The SAF on Climate Monitoring: An Overview

M. Werscheck

The Mandate

The CM-SAF aims at providing consistent sets of data in the highest possible quality, based mainly on input from operational meteorological satellites, in support to climate monitoring, climate change detection and for assessing the climate variability.

The mandate of the CM-SAF in its Initial Operations Phase (IOP):

- Support climate monitoring at regional scale
- generation of thematic climate data records in an operational off-line environment
- generation of long-term validated, homogeneous and consistent data sets
- take into account reprocessing events

Furthermore, the products of the CM-SAF shall contribute to broaden and deepen the understanding of the processes that govern and determine the climate system.

The nature of climate monitoring is per se a long running task and hence requires a long term commitment and an operational environment that provides a reliable and long-lasting basis of the equipment and the resources to perform adequately.

The Products

The product suit of the CM-SAF comprises:

- Cloud parameters
- Radiation budget parameters at the top of the atmosphere
- Radiation budget parameters at the surface
- Water vapour in the atmosphere

In table 1 the product list and the target accuracies for each product as of end of the Initial Operations Phase (2007) is summarised.

Table 1 CM-SAF Product List at the end of the IOP

Product	Acronym	Resolution/Target Accuracy					
		Spatial	Temporal				Version
			Daily	Weekly	Monthly	MMDC (Monthly Mean Diurnal Cycle)	
Fractional cloud cover	CFC	15 km	10%		10%	✓ 10% [1]	V3
Cloud type	CTY	15 km	20%		20%	✓ 20%[1]	V3
Cloud top temperature and height	CTT, CTH	15 km	✓		✓	✓[1]	V3
Cloud optical thickness [3]	COT	15 km	8%		8%	✓ 8%[1]	V3
Cloud phase [3]	CPH	15 km	✓		✓	✓[1]	V3
Cloud water path [3]	CWP	15 km	15%		15%	✓ 15%[1]	V3
Surface incoming short-wave radiation	SIS	15 km	15%		10 W/m^2	10 W/m^2 [1]	V3
Surface albedo	SAL	15 km		25%[4]	25%[4]		V3
Surface net short-wave radiation	SNS	15 km	15% [2]		15 W/m^2 [2]	15 W/m^2 [1,2]	V3
Surface outgoing long-wave radiation	SOL	15 km			10 W/m^2	10 W/m^2 [1]	V3
Surface downward long-wave radiation	SDL	15 km			10 W/m^2	10 W/m^2 [1]	V3
Surface net long-wave radiation	SNL	15 km			15 W/m^2 [2]	15 W/m^2 [1,2]	V3
Surface radiation budget	SRB	15 km			20 W/m^2 [2]	20 W/m^2 [1,2]	V3
Incoming solar radiative flux at the top of the atmosphere	TIS	(45 km)^2	1 W/m^2		1 W/m^2	1 W/m^2	V3
Reflected solar radiative flux at the top of the atmosphere	TRS	(45 km)^2 *	10 W/m^2		10 W/m^2	10 W/m^2	V3
Emitted thermal radiative flux at the top of the atmosphere	TET	(45 km)^2 *	5 W/m^2		5 W/m^2	5 W/m^2	V3
Vertical Integrated water vapour information[5]	HTW	(45 km)^2	<10%		< 5%		V3
Layered water vapour[6]	HLW	(45 km)^2 5 layers	<10%		< 5%		V3
Specific humidity and temperature at pressure levels[7]	HSH	(45 km)^2 6 levels	15 % 1 K		10 % 1 K		V3

[1]: monthly mean diurnal cycle will be derived only for products extracted from MSG data
[2]: accuracy of net fluxes depends on accuracy of input fluxes
[3]: The quality of these products depends on the availability of the 1.6 µm channel on the AVHRR instrument
*: the effective resolution will be (100 km)^2 in the polar regions without MSG coverage.
[4]: surface albedo relative accuracy, if the cloud mask accuracy is better than that
[5,6,7] relative accuracy may be lower for arctic atmospheres, Cal/Val activities for EPS will consolidate numbers

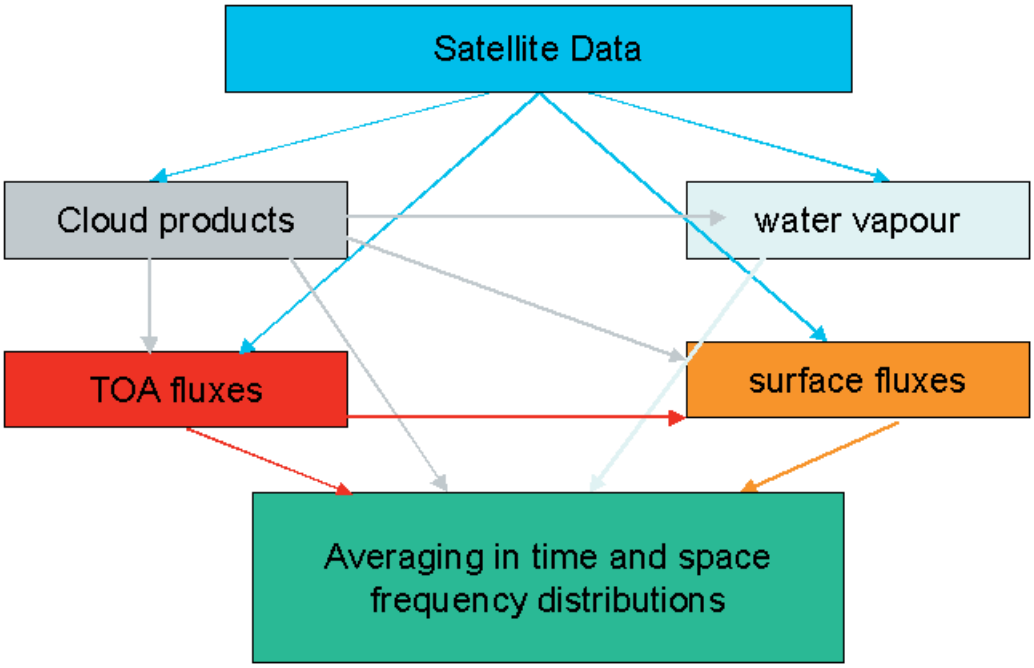

Figure 1 Schematic sketch of interdependencies of the CM-SAF products

The CM-SAF claims to produce and deliver products of high and known quality that are homogeneous and consistent in space and time.

Detailed information on the various products is given in the following articles and on the CD ROM attached to this issue of the Klimastatusbericht.

The SAF on Climate Monitoring as part of the SAF Network

The Satellite Application Facility on Climate Monitoring is part of the SAF Network, that comprises seven SAFs dealing with different topics (cf. article by Schüller/Sarlo in this issue).

Each of the seven SAFs is responsible for a particular thematic task, performed and executed with partners from the EUMETSAT member and co-operating states. With this, the SAF network is a “network of networks” dedicated to tackle the tasks and challenges in the field of meteorology and climatology with the help of satellite data as main input.

By sharing the tasks in a “network of networks” model all partners are obliged to share and trust, to give and take: Each consortium is in charge to execute the task in a reliable and responsible mode for the benefit of the whole community. On the other hand all partners are asked to have confidence in the fact that the very consortium, executing a particular task, performs reliable and responsible. With this, the EUMETSAT SAF network could serve as a paradigma and is an important step forward to foster and forge co-operation within Europe.

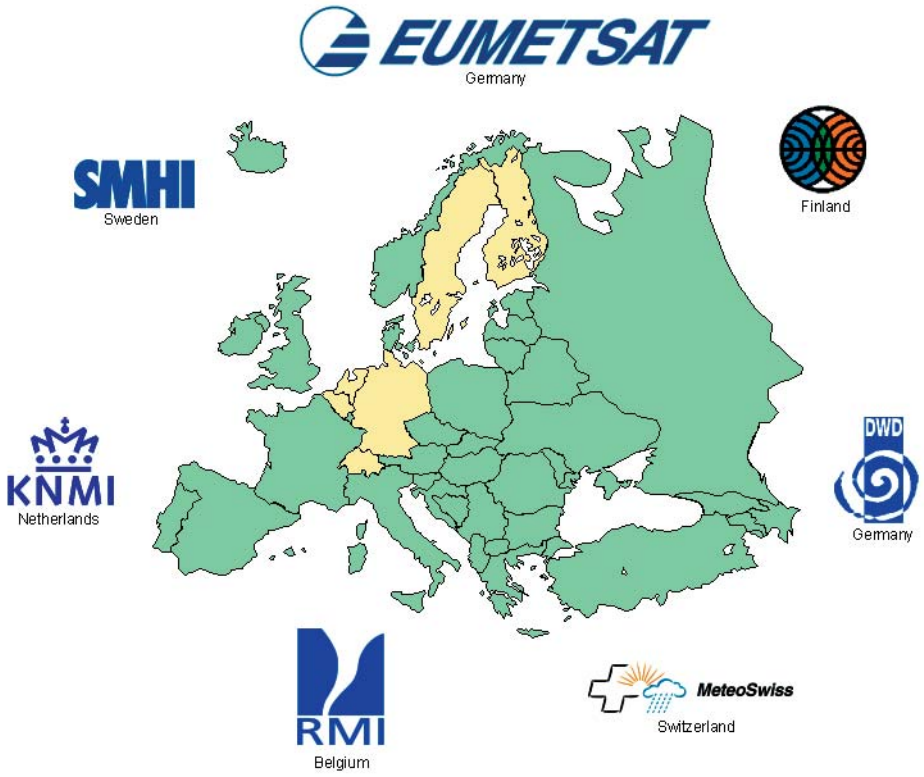

Figure 2 The partners of the SAF on Climate Monitoring

The Partners

Within the CM-SAF consortium five meteorological services jointly develop, implement, validate and execute the task to provide satellite based products apt for climate monitoring. The partners are:

Deutscher Wetterdienst (DWD)

Deutscher Wetterdienst is the “operations leading entity” (OLE) and responsible for the overall co-ordination and execution of the activities of the SAF on Climate Monitoring.

All products, except the radiation budget parameters at the top of the atmosphere, are produced on a routine basis in the premises of DWD. Furthermore DWD archives all products and provides the interface to the user for product access and delivery.

Jointly with SMHI and KNMI the development, implementation and validation of the algorithms to retrieve cloud parameters is performed.

DWD takes the lead for the radiation budget parameters at the surface, together with FMI and MeteoSwiss.

The water vapour related products are developed, implemented and validated under the responsibility of DWD.

Figure 3 The seven SAFs of the SAF network. An eighth SAF on Hydrology is currently under consideration.

The Finnish Meteorological Institute (FMI)

FMI is in charge to develop and validate the surface albedo product (SAL).

Konijklik Netherland Meterological Institute (KNMI)

KNMI is responsible for developing and validating the microphysical cloud properties, i.e. cloud optical thickness (COT) and cloud liquid water path (CWP).

MeteoSwiss

MeteoSwiss supports the validation activities for the surface radiation budget parameters especially in the alpine region.

The Royal Meteorological Institute of Belgium (RMIB)

RMIB is responsible for developing, implementing and validating the radiation budget parameters at the top of the atmosphere. RMIB is also executing the routine processing of these products.

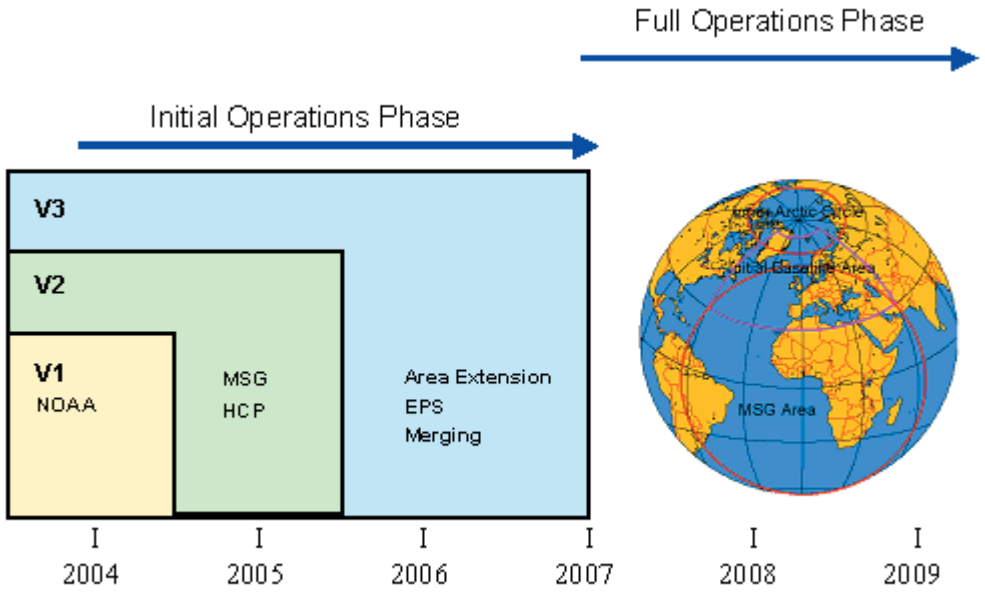

Figure 4 Versions and schedule of the CM-SAF

Swedish Meteorological and Hydrological Institute (SMHI)

SMHI is leading and co-ordinating all cloud related activities within the CM-SAF. In particular SMHI is responsible for the cloud algorithms that use data from polar orbiting satellites.

Schedule and Versioning

From the year 2004 until 2007 the CM-SAF is in its Initial Operations Phase (IOP). In the course of this period, the CM-SAF will stepwise get fully operational from the year 2007 onwards (Full Operations Phase; FOP).

Version 1

In version 1, the cloud parameters and the radiation budget parameters at service are based on data from AVHRR data from NOAA satellites.

The radiation budget parameters at the top of the atmosphere are based on CERES and GERB data (check).

The area of interest is within 30°N to 80°N and 60°W to 30°E (“Baseline Area”) and covers basically the European area.

Version 2

With version two, the water vapour products will become available. Also data from Meteosat-8 (MSG) will be ingested in the operational processing chain.

Version 3

With version three also data from the European polar orbiting satellite (EPS/Metop) will be used and a proper merging of the different satellite data will be tackled.
The area of interest will be extended towards the African continent, thus utilising the full view of Meteosat-8, and for a sub-set of parameters, to the inner arctic circle.

From 2007 onward the CM-SAF is running the Full Operations Phase (FOP).

References

www.eumetsat.de
www.fmi.fi
www.kmi.be
www.knmi.nl
www.meteoschweiz.ch
www.smhi.se
www.dwd.de