Data Formats and Data Viewers

Due to the huge amount of data, satellite information cannot be stored in formats like ASCII or excel-spreadsheets. Highly specialized binary data formats have been developed to store and handle array-oriented data sets, like satellite data. With the help of such standardized data formats large data sets can be assessed and analyzed with specialized software. However, commonly available software, e.g. software that is included in standard Windows distributions, is not able to open and read such binary data files.

Common formats for satellite data are hdf5 (Hierarchical Data Format) and NetCDF (network Common Data Form). The operational CM SAF products and CM SAF climate data records are distributed in NetCDF. The workshop will focus on the use of data in NetCDF-format. Current CM SAF data records are in NetCDF3, while the next releases of CM SAF data records will be in NetCDF4. Please check if you have installed all necessary libraries for NetCDF4. Otherwise, there is the option to choose between NetCDF3 and NetCDF4 during the ordering process (wui.cmsaf.eu).

To convert a binary NetCDF file into readable ASCII format, the command-line tool *ncdump* can be used. *ncdump* is distributed with the NetCDF-library, which is available for Unix/Linux and Windows operating systems.

To visualize data files in NetCDF-format software is required. For quicklooks of the data easy-to-use software is available:
For Unix/Linux operating systems, ncview is commonly used; the java-based ncBrowse and Panoply is available for all operating systems.

To analyse and for more advanced visualization of NetCDF data, more complex software packages are required. During the workshop we will use the *'cmsaf' R-package* for the analysis of CM SAF NetCDF data. However, most data analysis software packages are able to work with CM SAF NetCDF data, e.g., QGIS, IDL, MATLAB.

Joerg Trentmann / Steffen Kothe, DWD

Last modified: Friday, 17 February 2017

R: A software environment for statistical computing and graphics

The practical classes at the workshop will be based on the free software environment *R* (http://www.r-project.org/). This software is designed for the statistical analysis and the visualisation of data sets and is available for Unix/Linux, Windows, and MAC operating systems. *R* is widely used in numerous disciplines that require enhanced statistical analysis of data sets, including climatology and includes high-end graphical features to display and combine geographical data sets, e.g., from satellite.

During the workshop we will introduce the use of the CM SAF data within *R*. This will include the statistical analysis and the visualization of CM SAF data.
Experience with *R* is not required for the workshop, but would be beneficial.

Here are some useful webpages regarding *R*:

http://cran.r-project.org/manuals.html

http://cran.r-project.org/faqs.html

http://cran.r-project.org/doc/contrib/Short-refcard.pdf

For the installation of *R*, please follow the instruction on the *R*-homepage.

A good Interface for R is the *RStudio*. RStudio is recommended for beginners because it combines a graphical user interface, script editing and useful information on R.

Here is a link to a blog post from Oscar Perpiñán Lamigueiro about the use of R to estimate solar energy potential using CM SAF data:
http://procomun.wordpress.com/2011/06/17/raster-cmsaf-and-solar/

Jörg Trentmann / Steffen Kothe, DWD
29 April 2011
15 July 2011

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CM SAF R TOOLBOX

The CM SAF R toolbox consists of the 'cmsaf' R-package and a set of R-scripts, which are helpful to work with CM SAF NetCDF data.
The 'cmsaf' R-package provides a collection of R-functions, which can replace some basic cdo commands. This gives the opportunity to work with CM SAF data without the need of installing cdo. You can download the toolbox here. A preliminary tutorial video of the use of the toolbox on Windows platforms can be downloaded here. Additional comments on the video can be downloaded here. The documentation including a complete listing of available commands can be found here. More information and installation instructions are included in the CM SAF R toolbox.

Comments and suggestions on improvements are always welcome.

Steffen Kothe, DWD

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Install R-Instat

Download and Install

R-Instat can be downloaded from here http://r-instat.org/Download.html.

You may already have installed the latest version of R (3.4.1 or 3.4.2) from the previous section. If you have, then download **R-Instat BASIC INSTALLER** in the link above.

If have not, then download **R-Instat FULL INSTALLER** in the link above as this will install R at the same time.

Please follow the installation guide when installing, found in the above link, to ensure that you install R-Instat correctly.

Both the basic and full installers are quite large files and will require a good internet connection to download. However, once downloaded, no further internet is required.

If you cannot download R-Instat it will be provided in Pretoria.

If you have any issues installing R-Instat, please post a message in the forum and someone will assist you.

Mac & Linux Users

Note that R-Instat is currently a Windows only application. If you do not have access to a Windows machine you can still use R-Instat on a Mac or Linux through use of a Virtual Windows machine. If you need help installing a virtual Windows machine, please post a message in the forum and someone will assist you.

RStudio

You may have seen RStudio mentioned in an earlier section. This is a good way to use R if you want to write scripts and commands. You do not need RStudio to be able to use R-Instat, but it will be a useful during this workshop and afterwards. It can be downloaded from here https://www.rstudio.com/products/rstudio/download/

After Installing

Now move on to the next section showing how to run R-Instat for the first time and getting started.

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R-Instat Tutorials

To help you become familiar with R-Instat before you arrive in Pretoria we have created a set of introductory tutorials for you to try out.

Even if you were not able to download R-Instat, these documents are still useful reading as there are many screen shots and explanations of R-Instat's functionality.

There are three tutorial documents below. Part 1 is mainly concerned with creating graphs. Part 2 introduces a set of daily climatic data and shows some of the steps to prepare it for analysis. Part 3 is optional and less important for this workshop. It describes analyses of a survey data set. Only do this part of the tutorial if it interests you.

R-Instat is a general statistics package, with an added special menu for climatic analyses. These tutorials are on the general use of the software, which will prepare you to then use more of the specific climatic facilities when we meet in Pretoria.

You can either download PDF versions of the tutorials or view them online.

PDF Download Versions

Introductory Tutorial: Part 1 Describing Data

Introductory Tutorial: Part 2 A Second Data Set

Introductory Tutorial: Part 3 Working with Labelled Data

Online Versions

Introductory Tutorial: Part 1 Describing Data

Introductory Tutorial: Part 2 A Second Data Set

Introductory Tutorial: Part 3 Working with Labelled Data

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