CM SAF: Products and Services for Climate monitoring

R. Hollmann and the CM SAF team
Overview

- Introduction
- CM SAF Products
- A few application examples
- CM SAF Services
- Summary and conclusions

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CM SAF’s role and mandate

Global Stakeholder in **Climate Monitoring**
UNFCCC, IPCC, GFCS, GCOS, IPCC, CGMS, CEOS, WMO, GEO, …

**EUMETSAT’s Strategy 2025:**
support to climate services will be embedded [...] at its premises and across its network of SAFs, with the Climate Monitoring SAF (CM SAF) playing a leading role.
Mandate

The EUMETSA T Satellite Application Facility on Climate Monitoring develops, generates, archives and distributes high-quality satellite-derived products of the energy & water cycle in support to monitor, understand and adapt to climate variability and climate change.

Climate Data Record
climate trends, variability and process
validation and satellite simulators
Climate Monitoring based on Satellites

We provide
- Essential Climate Variables
  - Thematic Climate Data Records
  - Interim Climate Data Records
  - Fundamental Climate Data Records
- Training & capacity building
- toolbox
- Application examples

We support
- Process analysis
- Statistical analysis
- Climate assessments

We provide
- Validation data (Obs4MIPs compatible)
- Satellite simulators
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- Global Clouds and Radiation (CLARA-A3), extended in time, new: ERB
- Regional Clouds (CLAAS-3), extended in time
- Global Ocean Fluxes (HOAPS), extended in time
- Global UTH, extended in time
- FCDR Microwave Imager, extended in time
- Regional Radiation (SARAH-3), extended in time
- Regional Land Surface Temperature, extended in time
- Regional Land Fluxes (e.g. budget, LST), new
- Global High Clouds from HIRS, new
- Global Precipitation, new

See Poster outside & ask questions for details!
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Targeted Application areas CM SAF CDRs and ICDRs

- FCDR as input for Reanalyses, TCDR’s

- Climate Science

- Evaluation of (Climate) Models

- Climate Services / NMHSs operational climate monitoring
  - TCDR + ICDR as important component is needed
Publications CLARA-A1 (49) and A2 (23) vs application areas

- Arctic and Antarctic surface albedo and flux studies (15)
- Global (and regional) climate model evaluation (13)
- Global and regional climate monitoring (12)
- Evaluation of surface radiation climatologies and networks (12)
- Climate trend studies including inter-comparison of satellite data with other observations (6)
- Studies of physical processes (e.g., fluxes and evapotranspiration) (6)
- New validation methods and development of algorithms (6)
- Boreal snow studies (3)
- Biological studies (1)
Fundamental Climate Data Record (FCDR, SMMR+SSM/I+SSMIS FCDR from CM SAF, latest version: 10.5676/EUM_SAF_CM/FCDR_MWI/V003)

Key input to HOAPS product suite, in-house expertise and processing of Level 1 data and ECVs key advantages for the quality of the products.

Various users, among them ECMWF/C3S (ERA5), OSI SAF and ESA CCI_Sea_Ice
Anttila et al. (2018) examined seasonal snow melt timing and the pre-melt albedo from CLARA-A2 Surface Albedo, finding:

- trends towards earlier melt onset
- longer melting seasons
- pre-melt albedo decreases induced by vegetation growth

Diurnal cycle of South-Atlantic stratocumulus clouds

Seethala et al., ACP, 2018
Cloud Fraction JJA

Mean Arctic cloudiness 1982-2014 for CLARA-A2 and ISCCP-H

Results after applying CLARA-A2 simulator (left) and ISCCP-simulator (right) to mean cloudiness from EC Earth

Karlsson, Sedlar, 2019
CM SAF Solar Radiation data used in studies / services of solar energy resources, incl. EU

- CM SAF data helps EU and national activities to guide renewable energy expansion
- CM SAF data help scientists to develop the future European electricity grid with enhanced share of renewables
Application Example: Drought 2018

21. – 27. Mai 2018

9.-15. April 2018

25. Juni - 1. Juli 2018

20. – 26. August 2018

21.-27. Mai 2018


17.-23. September 2018
CM SAF Sunshine Duration included in European State of the Climate 2018

- CM SAF data contributes to EU / Copernicus
- Other operational applications of CM SAF data include WMO RCC RA VI (e.g., SIS, CFC, SDU)
- TCDR + ICDR concept well suited for climate monitoring
- adding Sunshine Duration to the CM SAF portfolio enhanced visibility / usage of CM SAF data
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International activities

- ESA CCI: Clouds, WV, …
- EC C3S Copernicus
CM SAF C3S Contributions

Main Contributions

- Clouds
- Radiation (surface)
- Water Vapor
- Generation of complementary ICDR’s and TCDRs
International activities

- ESA CCI: Clouds, WV, …
- EC C3S Copernicus
- GVAP, ICWG, ITWG,
CM SAF Support to GEWEX Water Vapour Assessment (G-VAP)

- G-VAP: Quantify the state of the art in satellite water vapour products being constructed for climate applications (not only Satellite CDR’s!)

- Overview of available water vapour data records at http://gewex-vap.org/.

- GEWEX data archive: Doi: 10.5676/EUM_SAF_CM/GVAP/V001

- Co-Lead from CM SAF: Marc Schröder

Key Publications:

Schröder et al. (2018) in ESSD, 10.5194/essd-10-1093-2018

WCRP report on G-VAP available at https://www.wcrp-climate.org/


Schröder et al. (2019)
User up-take

- users from more than 130 countries in all continents
- number ever rising

Research 52%
Companies 11%
NMHSs 28%
Government 9%
Impact and outreach

- Scopus search in title, abstract, keywords
  - „CM SAF“ or „CM-SAF“ or
  - „climate monitoring SAF“ or
  - „climate monitoring satellite application facility“

- only peer-reviewed articles
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Summary

Main topics addressed from 1999 - 2007

- Concept development
- Setup of system
- Focus on regional components of Energy budget and water cycle
- First EDRs generated
Summary

PP (Project Phase), IOP (Initial Operations Phase), CDOP (Continuous Development and Operations Phases)

Main topics addressed from 2007 - 2012

- Paradigm change with focus on TCDR’s
- 1st TCDR generation cycle
- Regional and global components of Energy budget and water cycle
Summary

Main topics addressed from 2012 - 2017

- 2nd TCDR generation cycle
- Global and regional components of Energy budget and water cycle
- Concept TCDR / ICDR developed
- International assessments & SCOPE-CM

PP (Project Phase), IOP (Initial Operations Phase), CDOP (Continuous Development and Operations Phases)
Summary

- **Main topics addressed from 2017 – 2022**
  - 3rd TCDR generation cycle, uncertainty
  - Extension of Product portfolio
  - First ICDRs provided
  - Support to International assessments
  - Important European CDR provider
Summary

Main topics addressed beyond 2022?

- 4th / 5th TCDR generation cycle
- New components of global and regional components of Energy budget and water cycle?
- Bridging to GeoRing, new sensors with enhanced capabilities?
- More ICDRs to be provided?

FACTS
Images: https://pixabay.com
Conclusion

- Since 20 years CM SAF is contributing / pioneering to climate monitoring with satellites
- CM SAF performs sustained CDR generation in an operational environment
- CM SAF is taking benefit from research using relevant opportunities
- CM SAF provides extensive services, training, support to User
- CM SAF data are freely available
- CM SAF provides an easy direct data access

Contact data:

www.cmsaf.eu
Contact.cmsaf@dwd.de
Splinter Groups

- Two Splinter Groups
- Tuesday Morning:
  - Thematic Areas
- Tuesday Afternoon
  - Application Areas
- 2 sticker to select Splinter Group
- Voting until **20:00 TODAY!**