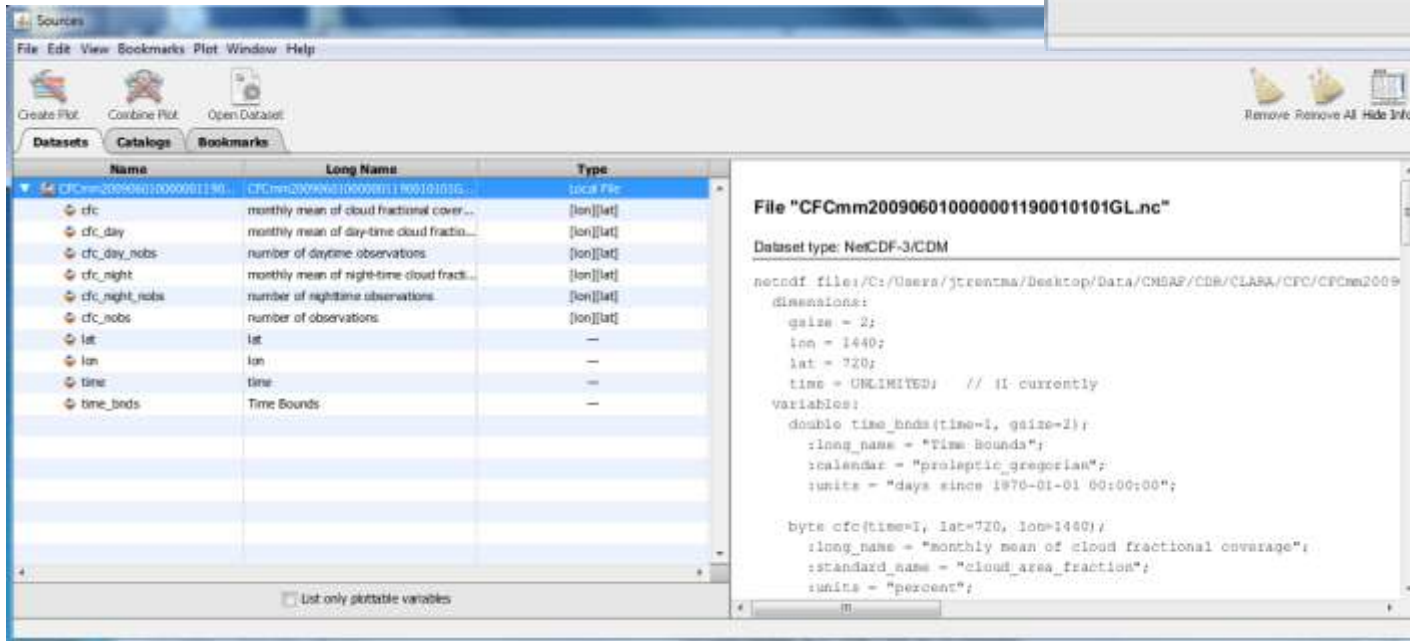
• **cdo:** <https://code.zmaw.de/projects/cdo>

• **R:** <http://www.r-project.org>



## Panoply

- developed at NASA GISS: <http://www.giss.nasa.gov/tools/panoply>
- Based on Java, freely available
- Displays netcdf (hdf, grib) data

Name	Long Name	Type
cfc	monthly mean of cloud fractional cover...	[lon][lat]
cfc_day	monthly mean of day-time cloud fractio...	[lon][lat]
cfc_day_nobs	number of daytime observations	[lon][lat]
cfc_night	monthly mean of night-time cloud fracti...	[lon][lat]
cfc_night_nobs	number of nighttime observations	[lon][lat]
cfc_nobs	number of observations	[lon][lat]
lat	lat	-
lon	lon	-
time	time	-
time_bnds	Time Bounds	-

```

File "CFCmm200906010000001190010101GL.nc"
Dataset type: NetCDF-3/CDM
netcdf file:/C:/Users/jjronema/Desktop/Data/CM SAF/CDR/CLARA/CFC/CFCmm2009
dimensions:
  gsize = 2;
  lon = 1440;
  lat = 720;
  time = UNLIMITED; // II currently
variables:
  double time_bnds(time=1, gsize=2);
  :long_name = "Time Bounds";
  :calendar = "proleptic_gregorian";
  :units = "days since 1970-01-01 00:00:00";

  byte cfc(time=1, lat=720, lon=1440);
  :long_name = "monthly mean of cloud fractional coverage";
  :standard_name = "cloud_area_fraction";
  :units = "percent";
  
```

## Climate Data Operators

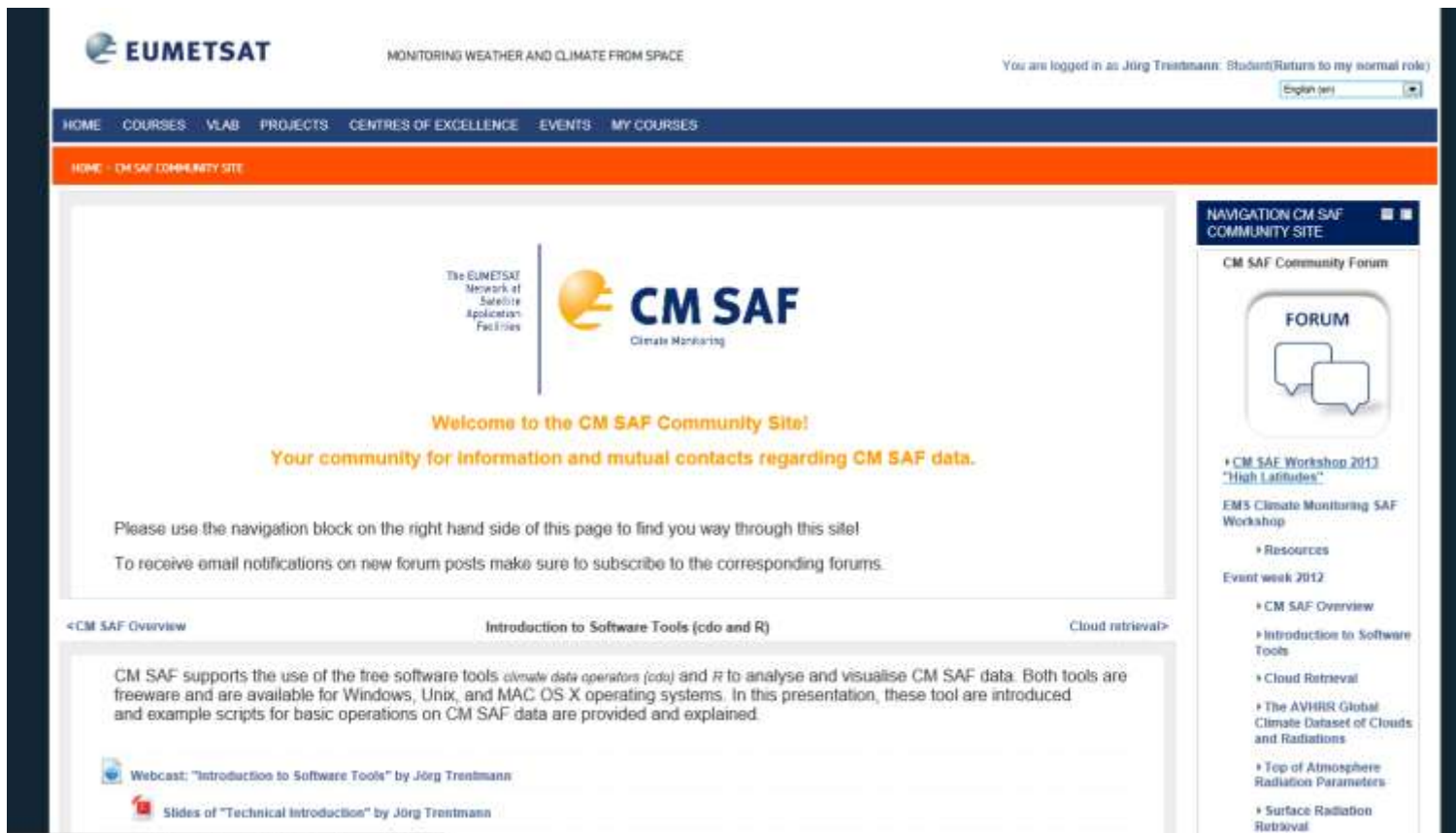
- developed at Max Planck Institute for Meteorology, Hamburg
- freely available including extensive documentation:  
<https://code.zmaw.de/projects/cdo>
- works with multiple file formats, including grib, netcdf etc.
- collection of operators for processing climate (model) data e.g.
  - spatial interpolation
  - data selection
  - Subsampling
  - statistical and arithmetical functions
  - ...
- is accessible from the 'command line' ('prompt')



## R

- programming language and software environment for statistical computing and graphics: <http://www.r-project.org/>
- includes an interface to netcdf
- has extensive statistical and graphical capabilities, mainly through additional packages
- supports the use of scripts
- extensive online-documentation available on the official webpage and on other webpages
- wide user community

A collection of software scripts including example CM SAF data is provided on the CM SAF Community Page:  
accessible via <http://training.eumetsat.int>



The screenshot shows the EUMETSAT website with the CM SAF Community Site highlighted. The main content area features the CM SAF logo and a welcome message: "Welcome to the CM SAF Community Site! Your community for information and mutual contacts regarding CM SAF data." Below this, there is a navigation block on the right side with a "FORUM" icon and a list of links including "CM SAF Overview", "Introduction to Software Tools", and "Cloud Retrieval". The main content area also contains a paragraph about the use of free software tools (cdo and R) for analyzing and visualizing CM SAF data, and a section for webcasts and slides.

**EUMETSAT** MONITORING WEATHER AND CLIMATE FROM SPACE

You are logged in as Jörg Trentmann: Student(Returns to my normal role)

English (en)

HOME COURSES VLAB PROJECTS CENTRES OF EXCELLENCE EVENTS MY COURSES

HOME - CM SAF COMMUNITY SITE

The EUMETSAT Network of Satellite Application Facilities

**CM SAF**  
Climate Monitoring

**Welcome to the CM SAF Community Site!**  
Your community for information and mutual contacts regarding CM SAF data.

Please use the navigation block on the right hand side of this page to find you way through this site!  
To receive email notifications on new forum posts make sure to subscribe to the corresponding forums.

<CM SAF Overview Introduction to Software Tools (cdo and R) Cloud retrieval>

CM SAF supports the use of the free software tools *climate data operators (cdo)* and *R* to analyse and visualise CM SAF data. Both tools are freeware and are available for Windows, Unix, and MAC OS X operating systems. In this presentation, these tool are introduced and example scripts for basic operations on CM SAF data are provided and explained.

Webcast: "Introduction to Software Tools" by Jörg Trentmann

Slides of "Technical Introduction" by Jörg Trentmann

**NAVIGATION CM SAF COMMUNITY SITE**

CM SAF Community Forum

**FORUM**

- CM SAF Workshop 2012 "High Latitudes"
- EMS Climate Monitoring SAF Workshop
  - Resources
- Event week 2012
  - CM SAF Overview
  - Introduction to Software Tools
  - Cloud Retrieval
    - The AVHRR Global Climate Dataset of Clouds and Radiations
    - Top of Atmosphere Radiation Parameters
    - Surface Radiation Retrieval




- Scripts are based on Windows, rearranging them for Unix/Linux/Mac-operating systems should be straight forward.
- Before running these scripts, install *cdo* and *R* on your local computer system (see further instructions on the Course Page)!
- Suggestion: install *panoply* (visualize netcdf-files) and *Notepad++* (text-editor).
- Have a look at the screencasts (provided on the Course page) that describe the use of the scripts!


- Have a look at the screencasts (provided on the Community Site) that describe the use of the scripts!

To receive email notifications on new forum posts make sure to subscribe to the corresponding forums.






<CM SAF Overview Introduction to Software Tools (cdo and R) Cloud retrieval>

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 Webcast: "Introduction to Software Tools" by Jörg Trentmann

 Slides of "Technical Introduction" by Jörg Trentmann

General information on the software tools *cdo* and *R*, as well as on text editors and data viewers

-  Data Formats and Data Viewers
-  Climate Data Operators (cdo)
-  Installing cdo
-  R: A software environment for statistical computing and graphics
-  Additionally required R packages

Sample Data and Software Scripts

- CM SAF Toolbox
  -  Instruction to the CM SAF Toolbox
- CM SAF File Naming Convention

Resources

- Event week 2012
- CM SAF Overview
- Introduction to Software Tools
- Cloud Retrieval
- The AVHRR Global Climate Dataset of Clouds and Radiations
- Top of Atmosphere Radiation Parameters
- Surface Radiation Retrieval
- Climate Dataset of Surface Radiation Parameters and Cloud Albedo
- Operational Products on Clouds and Radiation
- The Ocean Climate Dataset HCWAPS
- Global Moisture and Temperature Operational Product
- CM SAF Future Plans
- Applications
- Final Quiz

LATEST COMMENTS

30 Aug, 00:54  
Jörg Trentmann  
CM SAF Online Event, 1

## 1. Order data in netcdf-format on a regular lon-lat grid from the CM SAF [Web User Interface](#)

[www.cmsaf.eu/wui](http://www.cmsaf.eu/wui)



The screenshot shows the CM SAF Web User Interface (WUI) website. The main content area features a welcome message, a 'NEWS' section with a video presentation announcement for September 2012, and a section titled 'SATELLITE APPLICATION FACILITY ON CLIMATE MONITORING' which describes the facility's mission and data products. A disclaimer section at the bottom states that all intellectual property rights of the products belong to EUMETSAT. The right sidebar includes a login area, a message that the order cart is empty, and a section for 'Example products' showing three satellite-derived maps: a 3D topographic map, a 2D map of vertically integrated water vapour (TPW), and a 2D map of cloud parameters. The left sidebar contains navigation links for Home, Products, User, Order, and Service, as well as direct links to documentation, help desk, and feedback.

1. Order data in netcdf-format on a regular lon-lat grid from the CM SAF [Web User Interface](#)

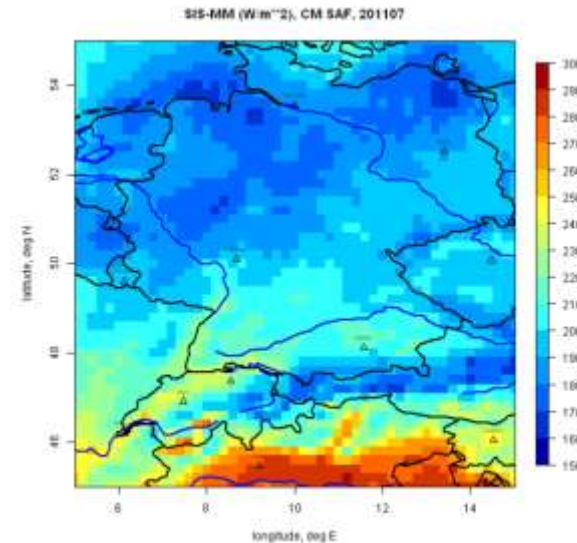
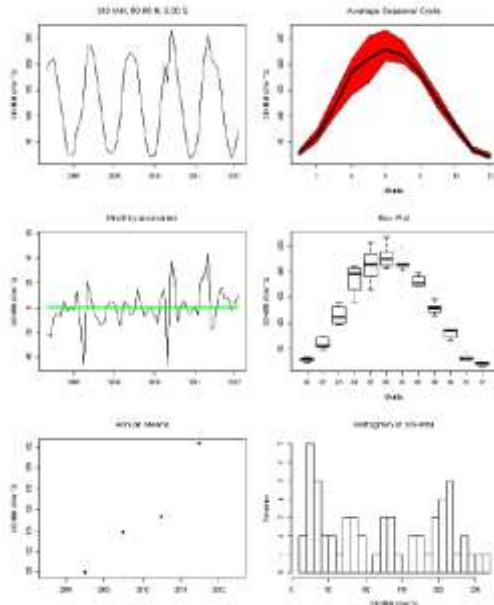
## **Software scripts based on cdo:**

1. Combine the individual time steps into one netcdf-file
2. Extract the time series for a single location
3. Calculate the temporal / spatial means
4. Calculate the multi-year monthly averages
5. Calculate the monthly anomalies

**Visualize the data (netcdf)  
with panoply!**

## Software scripts based on R:










1. Plot time series data
2. Analyse time series data,  
e.g., calculate average annual cycles, trends
3. Visualize the 2D Data,  
e.g., monthly means / temporal means / anomalies



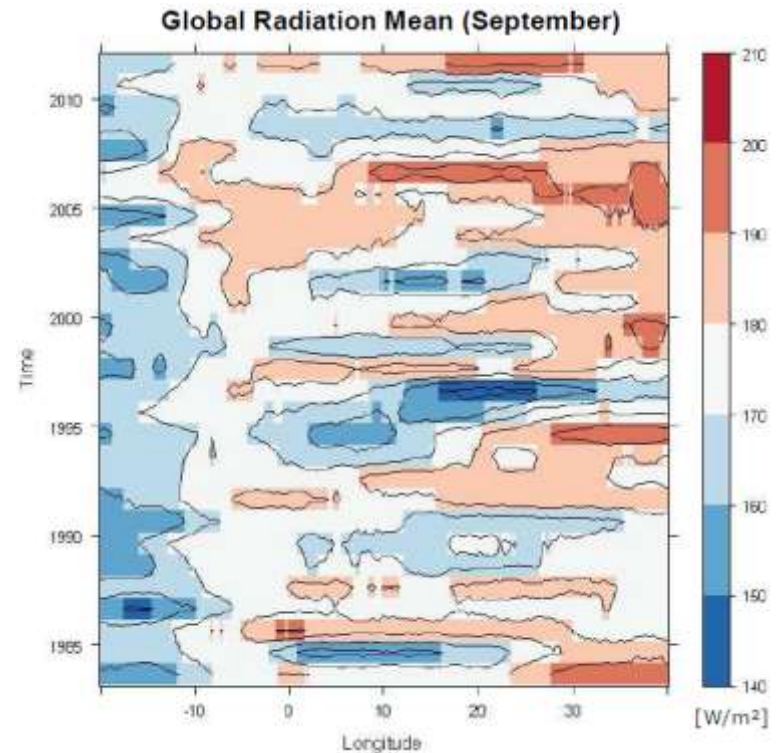
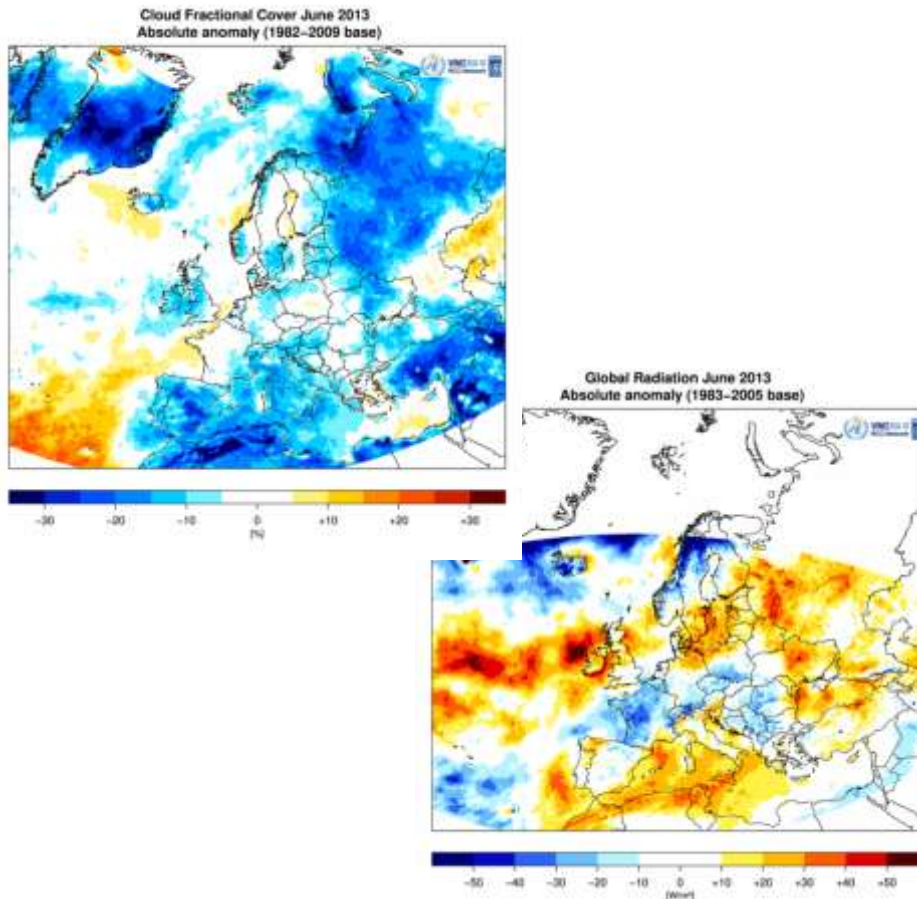
## Software support is provided through the Software Forum on the CM SAF Community Site

Please post your questions and comments concerning the software tools cdo and R and the provided software scripts.

▶ ADD A NEW DISCUSSION TOPIC

DISCUSSION	STARTED BY	REPLIES	UNREAD ✓	LAST POST
Error in 2011-2012 year SIS	 Theodoros Gkousarov	1	0	Jörg Trentmann Mon, 3 Jun 2013, 9:13 AM
Calculating percentiles and complex calculations	 Theodoros Gkousarov	1	0	Jörg Trentmann Mon, 22 Apr 2013, 4:26 PM
merging MAGIG outputs	 Blanka Bartok	4	0	Blanka Bartok Wed, 17 Apr 2013, 8:43 PM
Script for daily ClearSky radiation in MAGIC	 Blanka Bartok	0	0	Blanka Bartok Wed, 27 Feb 2013, 10:12 PM
Merging a large amount of .nc files ERROR.	 Theodoros Gkousarov	4	0	Theodoros Gkousarov Tue, 18 Sep 2012, 2:34 PM
Windows 7 x64 and CDO error	 Theodoros Gkousarov	1	0	Theodoros Gkousarov Fri, 20 Jul 2012, 12:19 AM
Convert SIS data from w/m2 to kj/m2	 Theodoros Gkousarov	7	0	Jörg Trentmann Mon, 16 Jul 2012, 11:10 AM
error in R	 Blanka Bartok	2	0	Jörg Trentmann Thu, 28 Jun 2012, 8:27 AM
Setting the spatial resolution of CM SAF data in netcdf-format	 Jörg Trentmann	0	0	Jörg Trentmann Tue, 26 Jun 2012, 6:38 PM

## Regional Climate Center on Climate Monitoring (RCC-CM), <http://www.dwd.de/rcc-cm>



Andre Obregon, RCC, DWD

## Solar Energy Applications (solaR), analysis and visualisation of gridded data (raster, rasterVis)

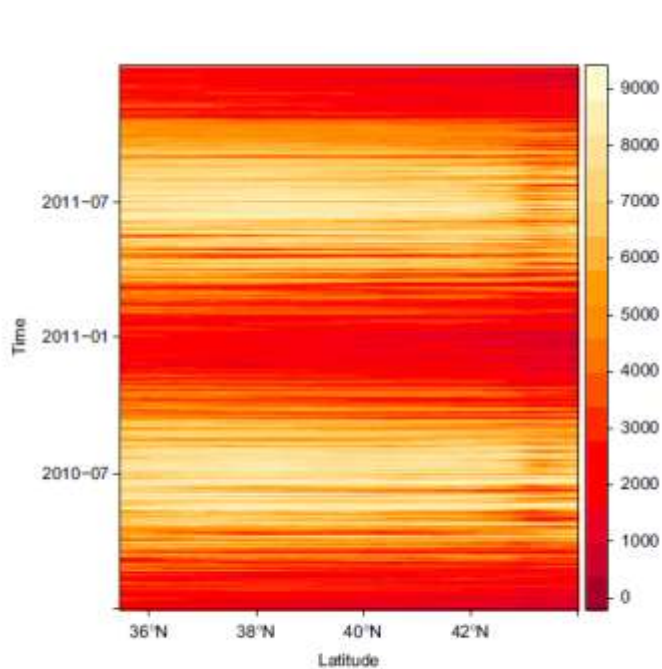


Fig. 1. Hovmöller plot with the time evolution of the daily horizontal irradiation ( $\text{Wh/m}^2$ ) as published by CM SAF, averaged along  $10^\circ\text{W}$  to  $5^\circ\text{E}$ .

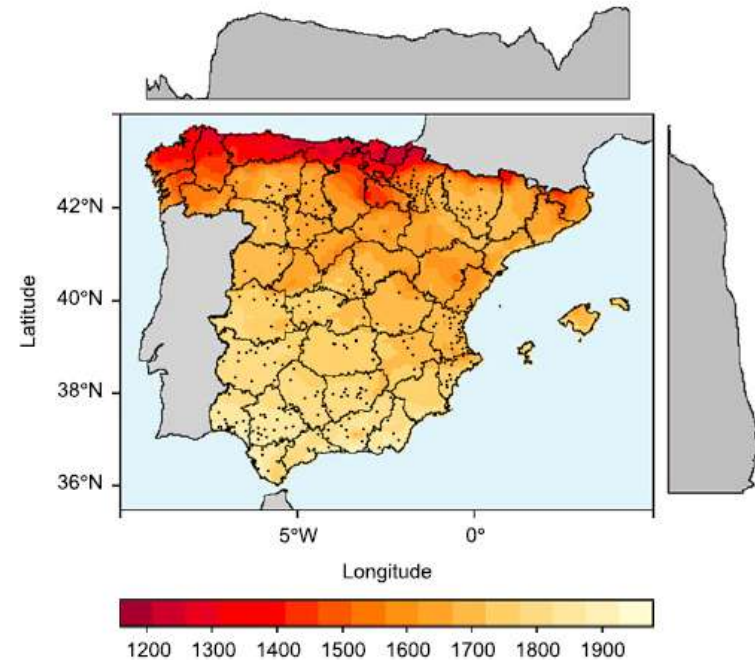


Fig. 2. Average of yearly horizontal irradiation ( $\text{kWh/m}^2$ ) on the horizontal plane as published by CM SAF during 2010 and 2011.

Comparative assessment of global irradiation from a satellite estimate model (CM SAF) and on-ground measurements (SIAR): A Spanish case study

F. Antonanzas-Torres<sup>a,\*</sup>, F. Cañizares<sup>b</sup>, O. Perpiñán<sup>c,d</sup>










Renewable and Sustainable Energy Reviews 21 (2013) 248–261



Many more examples are available on the CM SAF Community Site

ing of results from your applications using CM SAF data. Please post your comments / questions /  
 in using CM SAF data and share with us your experiences with the data.

▶ ADD A NEW DISCUSSION TOPIC

	STARTED BY	REPLIES	UNREAD ✓	LAST POST
	 Jörg Trentmann	13	0	Jörg Trentmann Wed, 27 Feb 2013, 12:54 PM
Comparison SIS from MSG and station data (first results)	 Theodoros Gkousarov	4	0	Theodoros Gkousarov Mon, 18 Feb 2013, 12:13 AM
Comparison of daily MSG CFC and CTY products with SYNOP observations in a region of Czech Republic	 Petr Sacha	7	0	Karl-Goran Karlson Thu, 18 Oct 2012, 10:26 AM
comparison SIS retrievals and observations	 Diego Enore	4	0	Diego Enore Mon, 27 Aug 2012, 6:14 PM
Some results	 Mesfin Ibrahim	5	0	Mesfin Ibrahim Wed, 18 Jul 2012, 2:48 PM
Some results	 Mesfin Ibrahim	0	0	Mesfin Ibrahim Fri, 13 Jul 2012, 8:08 AM
Spacial Distribution SIS over South America	 Jurandir Rodrigues	2	0	Jörg Trentmann Tue, 3 Jul 2012, 11:00 AM
First results	 Jurandir Rodrigues	1	0	Christine Träger-Chatterjee Fri, 29 Jun 2012, 8:03 AM
Some colours and ... some interesting things.	 Renato Zauri	4	0	Renato Zauri Fri, 29 Jun 2012, 6:49 AM

- CM SAF offer not only high-quality climate data, but does also provide software incl. support to analyse CM SAF data based on free software packages
- cdo and R are very powerful tools for in-depth data analysis, incl. CM SAF data; other tools (Matlab, IDL, GIS) are also suitable to analyse CM SAF data
- The CM SAF Community Site provides a huge source of information on CM SAF and is intended to allow user interactions
- Feel free to share your questions / comments / results with us and other users of CM SAF data through the forums at the CM SAF Community Site

# Any Questions / Comments?

Have fun playing with the data!



Looking forward to see your application!

