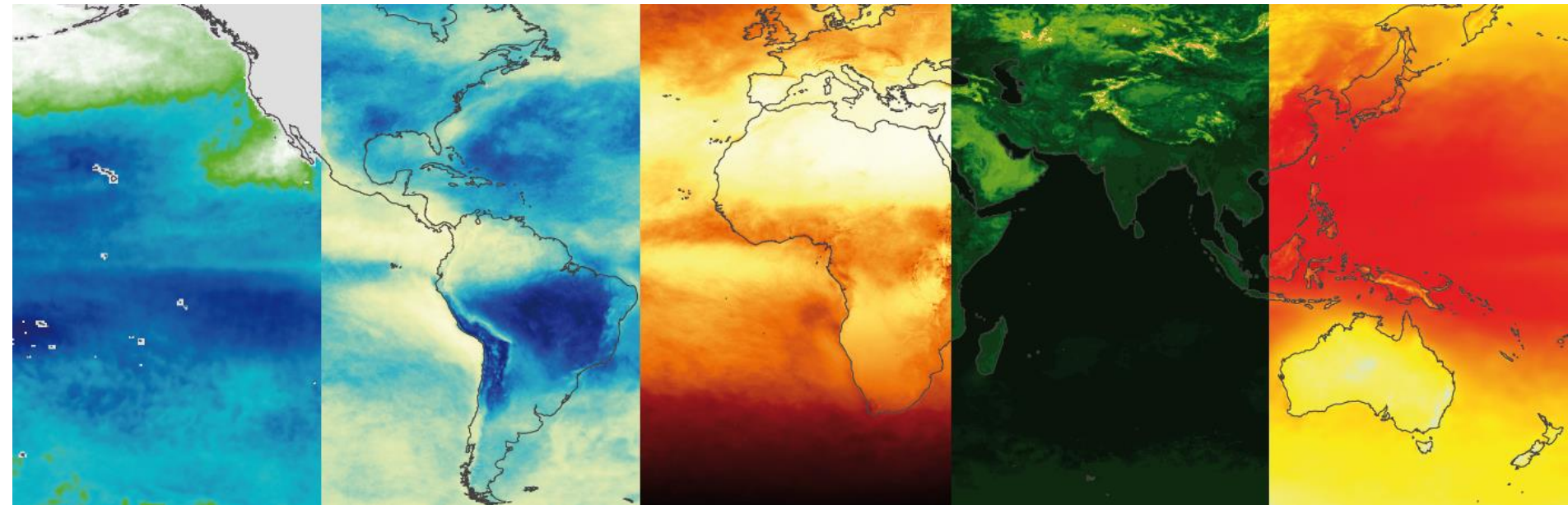
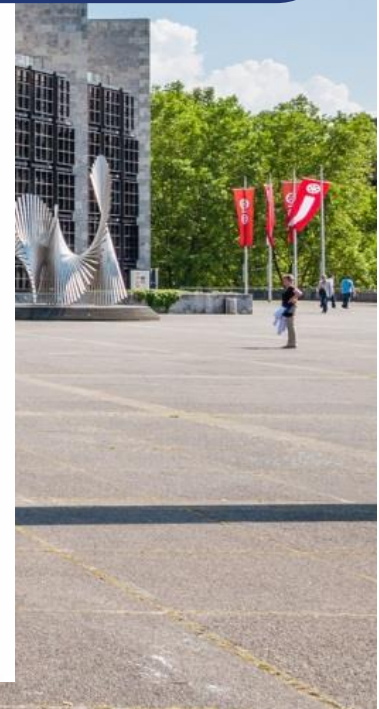


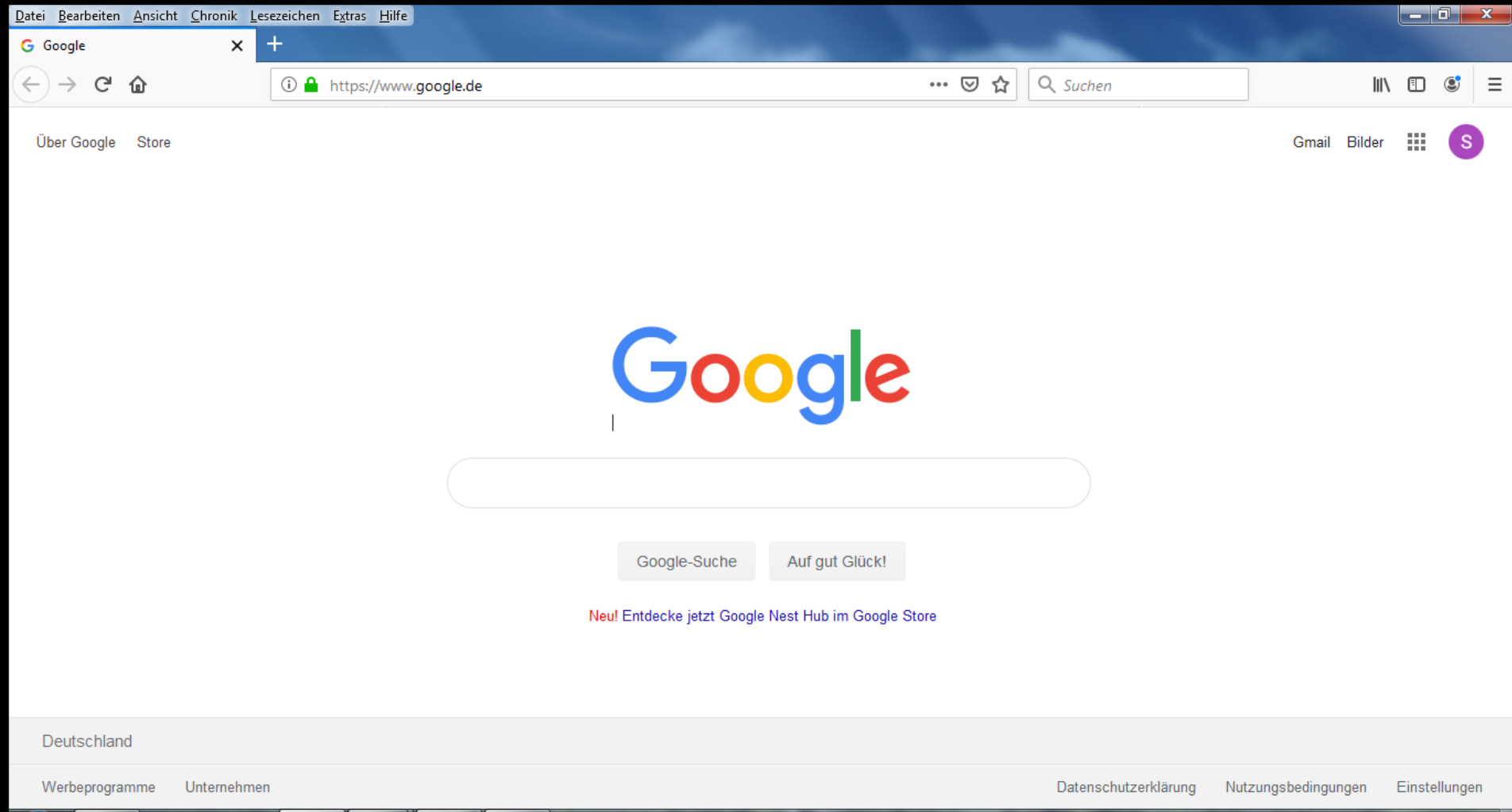
# CM SAF Data Access and Toolbox

Dr. Steffen Kothe  
Deutscher Wetterdienst



Was the sunshine duration in April 2019 higher than usual in Mainz and Germany?





The image shows a screenshot of a web browser displaying the Google homepage. The browser's address bar shows the URL <https://www.google.de>. The page features the Google logo, a search bar, and buttons for "Google-Suche" and "Auf gut Glück!". A promotional message reads "Neu! Entdecke jetzt Google Nest Hub im Google Store". The footer includes the text "Deutschland", "Werbeprogramme", "Unternehmen", "Datenschutzerklärung", "Nutzungsbedingungen", and "Einstellungen".





# http://cm-saf.eumetsat.int

 Google

Google-Suche

Auf gut Glück!

Neu! Entdecke jetzt Google Nest Hub im Google Store

Deutschland

[Werbeprogramme](#)

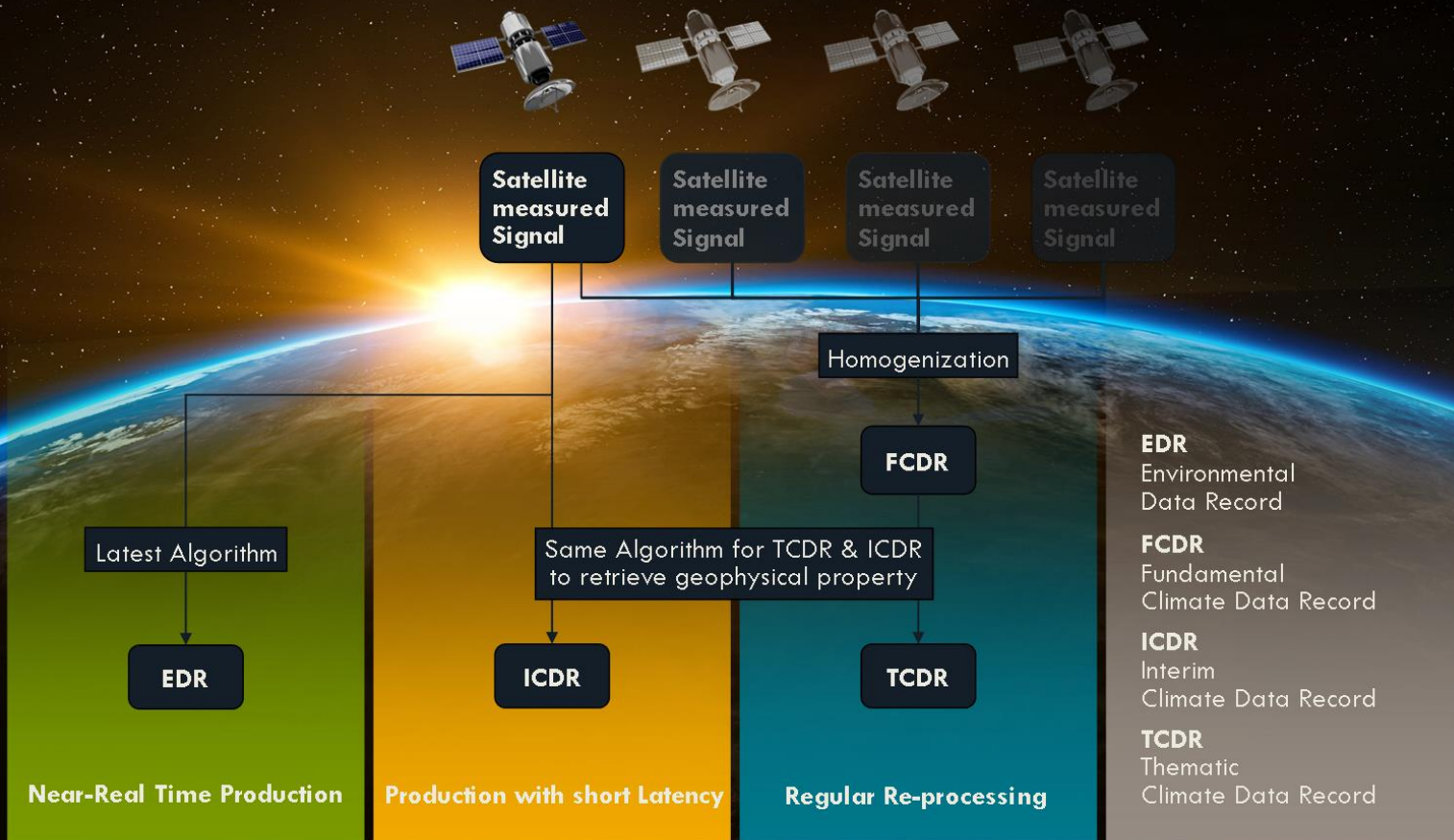
[Unternehmen](#)

[Datenschutzerklärung](#)

[Nutzungsbedingungen](#)













[Einstellungen](#)

## Satellite-based Climate Data Records







- ▶ Home
- ▼ **Products**
- ▶ Product search
- ▶ User
- ▶ Order
- ▶ Service

**List of products**

Name	Version	Data source	Time	Statistics	Area	
SDU - Sunshine Duration	SARAH ed. 2.1	MVIRI/SEVIRI on METEOSAT	Monthly	Sum	MSG full disk (includes Europe, Afrika, Atlantic Ocean)	 
SDU - Sunshine Duration	SARAH ed. 2.1	MVIRI/SEVIRI on METEOSAT	Daily	Sum	MSG full disk (includes Europe, Afrika, Atlantic Ocean)	 
SDU - Sunshine Duration	SARAH ed. 2.0	MVIRI/SEVIRI on METEOSAT	Monthly	Sum	MSG full disk (includes Europe, Afrika, Atlantic Ocean)	 
SDU - Sunshine Duration	SARAH ed. 2.0	MVIRI/SEVIRI on METEOSAT	Daily	Sum	MSG full disk (includes Europe, Afrika, Atlantic Ocean)	 
SDU - Sunshine Duration	ICDR SEVIRI Radiation, based on SARAH-2 methods	MVIRI/SEVIRI on METEOSAT	Monthly	Sum	MSG full disk (includes Europe, Afrika, Atlantic Ocean)	 
SDU - Sunshine Duration	ICDR SEVIRI Radiation, based on SARAH-2 methods	MVIRI/SEVIRI on METEOSAT	Daily	Sum	MSG full disk (includes Europe, Afrika, Atlantic Ocean)	 

6 Products found, displaying all Products.

- DIRECTLY TO
- Documentation 
  - User Help Desk 
  - Feedback / User Problem Report 
  - CM SAF Service Messages >
  - CM SAF FAQs >

- EXTERNAL LINKS
-  [...](#)

◀ Back to product search



```
001000110010110
010011011001001
001000110010110
010011011001001
```



[Home](#) [Sitemap](#) [Glossary](#) [Imprint](#)

Steffen Kothe, Logout [Order cart](#) (4)

- ▶ Home
- ▶ Products
- ▶ User
- ▼ **Order**
  - ▶ **Current orders**
  - ▶ Order status
  - ▶ Service

### Your current orders

Here you are able to finish your order. To do this we need your preferred product format and way of data transfer. Usually it takes 15 minutes at least and up to some days until you receive your data (depending on the way of transfer, the amount of data and the CPU effort to do the postprocessing).

Please note that standing orders and orders larger than 5 MB will always be delivered from our data server.

#### ORDER TRANSFER

##### Submit your order

Please consider that the total size of your order is **7.9 GB** which will take approx. **34 minute(s)** to download from CM SAF's data server at 4 MB/s transfer speed.

##### Choose your preferred type of data transfer

- HTTPS/SFTP - Delivery of data via data server (HTTPS/SFTP).
- E-MAIL - Delivery of data via Email attachment.




Please keep in mind that delivery via e-mail attachment is feasible up to 5 MB order order size only. Larger orders will be made available for download on our data server automatically.

[Place an order](#)

#### ORDER CART

Position	Description	From	To	Size
----------	-------------	------	----	------

#### DIRECTLY TO

- [Documentation](#) 
- [User Help Desk](#) 
- [Feedback / User Problem Report](#) 
- [CM SAF Service Messages](#) >
- [CM SAF FAQs](#) >

#### EXTERNAL LINKS



Start Senden/Empfangen Ordner Ansicht Lernen

Neue E-Mail-Nachricht Elemente  
Neue Elemente  
Ignorieren  
Aufräumen  
Junk-E-Mail  
Löschen  
Antworten  
Allen antworten  
Weiterleiten  
Besprechung  
Weitere  
Verschieben in: ?  
Team-E-Mail  
Antworten und I...  
An Vorgesetzte(n)  
Erledigt  
Neu erstellen  
Verschieben  
Regeln  
OneNote  
Ungelesen/gelesen  
Kategorisieren  
Zur Nachverfolgung  
Kontakt suchen  
Adressbuch  
E-Mail filtern  
Suchen

Posteingang durchsuchen (Strg+E)

Anordnen nach: Datum Neu nach alt

Sender	Datum	Subject
Strauß Annett	Mi 29.05	AW: Wochenbericht KU23
<b>Dienstag</b>		
CM SAF Contact	Di 28.05	CM SAF product request has been finished...
CM SAF Contact	Di 28.05	CM SAF product request has been finished...
CM SAF Contact	Di 28.05	CM SAF product request has been finished...
CM SAF Contact	Di 28.05	CM SAF product request has been finished...
CM SAF Contact	Di 28.05	CM SAF product request: ORD33396, ORD...
Christine Traeger Chatterjee	Di 28.05	RE: Menu -Mainz- Reservierung für 30 Pers...
Kaiser Johannes	Di 28.05	WG: Animationen SDU Anomalie von Proje...
CM SAF Contact	Di 28.05	CM SAF User Workshop Programme
Stengel Martin	Di 28.05	CM SAF User Workshop - Splinter group o...
Trentmann Jörg	Di 28.05	WG: Menu -Mainz- Reservierung für 30 ...
Trentmann Jörg	Di 28.05	AW: Menu -Mainz- Reservierung für 30 Per...
Stengel Martin	Di 28.05	

### CM SAF product request has been finished: ORD33397

CM SAF Contact <Contact.Cmsaf@dwd.de>

Zur Nachverfolgung. Beginn am Sonntag, 2. Juni 2019. Fällig am Sonntag, 2. Juni 2019.  
Die unnötigen Zeilenumbrüche des Nachrichtentextes wurden automatisch entfernt.

Gesendet: Di 28.05.2019 17:16  
An: Steffen.Kothe@dwd.de

Dear Steffen Kothe,

The extraction of your ordered CM SAF product (SDU, MVIRI-SEVIRI on METEOSAT, Monthly, Sum, Version 003, Latitude-longitude grid (0.05x0.05 degree), MSG full disk (includes Europe, Afrika, Atlantic Ocean), NetCDF4:LatLon,5.0,55.0,16.0,47.0,0.05,0.05, 2016-01-01 - 2017-12-01) from our archive has been finished successfully.

Your order has a total size of 2.9 MB (3082240 Byte) and contains 24 individual data files.

The order data files are available on our data server for the next 14 days.




You can get access to the data server via https:

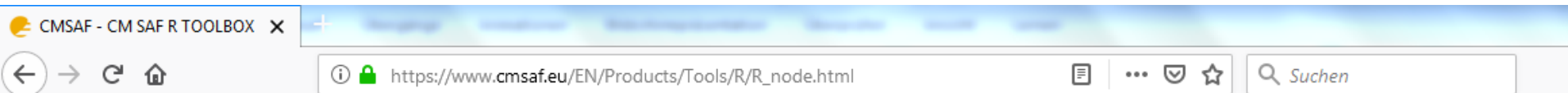
- host: cmsaf.dwd.de
- Username: routcm
- Password: 4gVdHUdpq8UhHclJIP
- Directory: data/ORD33397
- link: <https://cmsaf.dwd.de/data/ORD33397/>
- wget: `wget -r -np -nH --cut-dirs=1 --reject="index.html" --user=routcm --password=4gVdHUdpq8UhHclJIP https://cmsaf.dwd.de/data/ORD33397/`

or via sftp:

- host: cmsaf.dwd.de
- Username: routcm

## To-Do-List

- Find data 
- Download data  Piece of cake
- Work with data 
- Results



## Products

### Tools

### CM SAF R TOOLBOX

The [CM SAF R TOOLBOX](#) can be used to prepare, analyze and visualize CM SAF NetCDF data. For this the CM SAF R TOOLBOX consists of prepared R-scripts, which require only few adaptations of file- and path names. Thus, no R or scripting experience is needed. After starting a script the user is guided through all options. The heart of the CM SAF R TOOLBOX is the 'cmsaf' R-package. The '[cmsaf' R-package](#) contains a collection of more than 50 functions for analysis and manipulation of CM SAF NetCDF formatted data. There are R-scripts, which help unexperienced R-users to apply easily the functions of the 'cmsaf' R-package.

The 'cmsaf' R-package can be downloaded [here](#). For the [CM SAF R TOOLBOX](#) a small [tutorial-video](#), a [tutorial-pdf](#) and a brief [manual](#) are available.

### SECTION MENU

Available Products

Product Monitoring

Ordering and Data Access

Service Messages

Change Logs

Known Product Disruptions

Naming Convention



# The CM SAF R TOOLBOX

— R-based tools for an easy usage of CM SAF NetCDF data —

## PREPARE

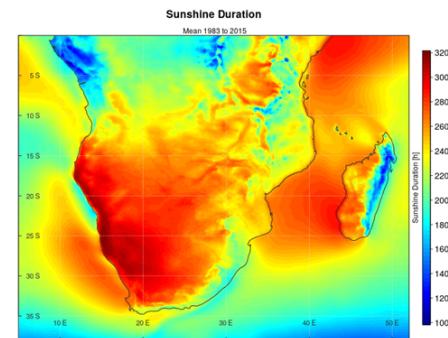
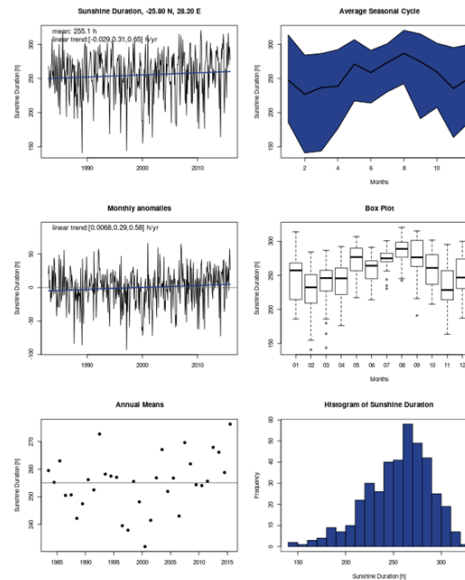
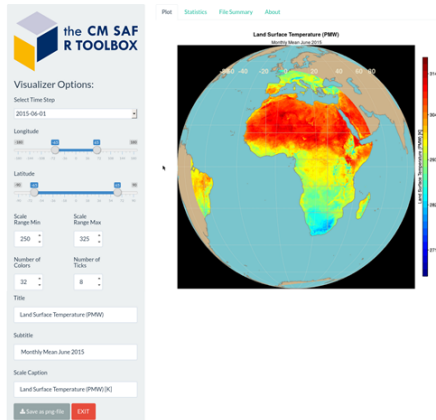
Extract, unzip, select time range and region, merge.

## ANALYSE

The cmsaf R-package contains more than 60 useful operators.

## VISUALIZE


Visualize spatial data, statistical analysis and 1D-timeseries.



© DWD 2018

## CM SAF R TOOLBOX Scripts

- The CM SAF R TOOLBOX requires **no** R or scripting experience
- After starting the main script the user is guided through all options



The screenshot shows the CM SAF R TOOLBOX interface. On the left, there is a vertical stack of buttons: 'Prepare' (dark blue), 'Analyze' (dark blue), 'Visualize' (dark blue), 'GO' (teal), 'EXIT' (red), and 'Browse files...' (grey). The main area on the right contains text instructions and a status bar. The text reads: 'the CM SAF R TOOLBOX \'Mostly Harmless\'', 'The intention of the CM SAF R Toolbox is to help you using CM SAF NetCDF formatted data.', 'This includes: 1. Preparation of ordered CM SAF data files, 2. Analysis of prepared CM SAF data, 3. Visualization of the results', 'Select one of the three steps and launch it by clicking the GO button.', 'Stop the application by clicking the EXIT button.', 'Suggestions for improvements and praise for the developers can be send to contact.cmsaf@dwd.de.', '- Steffen Kothe - 2018-07-26 -'. Below this, the 'Visualize' section is active, showing 'Please select a NetCDF file (.nc) and click on GO to start the R-script CMSAF\_Visualizer.R.', 'This application can be used to display NetCDF data. In addition, it provides information on the data and the NetCDF file.', 'To stop the CM SAF Visualizer click on EXIT.', and a status bar at the bottom: 'Selected file: /cmsaf/cmsaf-rad6/stkothe/TOOLBOX/CHSAF-R-TOOLBOX\_work/output/SDU\_198301-201512.nc'.



## Data Preparation

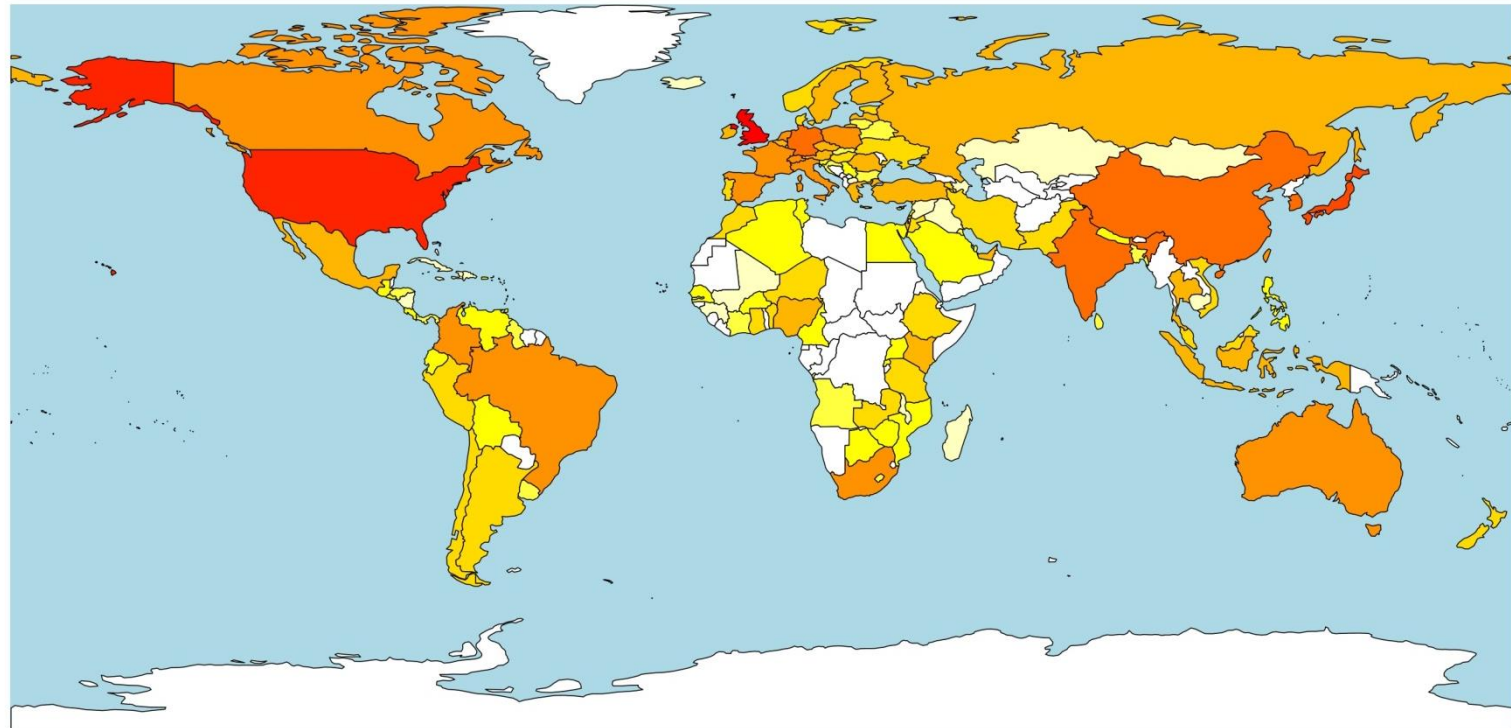
- This step helps to get from downloaded .tar-file to ready-to-use NetCDF
- Use the **Prepare** step to:
  - Extract
  - Unzip
  - Select time range
  - Select region
  - Merge single files into one

## Data Analysis

- The **Analyze** step is a simple-to-apply interface to functions of the *cmsaf* R-package
- ***cmsaf* R-package**
  - The *cmsaf* R-package is a collection of functions for basic analysis and manipulation of CM SAF NetCDF data
  - It contains more than 60 operators, such as:
    - `fldmean` → mean of a 2d field
    - `mon.anomaly` → monthly anomalies
    - `monmean` → monthly means
    - `ncinfo` → content of a NetCDF file
    - `remapbil` → bilinear interpolation
    - `selpoint` → extract a point or time series
    - `trend` → linear trend

## 'cmsaf' R-package downloads since 26-06-2015

Total downloads: 25249 (14 April 2019)





# Data Visualization

→ The **Visualize** step allows an easy creation customized plots

the CM SAF  
R TOOLBOX

Visualizer Options:

Select Time Step  
2015-06-01

Longitude  
-180 -160 -140 -120 -100 -80 -60 -40 -20 0 20 40 60 80 100 120 140 160 180

Latitude  
-90 -85 -80 -75 -70 -65 -60 -55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90

Scale  
Range Min: 250  
Range Max: 325

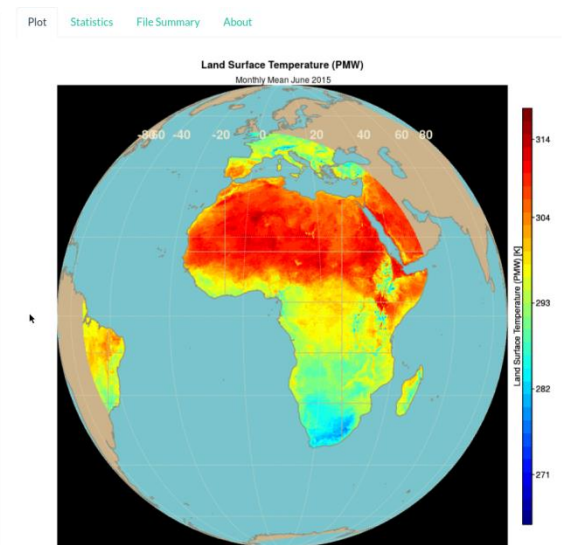
Number of Colors: 32  
Number of Ticks: 8

Title: Land Surface Temperature (PMW)

Subtitle: Monthly Mean June 2015

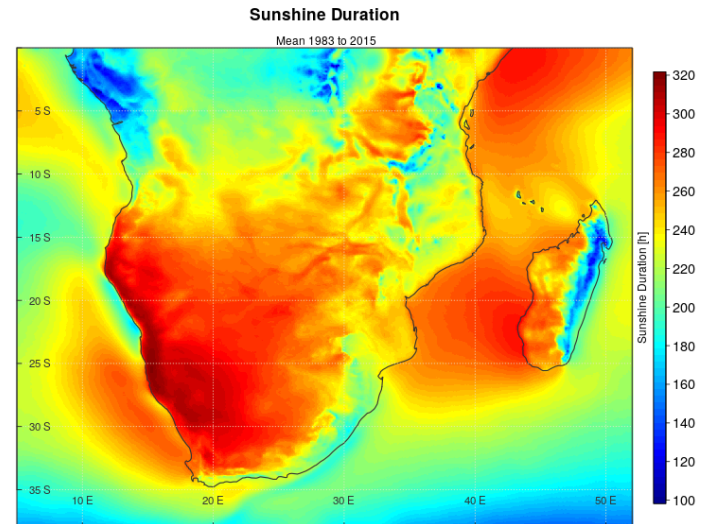
Scale Caption: Land Surface Temperature (PMW) [K]

Save as png-file EXIT



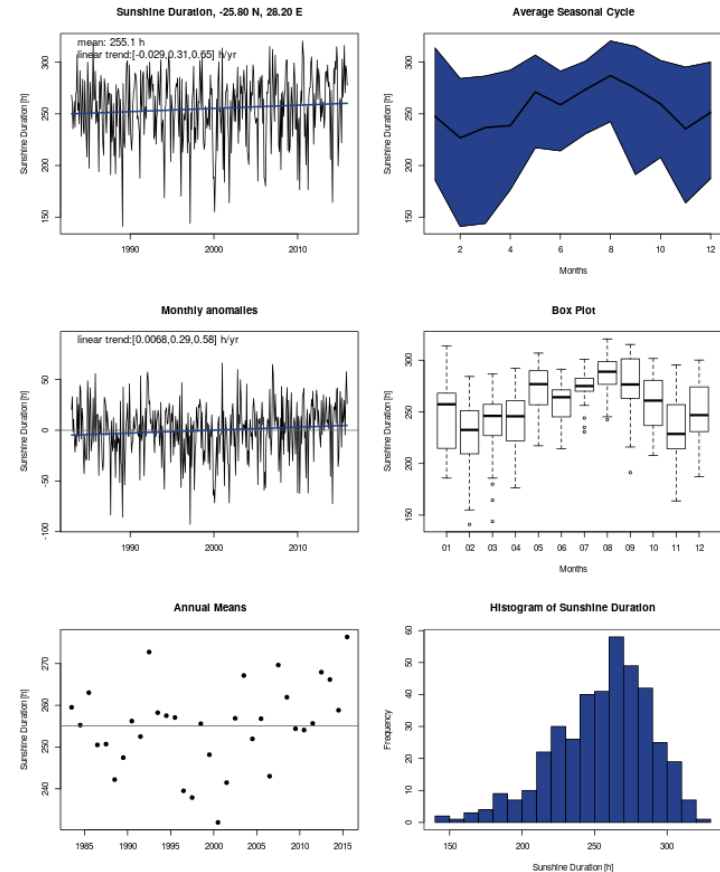
## Data Visualization

- The **Visualize** step allows an easy creation customized plots
  - 2d maps
  - 1d line plots



# Data Visualization

- The **Visualize** step allows an easy creation customized plots
  - 2d maps
  - 1d line plots
  - statistical figures of 1d time series
- Provides useful information on the data
- There are several possibilities of adaptations



## CM SAF R Toolbox

→ Let's try it!

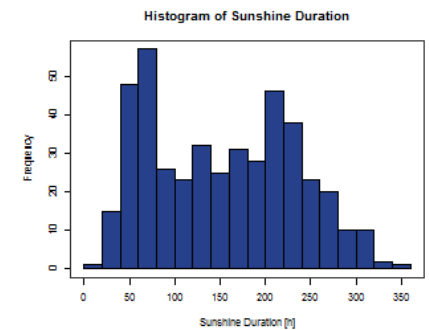
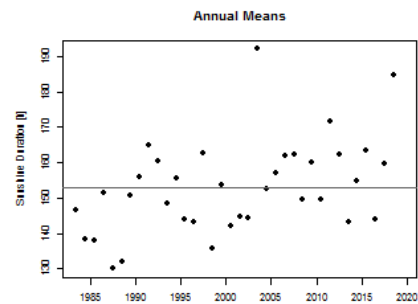
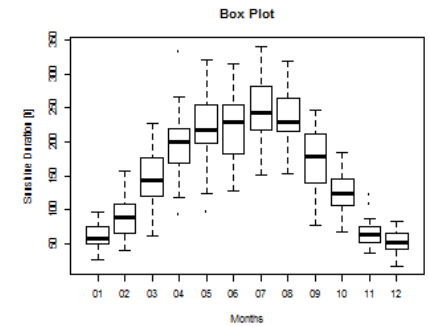
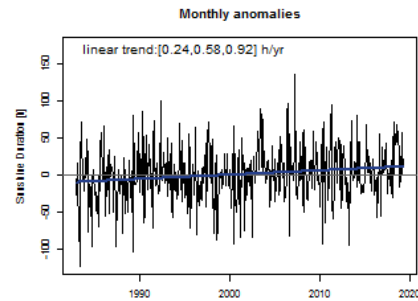
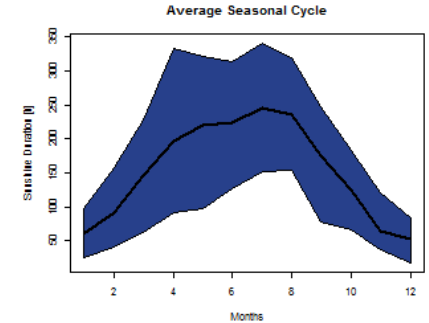
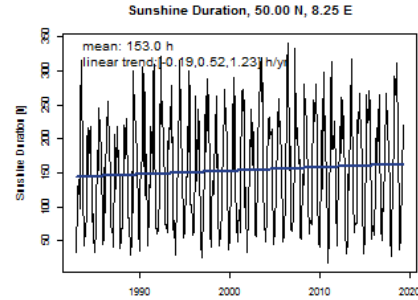
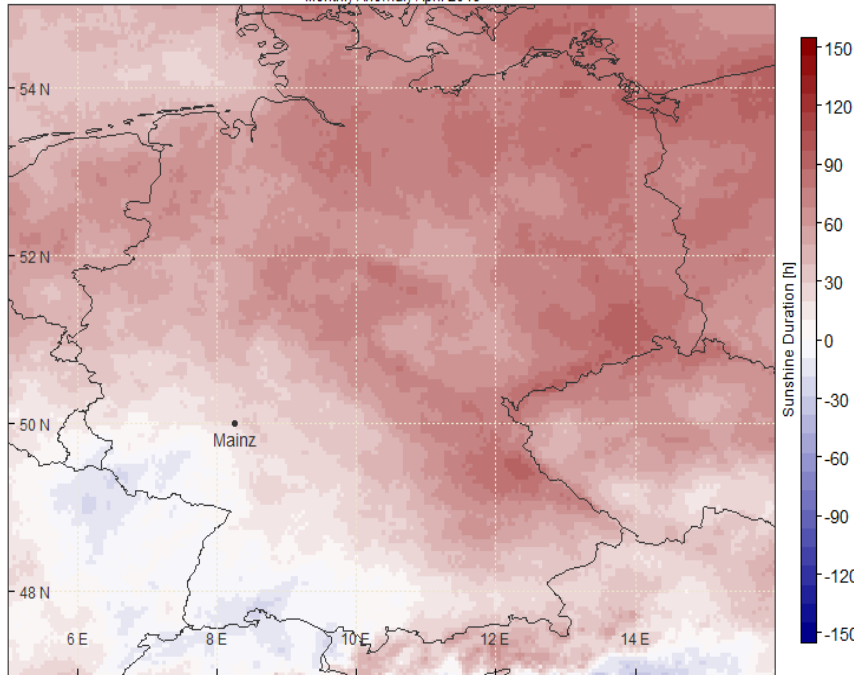
→ Mainz: 50 N, 8.25 E

# CM SAF R Toolbox

➔ Results

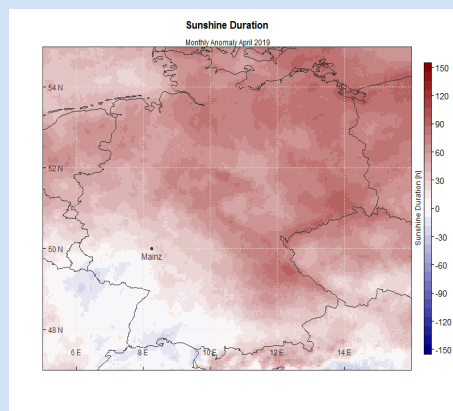
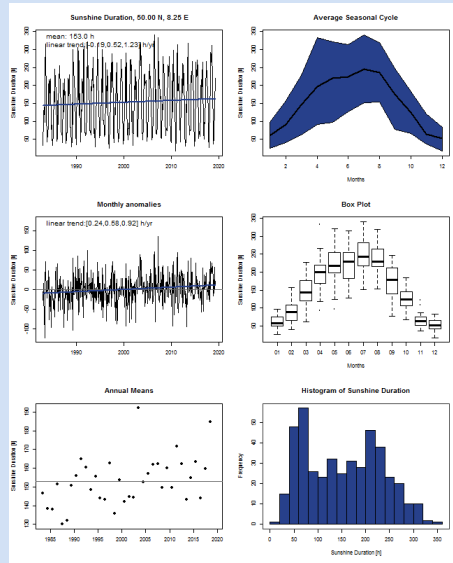
## Sunshine Duration

Monthly Anomaly April 2019



# To-Do-List

- Find data ✓
- Download data ✓
- Work with data ✓
- Results ✓



## Summary

- CM SAF freely provides the CM SAF R Toolbox
- Easy preparation, analysis and visualization of CM SAF data
- ‘cmsaf’ R-package offers collection of functions for analysis and manipulation of CM SAF NetCDF data  
(<https://cran.r-project.org/web/packages/cmsaf/index.html>)

 **Contact:**

Steffen.Kothe@dwd.de




contact.cmsaf@dwd.de



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

Article

# The CM SAF R Toolbox—A Tool for the Easy Usage of Satellite-Based Climate Data in NetCDF Format

Steffen Kothe <sup>1,\*</sup>, Rainer Hollmann <sup>1</sup>, Uwe Pfeifroth <sup>1</sup>, Christine Träger-Chatterjee <sup>2</sup> and Jörg Trentmann <sup>1</sup>

<sup>1</sup> Deutscher Wetterdienst, 63067 Offenbach, Germany; Rainer.Hollmann@dwd.de (R.H.); Uwe.Pfeifroth@dwd.de (U.P.); Joerg.Trentmann@dwd.de (J.T.)

<sup>2</sup> EUMETSAT, 64295 Darmstadt, Germany; Christine.Traeger@eumetsat.int

\* Correspondence: Steffen.Kothe@dwd.de

Received: 5 February 2019; Accepted: 24 February 2019; Published: 28 February 2019



**Abstract:** The EUMETSAT Satellite Application Facility on Climate Monitoring (CM SAF) provides satellite-based climate data records of essential climate variables of the energy budget and water cycle. The data records are generally distributed in NetCDF format. To simplify the preparation, analysis, and visualization of the data, CM SAF provides the so-called CM SAF R Toolbox. This is a collection of R-based tools, which are optimized for spatial data with longitude, latitude, and time dimension. For analysis and manipulation of spatial NetCDF-formatted data, the functionality of the cmsaf R-package is implemented. This R-package provides more than 60 operators. The visualization of the data, its properties, and corresponding statistics can be done with an interactive plotting tool with a graphical user interface, which is part of the CM SAF R Toolbox. The handling, functionality, and visual appearance are demonstrated here based on the analysis of sunshine duration in Europe for the year 2018. Sunshine duration in Scandinavia and Central Europe was extraordinary in 2018 compared to the long-term average.




## CM SAF R Toolbox – The Extension

- Extension of cmsaf R-package
  - Use operators for more grids (MSG native grid, CLARA polar grids, ...)
  - New operators (add.grid.info, remap, ...)
  - Easier implementation of new operators
  - Integration of main scripts into one application
  - Improved stability

C:/Users/stkothe/Desktop/ToolboxExtension/CMSAF-R-TOOLBOX-0.2 - Shiny

http://127.0.0.1:7483 | Open in Browser | Publish



# the CM SAF R TOOLBOX

Prepare

Analyze

Visualize

EXIT

The CM SAF R TOOLBOX 'Infinite Monkeys'

The intention of the CM SAF R Toolbox is to help you using CM SAF NetCDF formatted data

This includes:

1. Preparation of ordered CM SAF data files.
2. Analysis of prepared CM SAF data.
3. Visualization of the results.


To begin, choose a .tar file in the prepare section or jump right in and analyze or visualize a .nc file.

Suggestions for improvements and praise for the developers can be sent to [contact.cmsaf@dwd.de](mailto:contact.cmsaf@dwd.de).

- Steffen Kothe - 2019-01-22 -

C:/Users/stkothe/Desktop/ToolboxExtension/CMSAF-R-TOOLBOX-0.2 - Shiny

http://127.0.0.1:7483 | Open in Browser | Publish



# the CM SAF R TOOLBOX

Prepare

Analyze

Visualize

EXIT

The CM SAF R TOOLBOX 'Infinite Monkeys'

The intention of the CM SAF R Toolbox is to help you using CM SAF NetCDF formatted data

This includes:

1. Preparation of ordered CM SAF data files.
2. Analysis of prepared CM SAF data.
3. Visualization of the results.

To begin, choose a .tar file in the prepare section or jump right in and analyze or visualize a .nc file.

Suggestions for improvements and praise for the developers can be sent to [contact.cmsaf@dwd.de](mailto:contact.cmsaf@dwd.de).

- Steffen Kothe - 2019-01-22 -

