EUMETSAT Satellite Application Facility on Climate Monitoring

Product User Manual

Meteosat Cloud Fractional Cover (Comet) Edition 1

DOI: 10.5676/EUM_SAF_CM/CFC_METEOSAT/V001

Cloud Fractional Cover (CFC) **CM-23011**

Reference Number:	**SAF/CM/MeteoSwiss/PUM/MET/CFC**
Issue/Revision Index:	**1.1**
Date:	**09.05.2017**

Document Signature Table

	Name	Function	Signature	Date
Author	Anke Duguay-Tetzlaff Reto Stöckli Jedrzej Bojanowski	CM SAF Scientist CM SAF Scientist CM SAF Scientist		20.09.2016
Editor	Rainer Hollmann	Science Coordinator		09.05.2017
Approval	Steering Group			
Release	Martin Werscheck	Project Manager		22.08.2017

Distribution List

Internal Distribution	
Name	**No. Copies**
DWD Archive	1
CM SAF Team	1

External Distribution		
Company	**Name**	**No. Copies**
PUBLIC		1

Document Change Record

Issue/ Revision	Date	DCN No.	Changed Pages/Paragraphs
1.0	15/08/2016	SAF/CM/MeteoSwiss/PUM/MET/CFC	First version submitted for DRR 2.8
1.1	09/05/2017	SAF/CM/MeteoSwiss/PUM/MET/CFC	Final Document based on comments from DRR 2.8

Applicable Documents

Reference	Title	Code
AD 1	CM SAF Product Requirements Document	SAF/CM/DWD/PRD/2.8

Reference Documents

Reference	Title	Code
RD 1	Validation Report Meteosat Cloud Fractional Cover Edition 1	SAF/CM/MeteoSwiss/VAL/MET/CFC
RD 2	Algorithm Theoretical Basis Document Meteosat Cloud Fractional Cover Edition 1	SAF/CM/MeteoSwiss/ATBD/MET/CFC

Table of Contents

List of Figures

List of Tables

1 Executive Summary

This CM SAF Product User Manual provides information on the MVIRI / SEVIRI Cloud Fractional Cover (CFC) derived from the Meteosat Visible and InfraRed Imager (MVIRI) on board the Meteosat First Generation (MFG) and the Spinning Enhanced Visible and InfraRed Imager (SEVIRI) observations onboard the Meteosat Second Generation (MSG) satellites. The covered time period of the presented Thematic Climate Data Record (TCDR) ranges from January 1991 to December of 2015, thus includes MFG 4 to 7 and MSG 1 to 3. The presented climate data contain the following product:

Cloud Fractional Cover [CM-23011, CFC]

Important features of the presented Meteosat CFC TCDR are:

- Long-term climate data record for CFC dating back until 1991. Those multi-decadal characteristics make the data very well suited for climate analysis.

- The high temporal ($\leq$ 30 min) and high spatial resolution ($\leq$ 5 km) of the MVIRI and SEVIRI instrument allow a sufficient temporal and spatial sampling of Cloud Fractional Cover (CFC). Hence, the data can provide accurate estimates of monthly diurnal cycle information for a physical variable, which vary strongly in time and space. The presented TCDR is therefore complementary to existing global longterm TCDRs which have a lower temporal resolution such as the International Satellite Cloud Climatology Project (ISCCP, Rossow and Schiffer 1999) and PATMOS-X (Heindinger et al. 2005).

- The SEVIRI field of view covers a fairly large domain of the globe. For the regions covered (e.g. Europe, Africa, Atlantic Ocean) this allows monitoring climate variability of the considered variable.

The Cloud Fractional Cover data is derived from two Meteosat heritage channels by use of an advanced Bayesian retrieval algorithm. It employs continuous cloud scores, which are built on a contemporaneous clear sky background inversion. The Meteosat CFC is characterized by comparability to the SYNOP-based long-term CFC observations carried out at WMO ground stations. The Meteosat CFC is therefore useful to supplement the ground-based CFC estimates in areas with low station density or high spatio-temporal CFC variability.

2 The EUMETSAT SAF on Climate Monitoring (CM SAF)

The importance of climate monitoring with satellites was recognized in 2000 by EUMETSAT Member States when they amended the EUMETSAT Convention to affirm that the EUMETSAT mandate is also to “contribute to the operational monitoring of the climate and the detection of global climatic changes". Following this, EUMETSAT established within its Satellite Application Facility (SAF) network a dedicated centre, the SAF on Climate Monitoring (CM SAF, http://www.cmsaf.eu).

The consortium of CM SAF currently comprises the Deutscher Wetterdienst (DWD) as host institute, and the partners from the Royal Meteorological Institute of Belgium (RMIB), the Finnish Meteorological Institute (FMI), the Royal Meteorological Institute of the Netherlands (KNMI), the Swedish Meteorological and Hydrological Institute (SMHI), the Meteorological Service of Switzerland (MeteoSwiss), and the Meteorological Service of the United Kingdom (UK MetOffice). Since the beginning in 1999, the EUMETSAT Satellite Application Facility on

Climate Monitoring (CM SAF) has developed and will continue to develop capabilities for a sustained generation and provision of Climate Data Records (CDR's) derived from operational meteorological satellites.

In particular, the generation of long-term data sets is pursued. The ultimate aim is to make the resulting data sets suitable for the analysis of climate variability and potentially the detection of climate trends. CM SAF works in close collaboration with the EUMETSAT Central Facility and liaises with other satellite operators to advance the availability, quality and usability of Fundamental Climate Data Records (FCDRs) as defined by the Global Climate Observing System (GCOS). As a major task the CM SAF utilizes FCDRs to produce records of Essential Climate Variables (ECVs) as defined by GCOS. Thematically, the focus of CM SAF is on ECVs associated with the global energy and water cycle.

Another essential task of CM SAF is to produce data sets that can serve applications related to the Global Framework of Climate Services (GFCS) initiated by the WMO World Climate Conference-3 in 2009. CM SAF is supporting climate services at national meteorological and hydrological services (NMHSs) with long-term data records but also with data sets produced close to real time that can be used to prepare monthly/annual updates of the state of the climate. Both types of products together allow for a consistent description of mean values, anomalies, variability and potential trends for the chosen ECVs. CM SAF ECV data sets also serve the improvement of climate models both at global and regional scale.

As an essential partner in the related international frameworks, in particular WMO SCOPE-CM (Sustained COordinated Processing of Environmental satellite data for Climate Monitoring), the CM SAF - together with the EUMETSAT Central Facility, assumes the role as main implementer of EUMETSAT's commitments in support to global climate monitoring. This is achieved through:

- Application of highest standards and guidelines as lined out by GCOS for the satellite data processing,
- Processing of satellite data within a true international collaboration benefiting from developments at international level and pollinating the partnership with own ideas and standards,
- Intensive validation and improvement of the CM SAF climate data records,
- Taking a major role in data set assessments performed by research organisations such as WCRP (World Climate Research Program). This role provides the CM SAF with deep contacts to research organizations that form a substantial user group for the CM SAF CDRs,
- Maintaining and providing an operational and sustained infrastructure that can serve the community within the transition of mature CDR products from the research community into operational environments.

A catalogue of all available CM SAF products is accessible via the CM SAF webpage, http:/www.cmsaf.eu/. Here, detailed information about product ordering, add-on tools, sample programs and documentation is provided.

3 Compilation of the Meteosat TCDR

The Meteosat CFC TCDR is based on 25 years of Meteosat measurements.

MVIRI and SEVIRI are optical imaging radiometers mounted on the geostationary Meteosat First Generation (MFG) satellites 1 to 7 and Meteosat Second Generation (MSG) satellites 1 to 4. Meteosat imagers in operational mode are centred near 0°/0° latitude/longitude, where

a full earth disk image includes Europe, Africa, the Middle East and the Atlantic Ocean. MVIRI scans the full disk of the earth every 30 minutes with spatial resolution of at least 5 x 5 km² at nadir (the visible channel has double resolution). SEVIRI images the full disk every 15 minutes with a horizontal resolution of 3 x 3 km² at nadir. Both passive imagers have spectral bands in the visible and thermal infrared. MVIRI has only three bands including a broad visible channel, a water vapour channel and an infrared channel. SEVIRI has 12 spectral channels ranging from 0.6 µm to 13.4 µm. To ensure consistency of the TCDR we use only those channels for the retrieval which are available or can be simulated from both sensors i.e. the broad visible channel and the 10.8 µm infrared channel.

The presented TCDR covers the time-span 1991-2015, and is based on measurements of MFG-4, MFG-5, MFG-6, MFG-7, MSG-1, MSG-2 and MSG-3 (see Figure 3-1). The prime (operational) satellite at the 0 degree longitude position was used. Gaps in the prime satellite were filled by the back-up satellite if avaliable. For the derivation of the TCDR we used the Level 1.5 MVIRI and SEVIRI data provided by EUMETSAT.

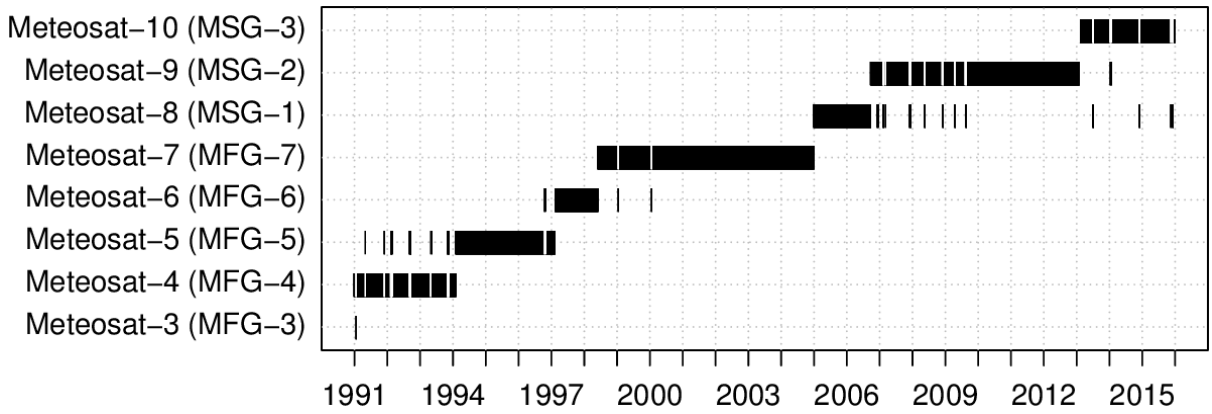

Figure 3-1: *Overview of the MFG and MSG measurements record used as basis for the Meteosat CFC TCDR.*

For SEVIRI original radiance calibration factors are used as provided as part of the Level 1.5 radiance data by EUMETSAT. The MVIRI infrared channel inter-calibration factors are provided by EUMETSAT (V. John, R. Roebeling and J. Schulz, personal communication). These inter-calibration factors are available back to 1991 (Meteosat 4-7) and are based on a daily inter-calibration of MFG MVIRI with the High Resolution Infrared Radiation Sounder (HIRS) instrument on board the National Oceanic and Atmospheric Administration (NOAA) polar orbiting platforms. The inter-calibration is carried out with the spectral response function of the respective MVIRI sensor. CM-23011 could be processed back to 1983 (including Meteosat 2 and 3) as soon as the required IR inter-calibration factors become available. The MVIRI visible channel calibration factors are used as provided by EUMETSAT (Govaerts et al., 2004).

For a more detailed instrument specification and description of the calibration the reader is referred to the corresponding Algorithm Theoretical Baseline Document [RD-2].

4 Product Description

In this section, the Cloud Fractional Cover (CFC) data is described shortly regarding retrieval methods, information content and limitations. Validation results are also described and a short statement on recommended applications is given.

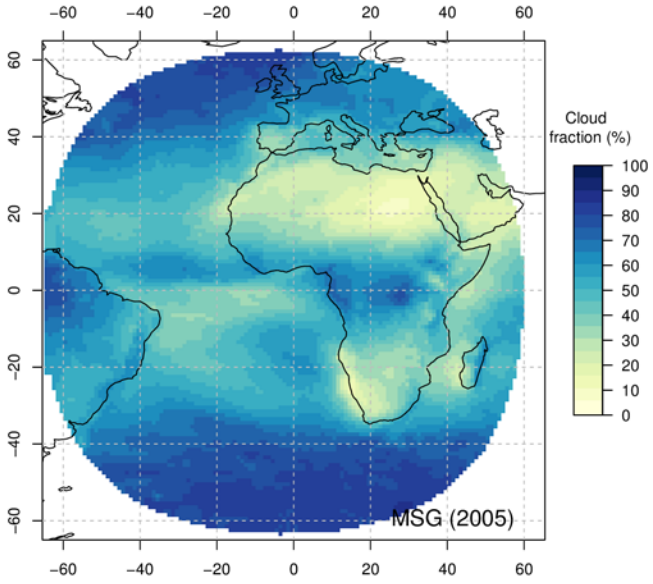

Figure 4-1: *mean annual MSG-based CFC for 2005.*

The Meteosat CFC is provided in % cloud cover (0-100%) corresponding to 0-8 okta according to the WMO specification as given in the ATBD [RD-2].

4.1 Short Algorithm Description

The Cloud Fractional Cover data is based on only two heritage channels from MFG MVIRI and MSG SEVIRI. The calibrated visible and inter-calibrated infrared radiances firstly serve as input to a daily recurring parametric estimation of clear sky background fields with diurnal cycle models of brightness temperature and reflectance. These clear sky inversions are constrained by previously cloud masked reflectances and brightness temperatures. The resulting clear sky background fields together with the all sky instantaneous reflectances and brightness temperatures yield continuous cloud mask scores of pixel wise state and spatio-temporal variability. CFC is retrieved from these scores by use of a Bayesian classifier. It is based on the conditional occurrence probability of scores and two dimensional score combinations given SYNOP observed CFC classes. The use of such two dimensional score combinations featuring both the state and variability of specific reflectance or brightness temperature features is a substantial and useful addition to the commonly used naïve Bayesian classifier [RD-2]. The use of a Bayesian classifier has the benefit of instantaneous and pixelwise CFC estimates. This means that Meteosat CFC is not built from the spatial aggregation binary cloud mask estimates as often done. The use of a Bayesian classifier also yields posterior retrieval probabilities for each CFC value.

4.2 Highlights

- Heritage: Corresponds to CFC measured at WMO/SYNOP sites
- Applicability: Instantaneous and pixel wise CFC estimates with posterior retrieval probability as part of the dataset
- Precision: Inter-calibrated input radiance time series from EUMETSAT

- Accuracy: Meets optimal CM SAF daily and monthly requirements and decadal stability. Meets those requirements for many of the individual locations.
- Resolution: 0.05 degree spatial and 30 minute temporal resolution

4.3 Limitations

- No coverage yet for MFG-2 and MFG-3 due to inter-calibration / stability issues (in preparation)
- Accuracy lower during night and beyond 60 degree View Zenith Angle
- No full pixel wise CFC and CFC probability histogram provided to the user
- No additional usage of non-heritage channels for MSG due to homogeneity issues.

4.4 Validation

The reference datasets used to evaluate the Meteosat CFC were derived from synoptical cloud observations in 1991-2015, and cloud observations from the CALIPSO-CALIOP instrument in 2010.

Validation carried out for level-2 data revealed that Meteosat CFC underestimates synoptic observations by 0.28%. Validation of level-3 daily and monthly means showed that, aggregated over all reference sites, Meteosat CFC fulfils the target requirements (see RD-1 for details) for accuracy and precision (Table 4-1 and Table 4-2). Evaluation performed for each SYNOP site shows that optimal, target and threshold requirements are met by 26%, 80% and 97% of sites, respectively (Figure 4-2).

Consistency checks of Meteosat CFC monthly means for 2005 were also carried out with datasets from MODIS, PATMOS-x, CLARA-A2, CLAAS-A2 and CC4CL-AVHRR. Meteosat CFC is higher compared to each of these datasets. The differences range from 4% (as compared to CLARA-A2) to 10% (as compared to ESA-Cloud-CCI's CC4CL-AVHRR).

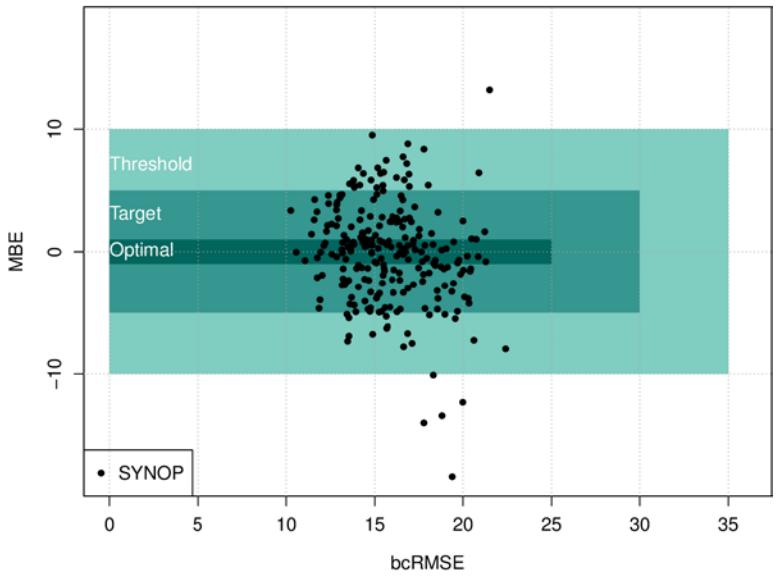

Figure 4-2: *Daily bias-corrected root mean square error (bcRMSE) and mean bias error (MBE) of CFC (%) compared to 237 SYNOP sites. Coloured bars give the optimal, target and threshold accuracy requirements. They have to be fulfilled in the mean of all stations.*

Table 4-1: *Summary of Meteosat CFC validation results compared to target accuracy requirements. The accuracies are formulated in terms of biases.*

Product	Target accuracy (bias)	Achieved accuracy
Cloud Fractional Cover (CFC) : Daily	5 %	-0.17 %
Cloud Fractional Cover (CFC) : Monthly	5 %	-0.14 %

Table 4-2: *Summary of Meteosat CFC validation results compared to target precision requirements. The accuracies are formulated in terms of bias-corrected RMSE.*

Product	Target precision (bc-RMSE)	Achieved accuracy
Cloud Fractional Cover (CFC) : Daily	30 %	16.53 %
Cloud Fractional Cover (CFC) : Monthly	20 %	7.04 %

Recommended Applications

Meteosat CFC is useful to extend existing ground-based CFC estimates with spatial information. Meteosat CFC can be used to evaluate and improve NWP or climate model based cloud cover diurnal cycles (e.g. the timing and phase of convective cloud formation). Meteosat CFC is also useful to augment CFC from polar orbiter data with statistical information on the diurnal cycle of cloudiness in order to e.g. correct incomplete diurnal coverage or orbital drift. Meteosat CFC is also useful to cloud or clear sky screen downstream applications such as LST or Albedo retrievals. The usability of Meteosat CFC in climates with substantial snow and near surface fog has to be tested. Despite the high decadal stability the applicability of Meteosat CFC in trend analyses has to be thoroughly evaluated and cross checked with quality screened ground based reference time series.

5 Data Format Description

The presented Meteosat CFC data is provided on a regular latitude and longitude grid. The geographic reprojection from the native Meteosat grid onto the latitude longitude grid is carried out with spatial averaging with nearest neighbour filling if the destination grid cell is more than half of the size of the source grid cell (near the equator). Bilinear interpolation is used elsewhere (e.g. at high latitudes) (RD-2). Table 5-1 gives information on the geographical coverage.

Table 5 1: *Characteristics of the Meteosat CFC data geographical coverage.*

Lon min*	Lon max*	Lat min*	Lat max*	Spacing (lon, lat)	Projection	Datum
-65.0 °	65.0 °	-65.0 °	65.0 °	0.05	latitude -	WGS 84

					longitude	

*pixel edges

The Meteosat CFC data are Level-3 data presented as hourly, daily and monthly means as outlined in Table 5-1.

CFC hourly means are the mean of all valid instantaneous retrievals for a given hour. A minimum of one valid instantaneous retrieval is required. For daily and monthly CFC means we require at least four observations per day and twenty observations per month, respectively. Details on the averaging procedure can be found in the corresponding ATBD (RD-2).

Table 5-1: *Meteosat CFC data.*

	CFC
Hourly mean	X
Daily mean	X
Monthly mean	X

For each time step we provide a separate output file, which follows the naming convention:

[CFC][t][s][yyyy][mm][dd][hh][mm][001231000101MA.nc]

Where CFC is the TCDR identifier,w **t** is time interval (m=monthly, d=daily, h=hourly), **s** is time statistics (m=mean, d=mean diurnal cycle), **yyyy**=year, **mm**=month, **dd**=day, **hh**=hour, **mm**=minute. The string 001231000101MA is the CM SAF specific TCDR suffix not of interest to the user. The file type identifier .nc stands for a NetCDF file.

Example for the daily mean for 1 May 2005: CFCdm2005050100000001231000101MA.nc

The Meteosat products are provided as NetCDF-4 (Network Common Data Format v4) files (http://www.unidata.ucar.edu/software/netcdf/). The data files are created following NetCDF Climate and Forecast (CF) Metadata Convention version 1.6 (http://cf-pcmdi.llnl.gov/) and NetCDF Attribute Convention for Dataset Discovery version 1.3.

For data processing and conversion to various graphical packages input format, CM SAF recommends the usage of the climate data operators (CDO), available under GNU Public License (GPL) from MPI-M (http://www.mpimet.mpg.de/~cdo). A common NetCDF file consists of dimensions, variables, and attributes. These components can be used together to capture the meaning of data and relations among data.

5.1 General Variables

Name	**Description**
time	*time of averaging/composite time period; in case of diurnal cycles, this vector has 24 elements [days counted from 1970-01-01]*

lat	*geographical latitude of grid-box centre [degree_north]*
lon	*geographical longitude of grid-box centre [degree_east]*
grid_mapping	*projection parameters*
SATID	*spacecraft ID (unique number defined by MSGGS or GSDS or NORAD or COSPAR):* *19 = MFG 4, 20 = MFG 5, 21 = MFG 6, 22 = MFG 7,* *321 = MSG 1, 322 = MSG 2, 323 = MSG 3*

5.2 Global Attributes

Table 5-2 contains the global attributes of the Meteosat CFC and LST final product files.

Table 5-2: *Overview of global attributes of NetCDF files and possible corresponding values.*

Name	**Description**
title	*geosatclim (processing software)*
summary	*This file contains time-space aggregated Thematic Climate Data Records (TCDR) produced by geosatclim within the Satellite Application Facility on Climate Monitoring (CM SAF)*
id	*DOI:10.5676/EUM_SAF_CM/CFC_METEOSAT/V001*
product_version	*1.0.0*
creator_name	*EUMETSAT/CMSAF*
creator_email	*contact.cmsaf@dwd.de*
creator_url	*http://www.cmsaf.eu*
institution	*Federal Office of Meteorology and Climatology MeteoSwiss*
project	*Satellite Application Facility on Climate Monitoring (CM SAF)*
references	*http://dx.doi.org/10.5676/EUM_SAF_CM/CFC_METEOSAT/V001*
keywords	*EARTH SCIENCE > ATMOSPHERE > CLOUDS > CLOUD PROPERTIES > CLOUD FRACTION*
Conventions	*CF-1.6, ACDD-1.3*
standard_name_vocabulary	*Standard Name Table (v28, 07 January 2015)*
date_created	*creation date*
geospatial_lon_units	*degrees_east*
geospatial_lon_min	*-65 (pixel edge)*
geospatial_lon_max	*65 (pixel edge)*
geospatial_lat_units	*degrees_north*
geospatial_lat_min	*-65 (pixel edge)*
geospatial_lat_max	*65 (pixel edge)*
platform	*METEOSAT*
platform_vocabulary	*GCMD Platforms, Version 8.1*

Name	Description
instrument	*MVIRI*
instrument_vocabulary	*GCMD Instruments, Version 8.1*

5.3 Variables

CFC(time, lon, lat)

field containing the CFC values given in percent
(mean hourly for hourly files, mean daily value for daily files, mean monthly value for monthly files, monthly mean for each hour of the day for monthly diurnal cycle files)

PCFC(time, lon, lat)

field containing the CFC retrieval probability given in percent

Table 5-3: *Summary of Meteosat CFC product variables.*

Parameter	Unit	Valid range	Type	Scale	Offset	Fill Value
CFC	%	[0,100]	byte	1.0	0.0	-127
PCFC	%	[0,100]	byte	1.0	0.0	-127

6 Data ordering via the Web User Interface (WUI)

User services are provided through the CM SAF homepage www.cmsaf.eu. The user service includes information and documentation about the CM SAF and the CM SAF products, information on how to contact the user help desk and allows to search the product catalogue and to order products.

On the main webpage, a detailed description how to use the web interface for product search and ordering is given. We refer the user to this description since it is the central and most up to date documentation. However, some of the key features and services are briefly described in the following sections.

6.1 Product Ordering Process

You need to be registered and logged in to order products. A login is provided upon registration, all products are delivered free of charge. After the selection of the product, the desired way of data transfer can be chosen. This is either via a temporary ftp account (the default setting), or by CD/DVD or email. Each order will be confirmed via email, and the user will get another email once the data have been prepared. If the ftp data transfer was selected, this second email will provide the information on how to access the ftp server.

6.2 Contact User Help Desk Staff

In case of questions the contact information of the User Help Desk (e-mail address contact.cmsaf@dwd.de, telephone and fax number) are available via the CM SAF main webpage (http://www.cmsaf.eu) or the main page of the Web User Interface.

6.3 Feedback/User Problem Report

Users of CM SAF products and services are encouraged to provide feedback on the CM SAF product and services to the CM SAF team. Users can either contact the User Help Desk (see chapter 6.2) or use the “User Problem Report” page. A link to the “User Problem Report” is available either from the CM SAF main page (www.cmsaf.eu) or the Web User Interface main page.

6.4 Service Messages / Log of Changes

Service messages and a log of changes are also accessible from the CM SAF main webpage (www.cmsaf.eu) and provide useful information on product status, versioning and known deficiencies.

7 Copyright and Disclaimer

The user of CM SAF data agrees to respect the following regulations:

Copyright

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 in publications, presentations, web pages etc., EUMETSAT’s copyright credit must be shown by displaying the words “copyright (year) EUMETSAT” on each of the products used.

Acknowledgement and Identification

When exploiting EUMETSAT/CM SAF data you are kindly requested to acknowledge this contribution accordingly and make reference to the CM SAF, e.g. by stating “The work performed was done (i.a.) by using data from EUMETSAT’s Satellite Application Facility on Climate Monitoring (CM SAF)”. It is highly recommended to clearly identify the product

version used. An effective way to do this is the citation of CM SAF data records via the digital object identifier (doi). The doi of the data sets can be retrieved through (http://www.cmsaf.eu/DOI).

Re-distribution of CM SAF data

Please do not re-distribute CM SAF data to 3rd parties. The use of the CM SAF products is granted free of charge to every interested user, but we have an essential interest to know how many and what users the CM SAF has. This helps to ensure of the CM SAF operational services as well as its evolution according to user needs and requirements. Each new user shall register at CM SAF in order to retrieve the data.

Feedback

We are keen to learn of what use the CM SAF data are. So please feedback your experiences and your application area of the CM SAF data. EUMETSAT CM SAF is user driven service and is committed to consider the needs and requirements of its users in the planning for product improvements and additions. Users are invited to provide their specific requirements on future products for their applications.

8 References

Govaerts, Y., Clerici, M., and N. Clerbaux, Operational calibration of the Meteosat radiometer VIS band. IEEE Transactions On Geoscience and Remote Sensing, 42(9):2004.

Heidinger, A., Goldberg, M., Jelenak, A., and Pavolonis, M. (2005). A new AVHRR cloud climatology. Proc. SPIE 5658, 197.Rossow and Schiffer (1999). Advances in Understanding Clouds From ISCCP. Bulletin of the American Meteorological Society, 80 (11), 2261-2287.

Glossary

ATBD	Algorithm Theoretical Baseline Document
AVHRR	Advanced Very High Resolution Radiometer
BC-RMSE	Bias-Corrected RMSE
CDO	Climate Data Operators
CFC	Cloud Fractional Cover
CM SAF	Satellite Application Facility on Climate Monitoring
DRR	Delivery Readiness Review
DWD	Deutscher Wetterdienst (German MetService)
ECMWF	European Centre for Medium Range Forecast
ECV	Essential Climate Variable
ERA-Interim	Second ECMWF Re-Analysis dataset
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FCDR	Fundamental Climate Data Record

FMI	Finnish Meteorological Institute
GCOS	Global Climate Observing System
GFCS	Global Framework of Climate Services
HIRS	High Resolution Infrared Radiation Sounder
KNMI	Royal Meteorological Institute of the Netherlands
LST	Land Surface Temperature
MeteoSwiss	Meteorological Service of Switzerland
MVIRI	Meteosat Visible and InfraRed Imager
MFG	Meteosat First Generation
MSG	Meteosat Second Generation
NOAA	National Oceanic and Atmospheric Administration
NWP	Numerical Weather Prediction
PRD	Product Requirement Document
PUM	Product User Manual
RMIB	Royal Meteorological Institute of Belgium
SAF	Satellite Application Facility
SMHI	Swedish Meteorological and Hydrological Institute
SEVIRI	Spinning Enhanced Visible and InfraRed Imager
SZA	Solar Zenith Angle
UK MetOffice	Meteorological Service of the United Kingdom
VZA	Viewing Zenith Angle
WCRP	World Climate Research Program
WMO SCOPE CM	Sustained COordinated Processing of Environmental satellite data for Climate Monitoring