

# A climate data record of "sunshine": SARAH

## From order to figure

28 October 2020

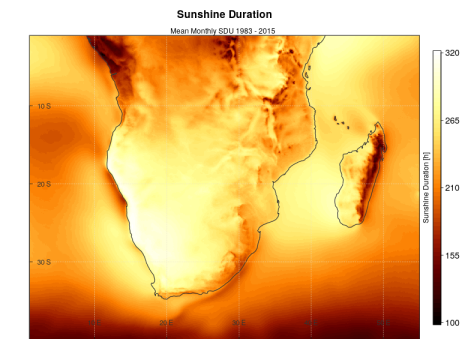
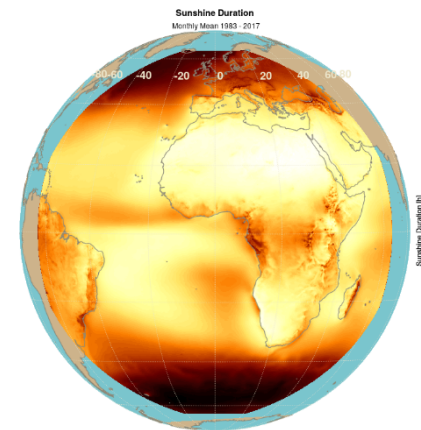
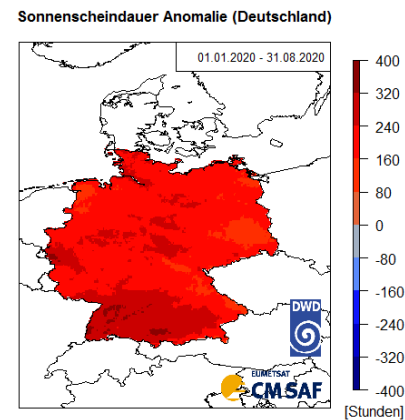
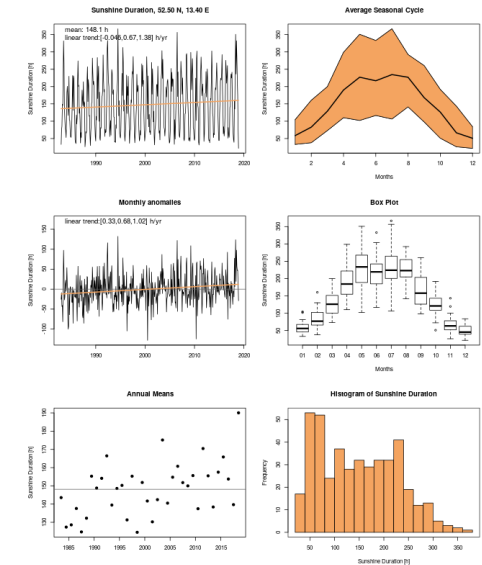
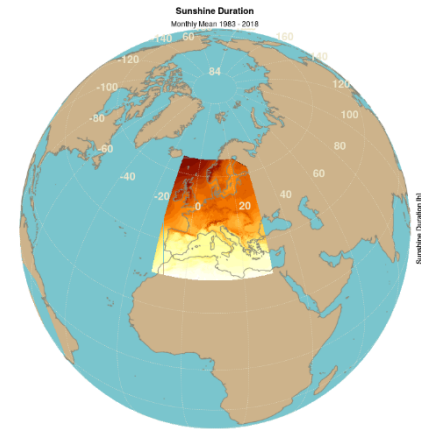
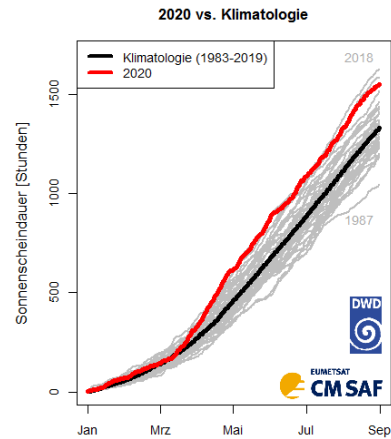
Steffen Kothe

DWD / CM SAF



# Hands-on session

- Order
- Prepare
- Analyze
- Visualize
- Be Amazed



# Data Access

- **Web User Interface**

- Registration
- Login
- Product Search
  - Product Search Form
- List of products
- Select Region
- Choose time range
- Place order

The screenshot displays the CM SAF web user interface. At the top, there is a navigation bar with the CM SAF logo and links for Home, Sitemap, Glossary, and Imprint. A binary code sequence is visible in the top right corner. Below the navigation bar, a left sidebar contains a menu with options: Home, Products (expanded to show Product search, User, Order, and Service), DIRECTLY TO (Documentation, User Help Desk, Feedback / User Problem Report), and EXTERNAL LINKS (EUMETSAT, SMHI, CM SAF, and other logos). The main content area is titled "CM SAF - Product navigator" and includes a search section with "Operational Products" and "Climate Data Sets" lists. A "USER SPECIFIED SEARCH" form is located at the bottom, featuring dropdown menus for Product group (2), Product name (42), Area (10), Temporal resolution (6), Statistics (5), Spatial resolution (13), and Data source (28). A "Reset" and "Search" button are provided. On the right side, there is a login section with a "Click here to log on." link and a "Login" button, followed by a message "Your order cart is empty." and a "To order cart" link. Below this, "Example products" are shown with three satellite imagery thumbnails.

<https://wui.cmsaf.eu>

# Data Access

- Web User Interface
  - Registration
  - Login
  - Product Search
    - Product Search Form
  - List of products
  - Select Region
  - Choose time range
  - Place order

The screenshot shows the registration page of the EUMETSAT CM SAF Web User Interface. The page has a dark blue header with the EUMETSAT CM SAF logo on the left and navigation links (Home, Sitemap, Glossary, Imprint, Data Protection) on the right. Below the header is a navigation menu with options: Home, Products, User (expanded), Registration (selected), Order, and Service. A 'DIRECTLY TO' section contains links for Documentation, User Help Desk, Feedback / User Problem Report, CM SAF Service Messages, and CM SAF FAQs. An 'EXTERNAL LINKS' section features logos for EUMETSAT, GUF, SMHI, and other partners. The main content area is titled 'Registration' and includes a welcome message and a 'Contact our User Help Desk' link. Below this is the 'USER PROFILE' form, which contains fields for First name, Last name, Organisation, Department, Country (a dropdown menu), and a checkbox for 'Subscribe CM SAF newsletter'. The 'Field of activity' section has radio buttons for Meteorological Service, Other government service, Research institute, Private company, and Other. A large text area is provided for 'Description of intended work'. At the bottom of the form are fields for E-mail and Re-enter E-mail, with a 'Continue' button and a note that asterisked fields are required.

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# Data Access

- **Web User Interface**
  - Registration
  - **Login**
  - Product Search
    - Product Search Form
  - List of products
  - Select Region
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  - Place order

The screenshot displays the EUMETSAT CM SAF Web User Interface (WUI). The header includes the EUMETSAT CM SAF logo, navigation links (Home, Sitemap, Glossary, Imprint, Data Protection), and a welcome message with a sign-in link and an order cart icon showing 0 items. The main content area is divided into three sections: **Login**, **REGISTRATION**, and **PASSWORD**. The **Login** section prompts users to log in to order products and provides input fields for 'Username or E-mail' (containing 'SKOTHE') and 'Password' (masked with dots), along with a 'Login' button. The **REGISTRATION** section asks if the user is new to the interface and provides a link to 'Registration'. The **PASSWORD** section offers options for users who have forgotten their password or cannot find their username, including links to 'Reset and resend password by e-mail' and 'Contact our User Help Desk'. A sidebar on the left contains navigation links for Home, Products, User (Registration, Order, Service), and a 'DIRECTLY TO' section with links to Documentation, User Help Desk, Feedback / User Problem Report, CM SAF Service Messages, and CM SAF FAQs. An 'EXTERNAL LINKS' section at the bottom left features logos for EUMETSAT, SMHI, and other partners. The footer contains copyright information for 2010-2020 DWD and 2010-2020 CM SAF.

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# Data Access

- **Web User Interface**
  - Registration
  - Login
  - **Product Search**
    - Product Search Form
  - List of products
  - Select Region
  - Choose time range
  - Place order

The screenshot shows the EUMETSAT CM SAF WUI personal area. The top navigation bar includes links for Home, Sitemap, Glossary, Imprint, and Data Protection. The user is logged in as Steffen Kothe. The main content area is divided into three sections: 'PERSONAL AREA' with links for 'Administration of your profile' (User Profile) and 'Administration of your password' (Change password); 'CM SAF ACCOUNT' with a link for 'Management of your account' (Manage Account); and 'CONTINUE BROWSING' with links for 'Show product search form', 'Show products', and 'Show all products'. The 'Show product search form' link is highlighted with a red circle.

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# Data Access

- **Web User Interface**

- Registration
- Login
- Product Search
  - **Product Search Form**
- List of products
- Select Region
- Choose time range
- Place order

The screenshot displays the CM SAF web user interface. On the left, there is a navigation menu with sections: "DIRECTLY TO" (Documentation, User Help Desk, Feedback / User Problem Report, CM SAF Service Messages, CM SAF FAQs), "EXTERNAL LINKS" (EUMETSAT, CITE, SMHI, CM SAF, and other logos), and "SEARCH ACCORDING TO PRODUCT GROUPS/TYPES" (Operational Products, Climate Data Records, Show all products). Below this is an "ADVANCED SEARCH" form with fields for Product group, Product family (SARAH ed. 2.1), Product name (SIS - Surface incoming shortwave radiation), Area, Temporal resolution, Statistics, Spatial resolution, and Platform. The "Temporal coverage" field has "from" and "to" dropdowns. Below the form, it shows "Result: 3" and a "Show" button circled in red. At the bottom, there is a "SEARCH PROFILE" section with a "current search profile" field, an "existing search profiles" dropdown, and radio buttons for "Load", "Save", and "Delete", along with an "OK" button.

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# Data Access

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- Select Region
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The screenshot shows the EUMETSAT CM SAF web user interface. The top navigation bar includes links for Home, Sitemap, Glossary, Imprint, and Data Protection. The user is logged in as Steffen Kothe. The main content area displays a 'List of products' table with the following data:

Name	Long Name	Version	Data source	Time	Statistics	Area
SIS	Surface incoming shortwave radiation	SARAH ed. 2.1	MVIRI/SEVIRI on METEOSAT	Monthly	Mean	MSG full disk (includes Europe, Afrika, Atlantic Ocean)
SIS	Surface incoming shortwave radiation	SARAH ed. 2.1	MVIRI/SEVIRI on METEOSAT	Instantaneous	(none)	MSG full disk (includes Europe, Afrika, Atlantic Ocean)
SIS	Surface incoming shortwave radiation	SARAH ed. 2.1	MVIRI/SEVIRI on METEOSAT	Daily	Mean	MSG full disk (includes Europe, Afrika, Atlantic Ocean)

The 'Time' column is circled in red. Below the table, it indicates '3 Products found, displaying all Products.' and provides a 'Back to product search' link. The page also features a sidebar with 'DIRECTLY TO' links (Documentation, User Help Desk, Feedback / User Problem Report, CM SAF Service Messages, CM SAF FAQs) and 'EXTERNAL LINKS' (EUMETSAT, SMHI, CM SAF, etc.).

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# Data Access

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The screenshot displays the CM SAF web user interface. On the left, there is a sidebar with 'EXTERNAL LINKS' including logos for EUMETSAT, CM SAF, and other partners. The main content area shows 'Citation / DOI' information for the Surface Radiation Data Set - Heliosat (SARAH) - Edition 2.1. Below this, there is a 'PRODUCT ADAPTATIONS' section with a red circle highlighting the link 'Change projection / spatial resolution / domain'. At the bottom, there is a 'VISUAL PRODUCT EXAMPLES' section featuring a map titled 'Surface Solar Radiation, CM SAF SARAH-2, 2015-01-01'. The map shows a global view of surface solar radiation with a color scale from 0 to 400 W/m<sup>2</sup>.

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The screenshot displays the 'PRODUCT ADAPTATIONS' section of the CMSAF web user interface. It includes a navigation menu on the left with options like 'User', 'Order', and 'Service'. The main content area features a world map with a bounding box around the North Atlantic region, labeled with coordinates '-10.52, -86.99'. Below the map, there are input fields for specifying domain boundaries: 'upper' (51°), 'lower' (48°), 'left' (7°), and 'right' (10°). A 'Preview' button is located between the 'left' and 'right' fields. Below these fields, there is a dropdown menu for '-Select Region-' and a section for specifying longitudinal and latitudinal mesh sizes, with 'Longitude' set to 0.05° and 'Latitude' set to 0.05°. At the bottom right, a 'Proceed to time range selection' button is highlighted with a red circle. The 'SELECTED PRODUCT' section is partially visible at the bottom.

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# Data Access

- **Web User Interface**

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  - Product Search Form
- List of products
- Select Region
- **Choose time range**
- Place order

The screenshot displays the EUMETSAT CM SAF web user interface. The top navigation bar includes links for Home, Sitemap, Glossary, Imprint, and Data Protection. The user is logged in as Steffen Kothe, and the order cart is empty (0). A sidebar menu on the left lists navigation options: Home, Products, User, Order (with sub-items for Current orders, Order status, and Service), and Service. Below the sidebar are sections for 'DIRECTLY TO' (Documentation, User Help Desk, Feedback / User Problem Report, CM SAF Service Messages, CM SAF FAQs) and 'EXTERNAL LINKS' (EUMETSAT, SMHI, CM SAF, and other logos).

The main content area is titled 'Specification of time range'. It contains the following text: 'Please select the time range for your product order as well as your intended product format. Please be reminded that Climate Data Records are available as NetCDF only. Furthermore you may decide between uniquely ordering (specification of time range necessary) and standing ordering, i.e. you will receive products on a daily/weekly/monthly basis created on the day before from today onwards until you cancel the standing order; the frequency of data delivery depends on the chosen time resolution of your product. Please note that Climate Data Records cannot be ordered continuously.'

Below this text, there is a section 'Please specify the time range' with the text: 'This product is available from 1983-01-01 to 2017-12-31 (64 GB\*)'. Two input fields are present: 'Begin: 2011-01-01' and 'End: 2015-12-31', both of which are circled in red. Below these fields is a section 'Please choose your preferred product format:' with a radio button selected for 'NetCDF4 - Products will be provided in Network Common Data Format v4 (native)'. A note below states: 'If the native data format is disabled, then you have selected subdomain and cdo post-processing will output NetCDF formatted files only.' An 'Add to order cart' button is circled in red at the bottom right of this section.

The bottom section is titled 'SELECTED PRODUCT' and lists the following details: Product group: Climate Data Records; Product family: SARAH ed. 2.1; Product name: SIS - Surface incoming shortwave radiation; Area: MSG full disk (includes Europe, Afrika, Atlantic Ocean); Temporal resolution: Daily; Statistics: Mean; Spatial resolution: Latitude/longitude grid (0.05x0.05 degree); Data source: MVIRI/SEVIRI on METEOSAT; Temporal coverage: 1983-01-01 - 2017-12-31; Version(s): V003; Documentation: Algorithm Theoretical Basis Document (ATBD), SARAH-2.1; Product User Manual (PUM) SARAH-2.1; Validation Report (VAL) SARAH-2.1.

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# Data Access

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- Registration
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  - Product Search Form
- List of products
- Select Region
- Choose time range
- **Place order**

The screenshot shows the EUMETSAT CM SAF web user interface. The top navigation bar includes links for Home, Sitemap, Glossary, Imprint, and Data Protection. The user is logged in as Steffen Kothe, and the order cart contains 1 item. The main content area is titled 'Your current orders' and provides instructions on how to finish an order, including a note about delivery time and a warning about standing orders. Below this, the 'ORDER TRANSFER' section allows users to submit their order, showing a total size of 8.9 GB\* and a download time of approximately 38 minutes. Users can choose their preferred type of data transfer: HTTPS/SFTP (selected) or E-MAIL. A 'Place an order' button is circled in red. The 'ORDER CART' section displays a table with one item: v003, SIS - Surface incoming shortwave radiation, MVIRI/SEVIRI on METEOSAT, Daily, Mean, MSG full disk (includes Europe, Afrika, Atlantic Ocean), with a size of 8.9 GB\*. The 'CONTINUE BROWSING' section offers links to show the product search form, products, and all products.

**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 **8.9 GB\*** which will take approx. **38 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	
1	v003, SIS - Surface incoming shortwave radiation, MVIRI/SEVIRI on METEOSAT, Daily, Mean, MSG full disk (includes Europe, Afrika, Atlantic Ocean)	2011-01-01	2015-12-31	8,9 GB*	

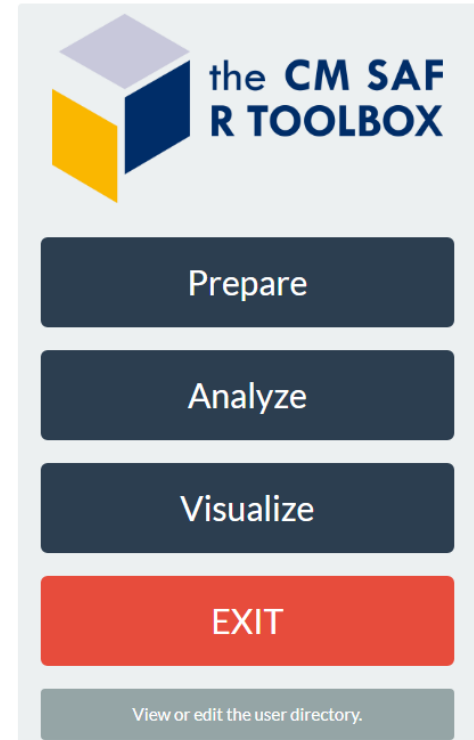
**CONTINUE BROWSING**

- » Show product search form
- » Products
- » Show all products

<https://wui.cmsaf.eu>

# Work with the data

- CM SAF provides CM SAF R Toolbox for free
- No R or scripting experiences needed



The CM SAF R TOOLBOX 3.0.0 -- 'Share and Enjoy'

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 or a .nc file in the prepare section or jump right in and analyze or visualize a .nc file.

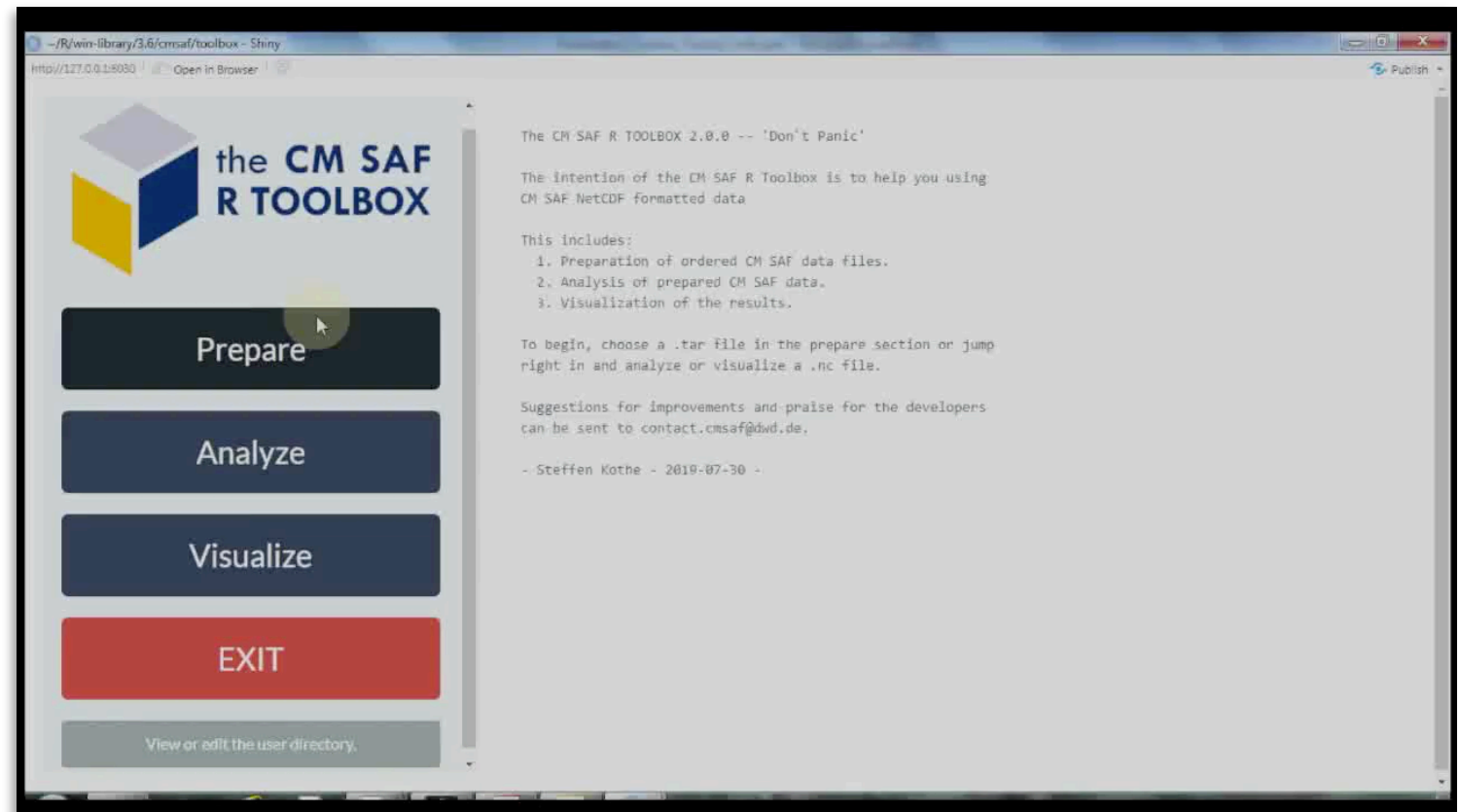
Suggestions for improvements and praise for the developers can be sent to [contact.cmsaf@dwd.de](mailto:contact.cmsaf@dwd.de).

- Steffen Kothe - 2020-07-24 -

# CM SAF R Toolbox

## Prepare

- Preparation of ordered CM SAF data (extract, choose time & region, merge)

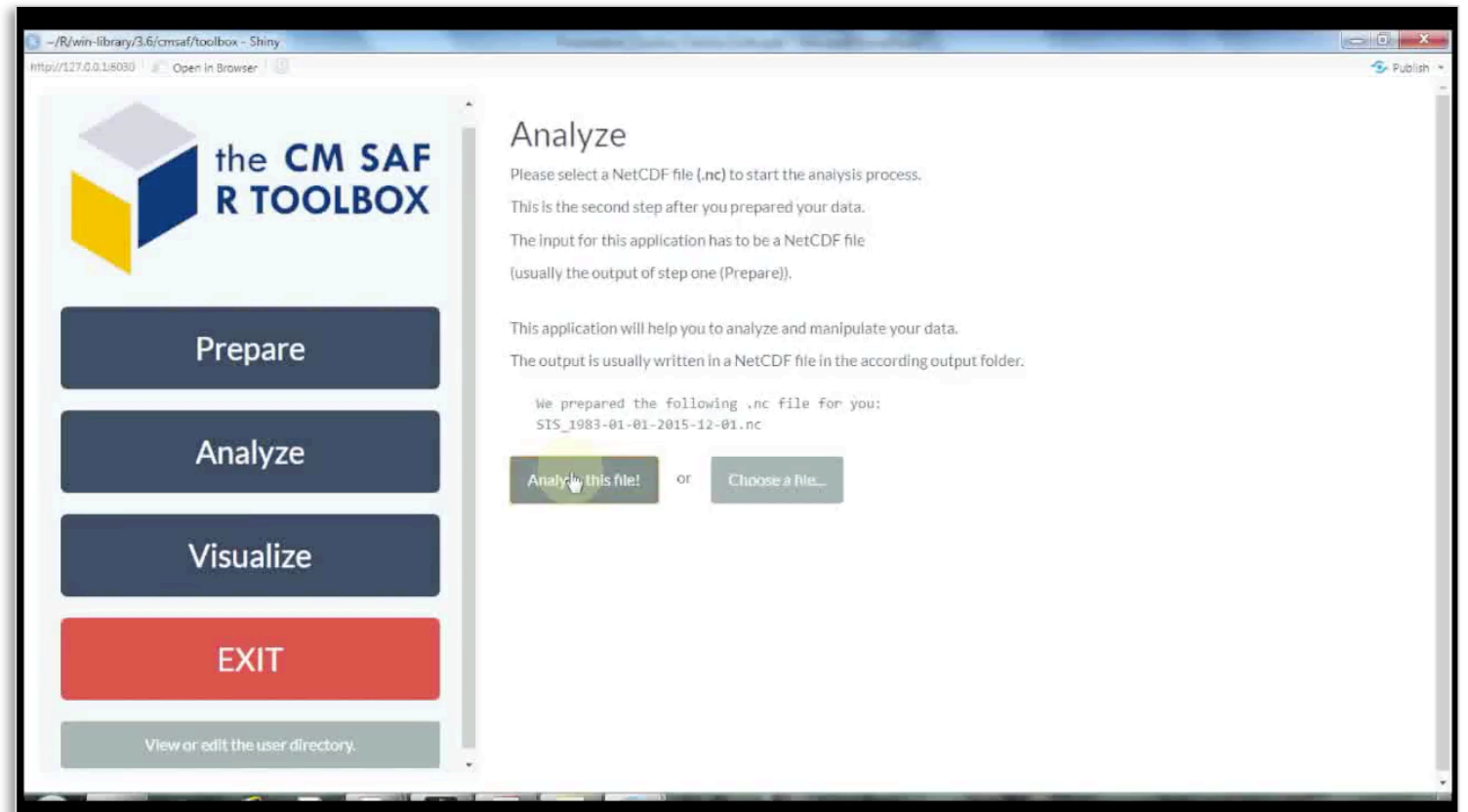




# CM SAF R Toolbox

## Analyze

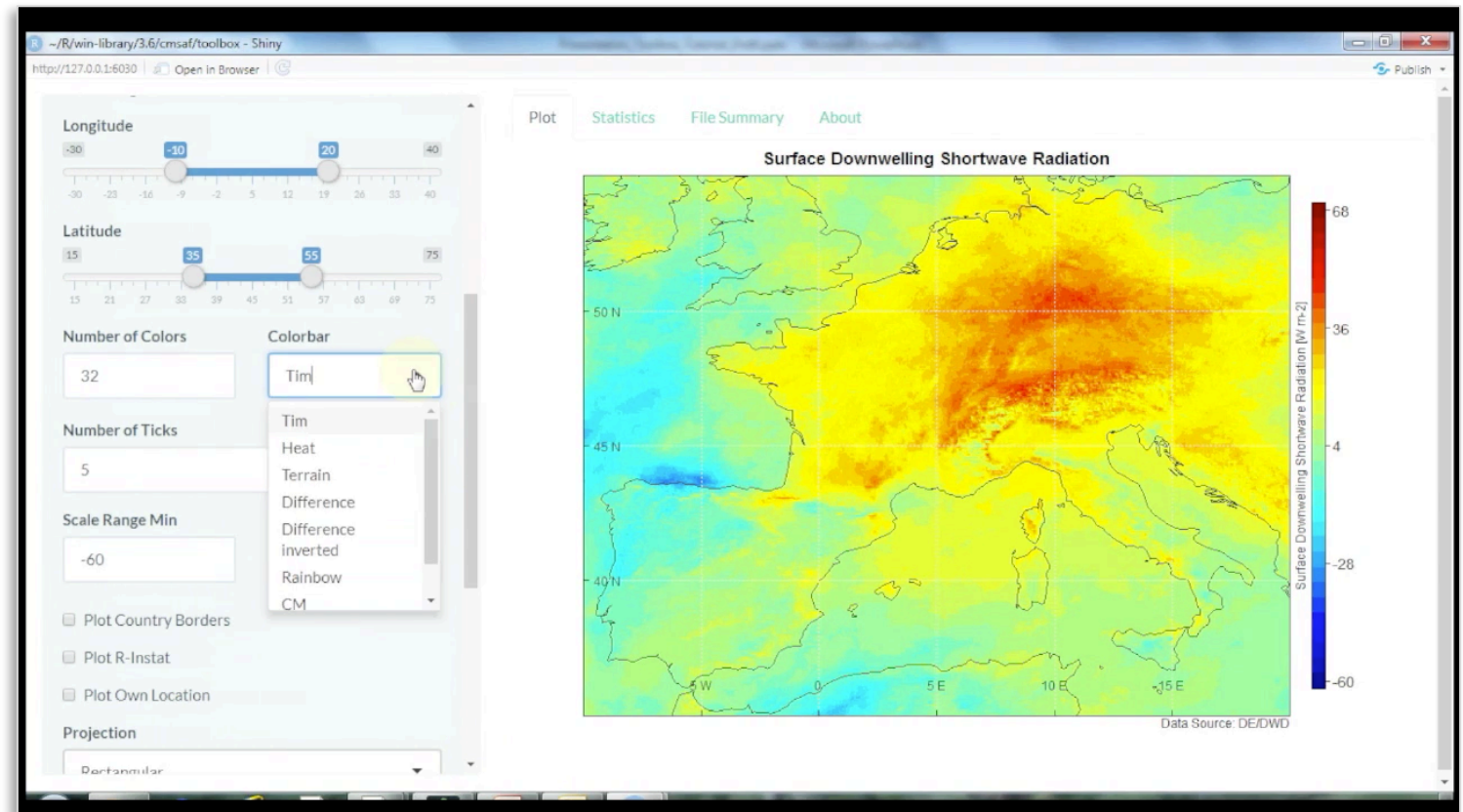
- Analysis and manipulation of CM SAF NetCDF data



# CM SAF R Toolbox

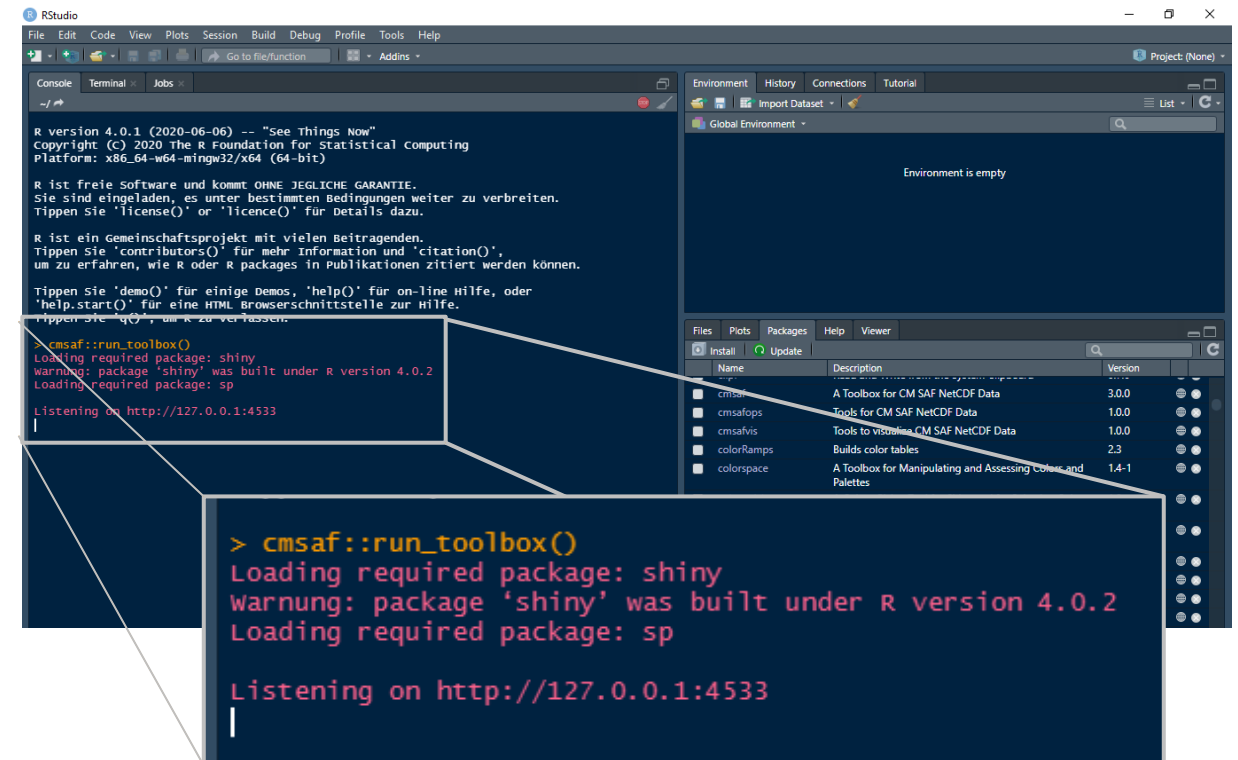
## Visualize

- Easy visualization of CM SAF data



# How to start the CM SAF R Toolbox

- Start Rstudio
  - `cmsaf::run_toolbox()`
  - Have fun



```
R version 4.0.1 (2020-06-06) -- "See Things Now"
Copyright (C) 2020 The R Foundation For Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

R ist freie Software und kommt OHNE JEGLICHE GARANTIE.
Sie sind eingeladen, es unter bestimmten Bedingungen weiter zu verbreiten.
Tippen Sie 'license()' or 'licence()' für Details dazu.

R ist ein Gemeinschaftsprojekt mit vielen Beitragenden.
Tippen Sie 'contributors()' für mehr Information und 'citation()',
um zu erfahren, wie R oder R packages in Publikationen zitiert werden können.

Tippen Sie 'demo()' für einige Demos, 'help()' für on-line Hilfe, oder
'help.start()' für eine HTML Browserschnittstelle zur Hilfe.
Tippen Sie 'q()' , um R zu verlassen.

> cmsaf::run_toolbox()
Loading required package: shiny
warning: package 'shiny' was built under R version 4.0.2
Loading required package: sp
Listening on http://127.0.0.1:4533
```

```
> cmsaf::run_toolbox()
Loading required package: shiny
warning: package 'shiny' was built under R version 4.0.2
Loading required package: sp

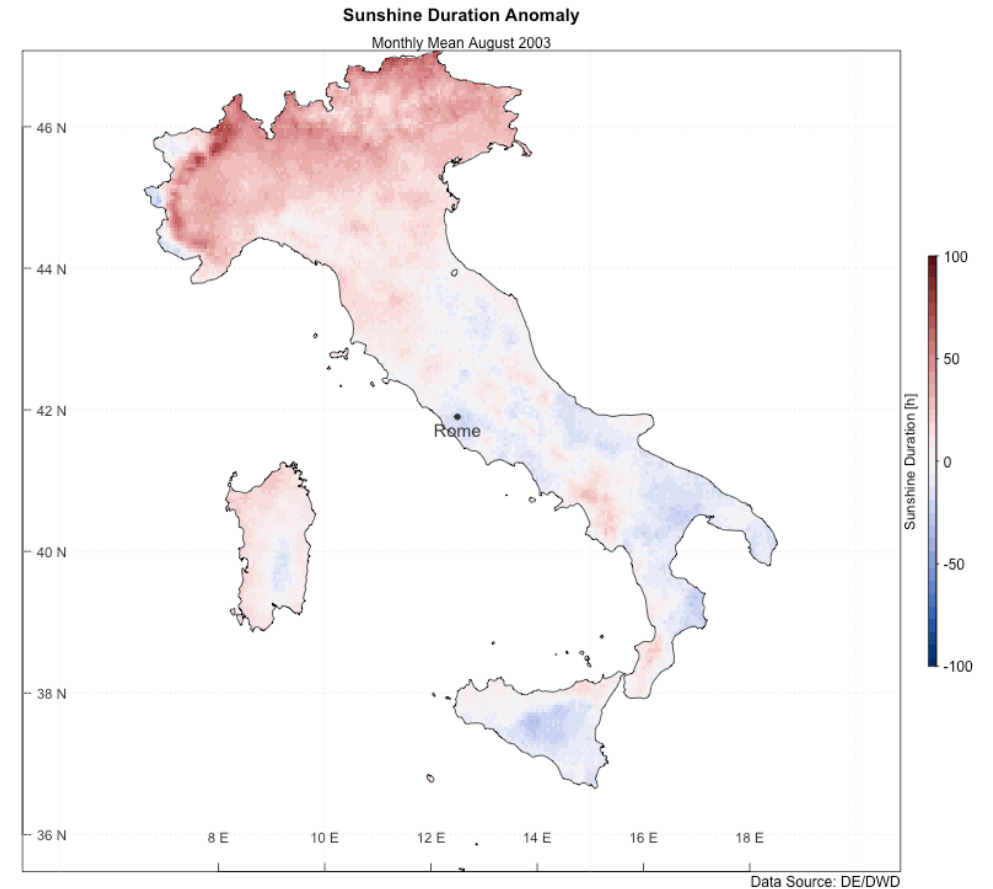
Listening on http://127.0.0.1:4533
```

Name	Description	Version
cmsaf	A Toolbox for CM SAF NetCDF Data	3.0.0
cmsafops	Tools for CM SAF NetCDF Data	1.0.0
cmsafvis	Tools to visualize CM SAF NetCDF Data	1.0.0
colorRamps	Builds color tables	2.3
colorspace	A Toolbox for Manipulating and Assessing Colors and Palettes	1.4-1

[www.cmsaf.eu/R\\_toolbox](http://www.cmsaf.eu/R_toolbox)

# Hands-on session

- Explore our SARAH data
- Use the CM SAF R Toolbox or any other tool you like
- Work in your own pace
  - Create a figure of SARAH data
  - More advanced: Create an anomaly for your country or city



# Now it's your turn...

Further information on Moodle:

<https://training.eumetsat.int/course/view.php?id=378>

If you wish, please share your results on padlet:

[https://padlet.com/CMSAF/cmsaf\\_padlet](https://padlet.com/CMSAF/cmsaf_padlet)

**The session continues at 15:15 UTC.**