The EUMETSAT Network of Satellite Application Facilities

CM SAF
Climate Monitoring

Long-term satellite-based cloud property datasets derived within CM SAF

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Wetter und Klima aus einer Hand

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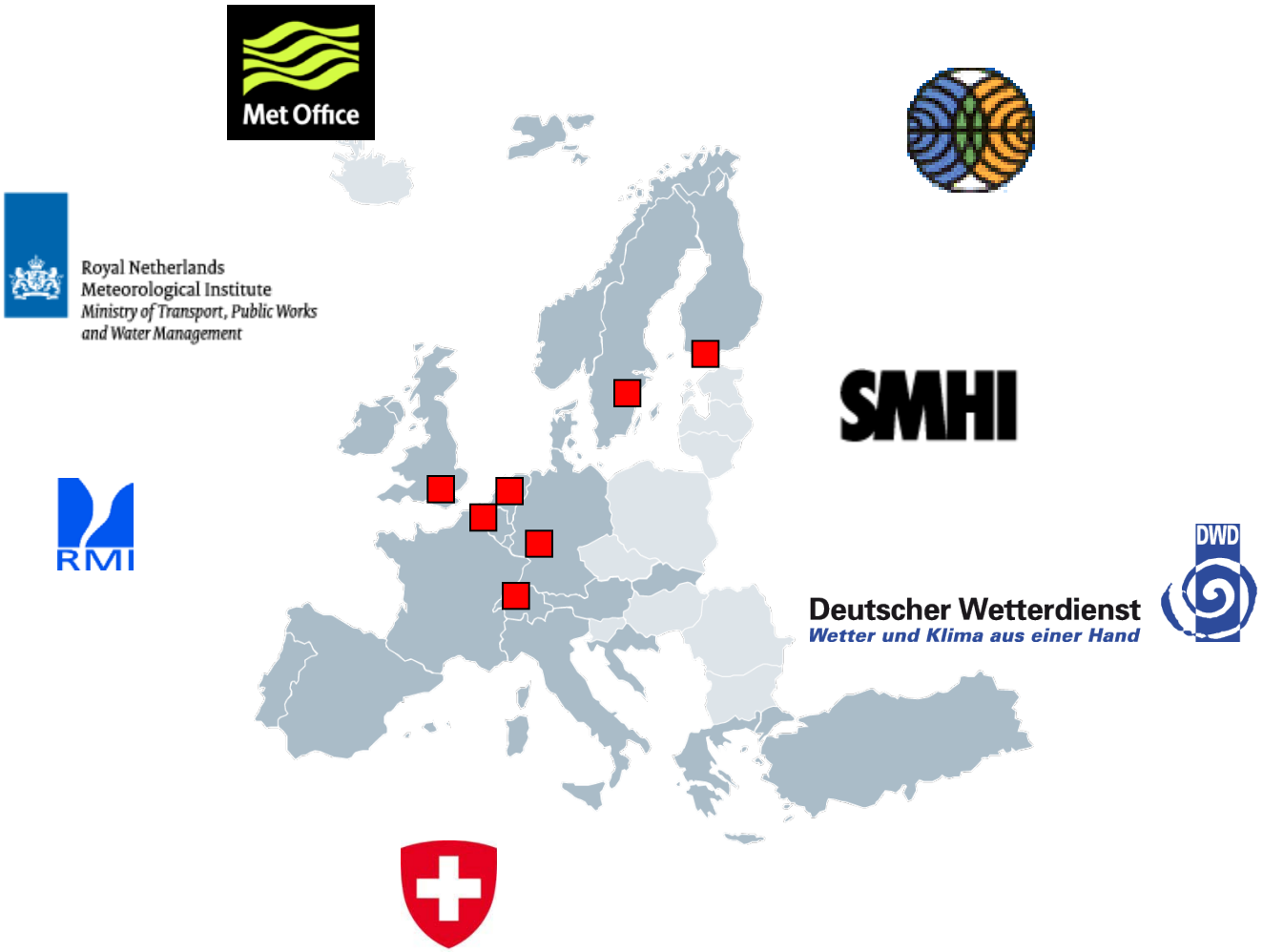
ITSC-18, Toulouse, France, March 2012

Outline

- Overview of CM SAF
- CM SAF cloud property datasets
  - 7 year record of SEVIRI
  - 28 year record of AVHRR GAC
- Example of validation and known problems
- Future activities
- Summary

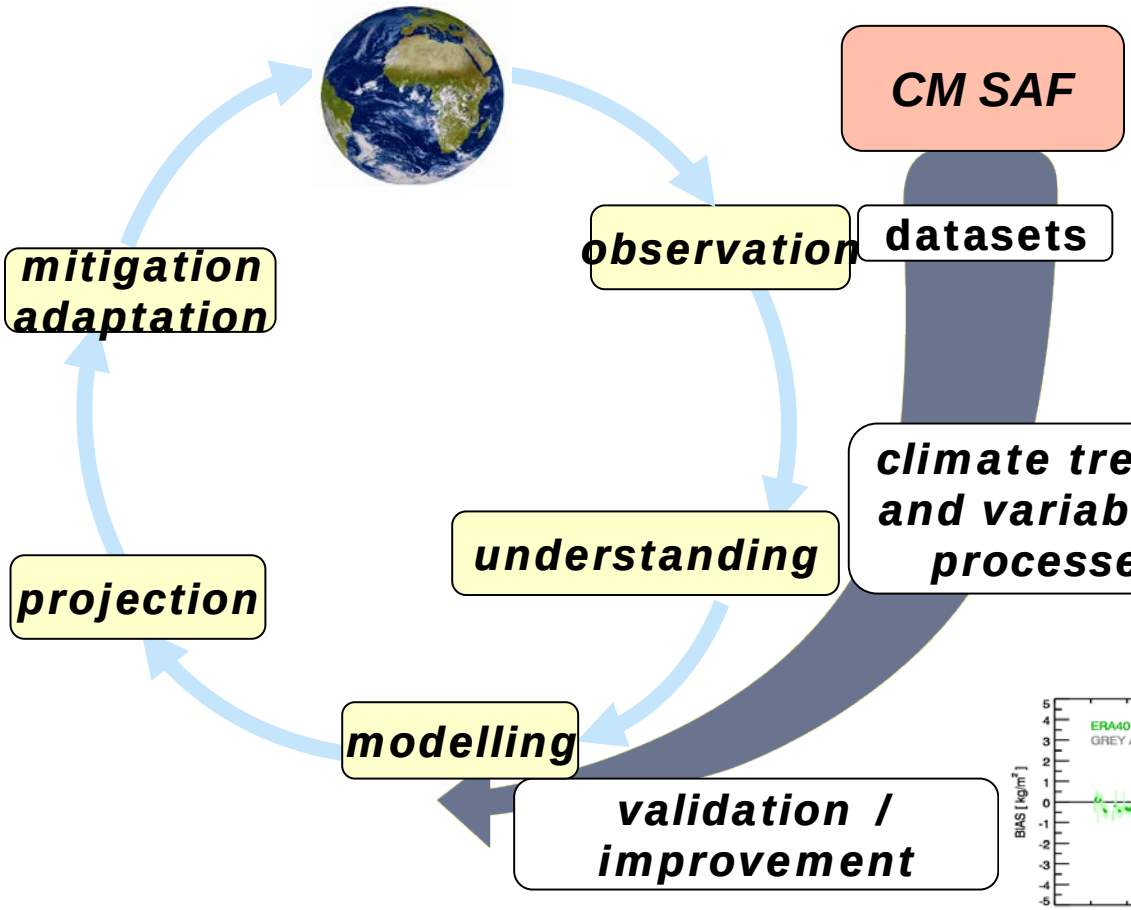
CM SAF overview

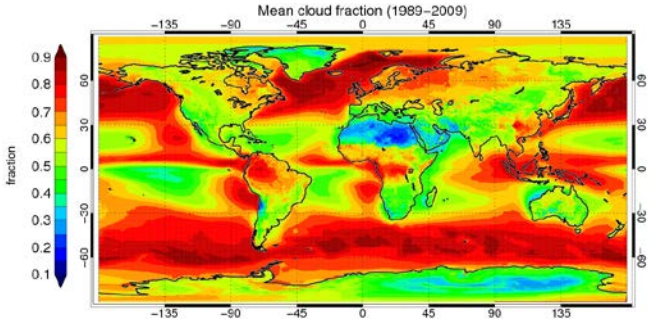
- EUMETSAT **S**atellite **A**pplication **F**acility on **C**limate **M**onitoring (CM SAF)

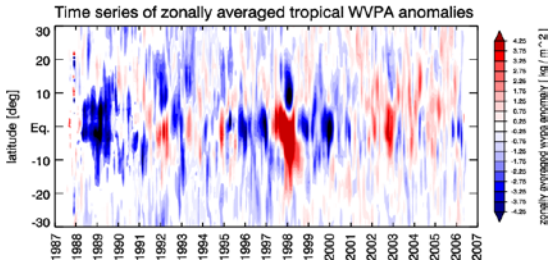


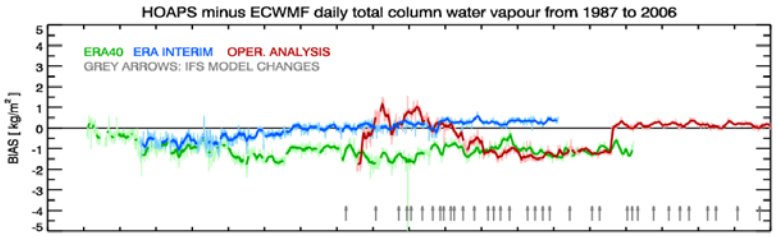
CM SAF overview

- CM SAF's role in climate monitoring and research



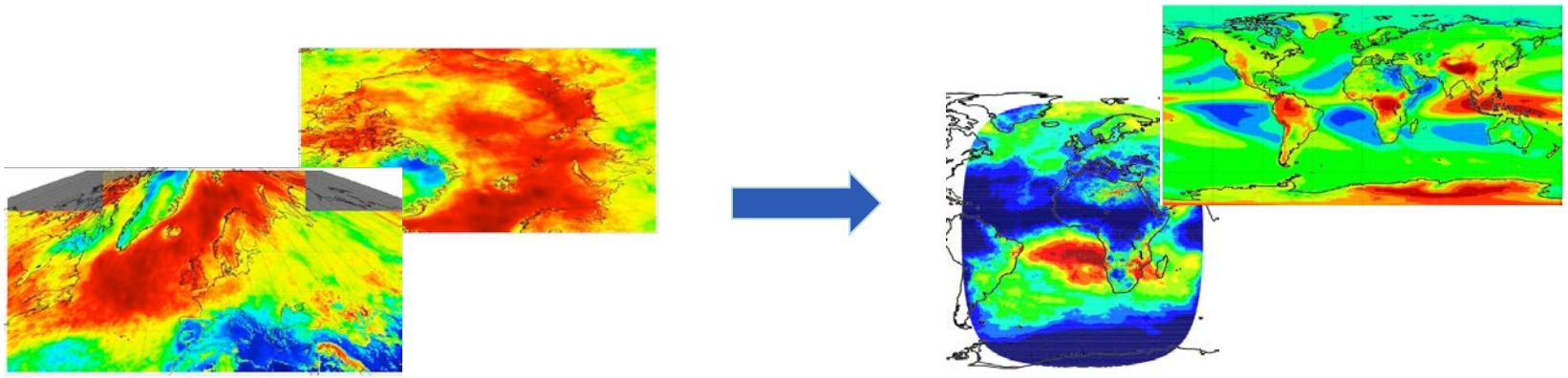






CM SAF overview

- CM SAF provides medium- and long-term **cloud**, **radiation**, **water vapour** and **temperature** products /datasets derived from different instruments (Schulz et al., 2009).
- As complementing part to the creation of **operational monitoring** products, CM SAF is increasingly focusing on the generation of **retrospectively produced long-term datasets** taking into **latest retrieval developments** and **inter-calibrated** and **homogenized** satellite measurement records.
- For these **datasets** errors due orbit changes and inter-satellite biases are minimized. These datasets can be used for monitoring **inter-annual variability**, and for **climate analysis** and **trend investigation**



CM SAF cloud property datasets

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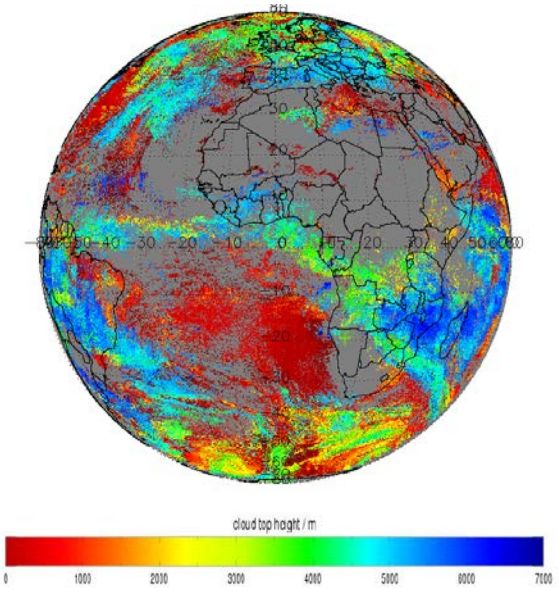
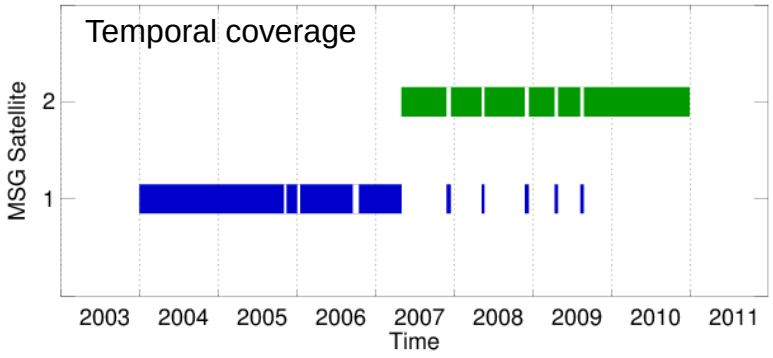
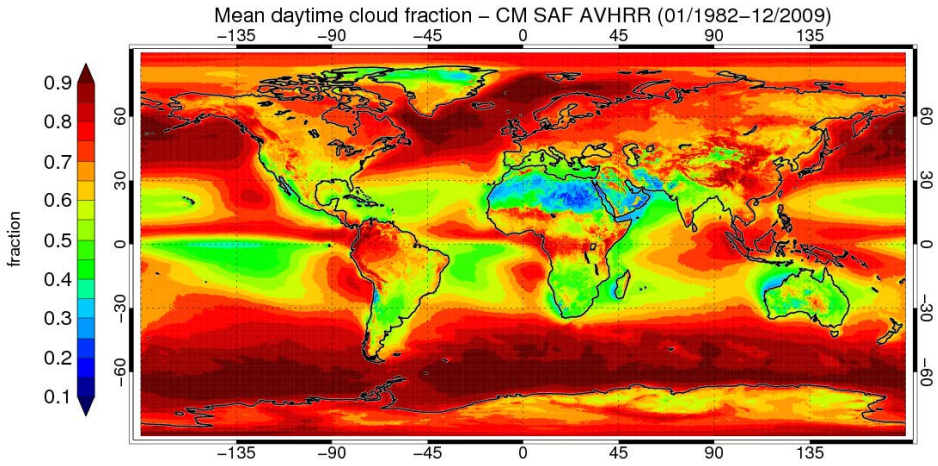
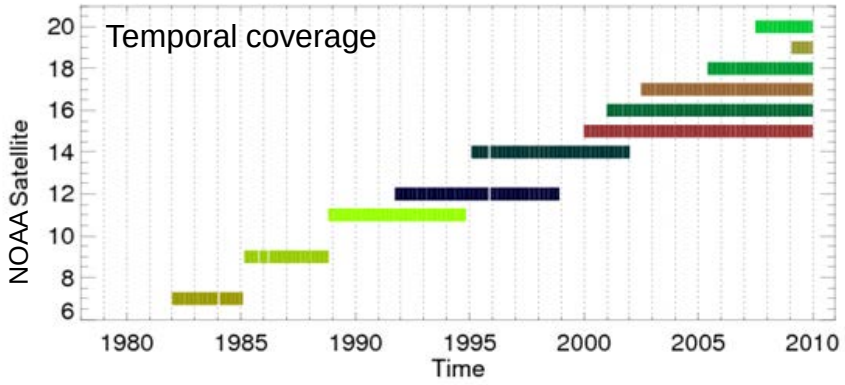
SEVIRI (Meteosat SG)





AVHRR (NOAA-xy, MetOp)





CM SAF cloud property datasets

SEVIRI (Meteosat SG)

- MSG-NWC package for CFC, CTH, CTP, CTT; CPP software for COT, LWP, IWP
- ERA-Interim used as auxiliary data
- SEVIRI on MSG1/2, 2004 – 2010, full SEVIRI disk
- **IR: Reprocessed radiances before May/2008 (recently provided by EUMETSAT)**
- **VIS/NIR: calibration (against MODIS, done by KNMI) applied to channels 0.6, 0.8, 1.6**
- Daily and monthly means, 1d/2d histograms

AVHRR (NOAA-xy, MetOp)

- PPS software package for CFC, CTH, CTP, CTT; CPP software for COT, LWP, IWP
- ERA-Interim used as auxiliary data
- AVHRR-GAC of all NOAAs and MetOp, 1982 – 2009, global coverage on 0.25°
- **VIS: Recalibrated visible reflectances provided by NOAA (Heidinger et al., 2010).**
- **IR: unchanged (only onboad BB calibration)**
- Daily and monthly means, 1d/2d histograms

CPP: Cloud Physical Properties (Roebeling et al., 2006; PUM, 2009)

MSG-NWC: NWC SAF MSG software package (SATBD1, 2009)

PPS: NWC SAF Polar Processing System (Dybbroe et al., 2005a and Dybbroe et al., 2005b)

CM SAF cloud property datasets

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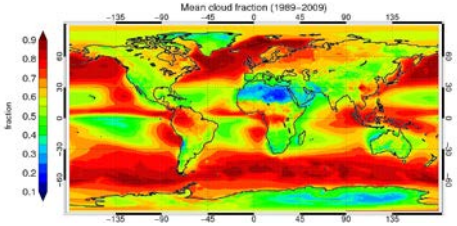
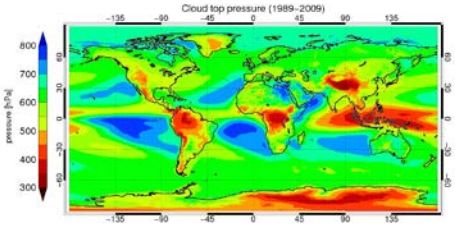
Derived cloud parameters:

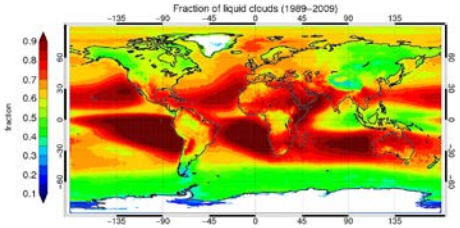
- Cloud Fractional Coverage (CFC)



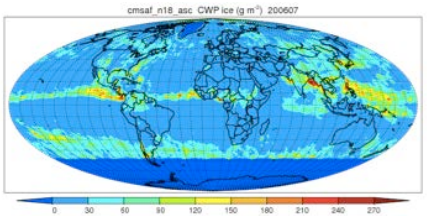
- Cloud Top Parameters (CTH, CTP, CTT)



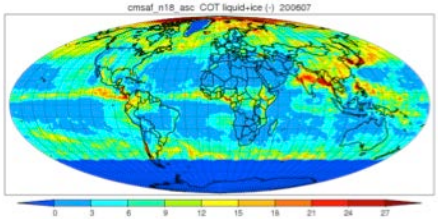
- Cloud Phase (CPH)



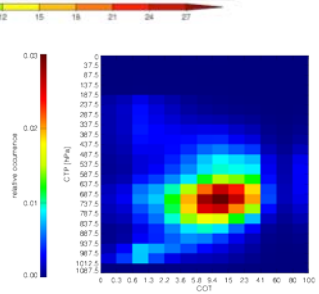
- Liquid/Ice Water Path (LWP/IWP)

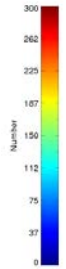


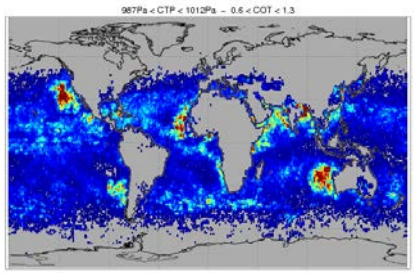
- Cloud Optical Thickness (COT)



- 1D-Histograms, COT-CTP-2D-Histograms







Validation examples

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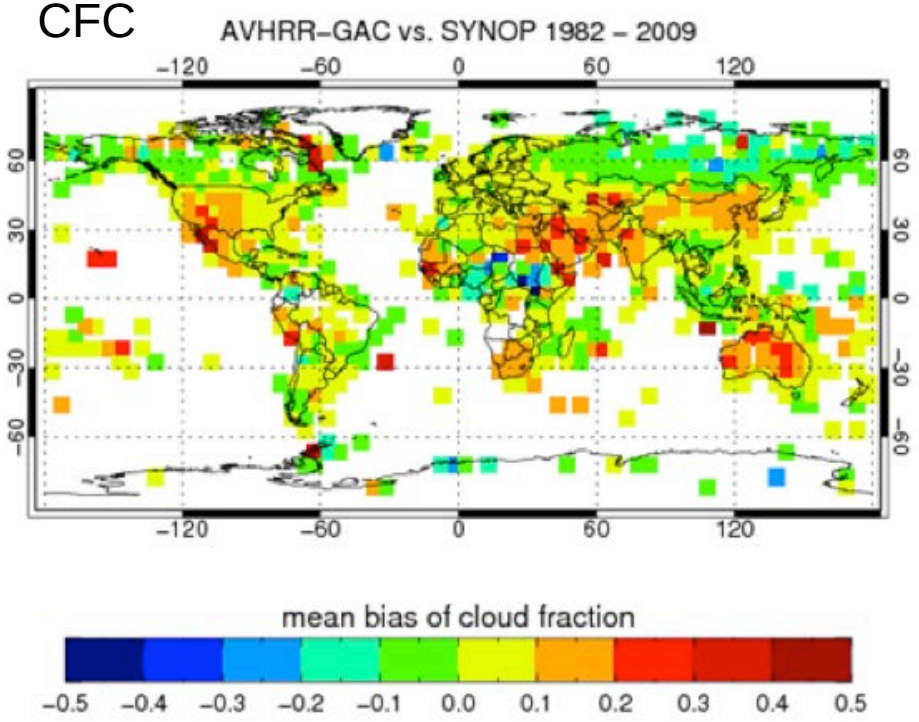
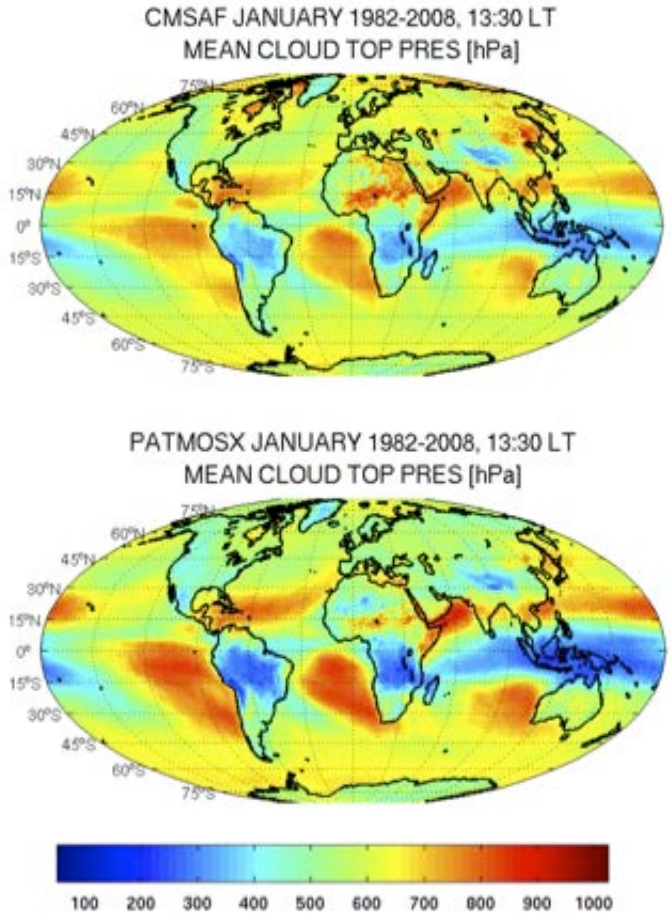
CFC

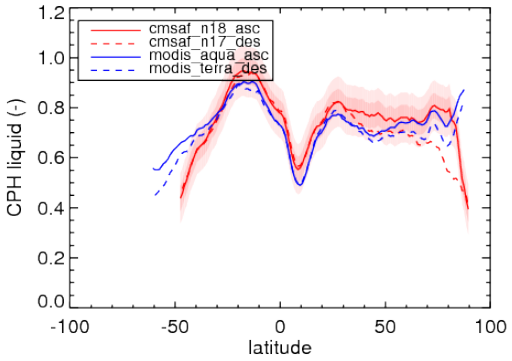


CTP

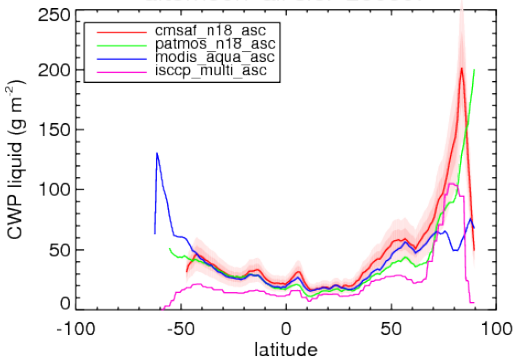


Validation examples

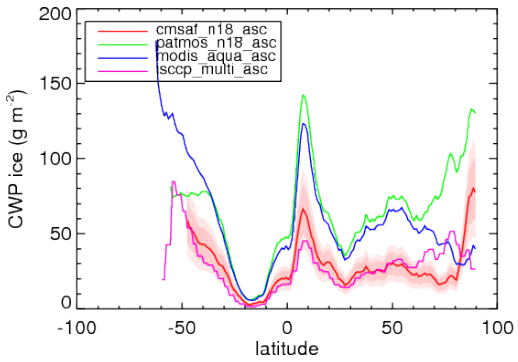
Cloud phase all sfc. 200607



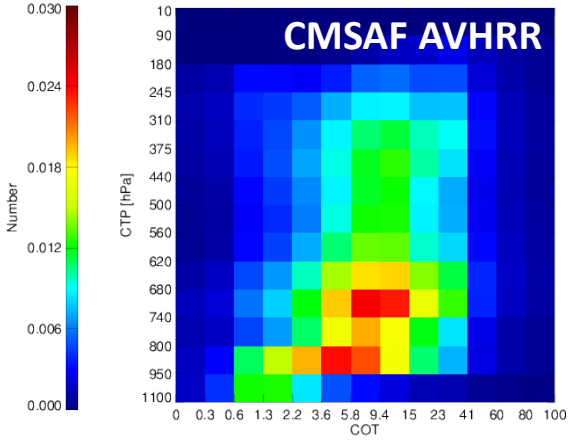
LWP afternoon all sfc. 200607

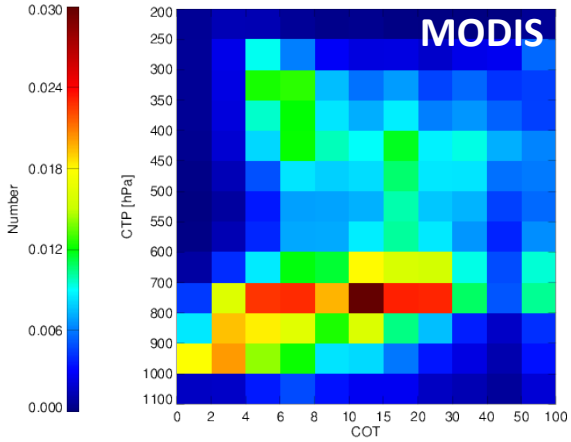


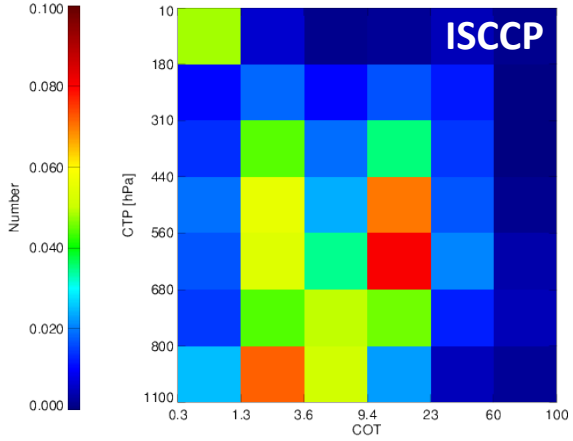
IWP afternoon all sfc. 200607



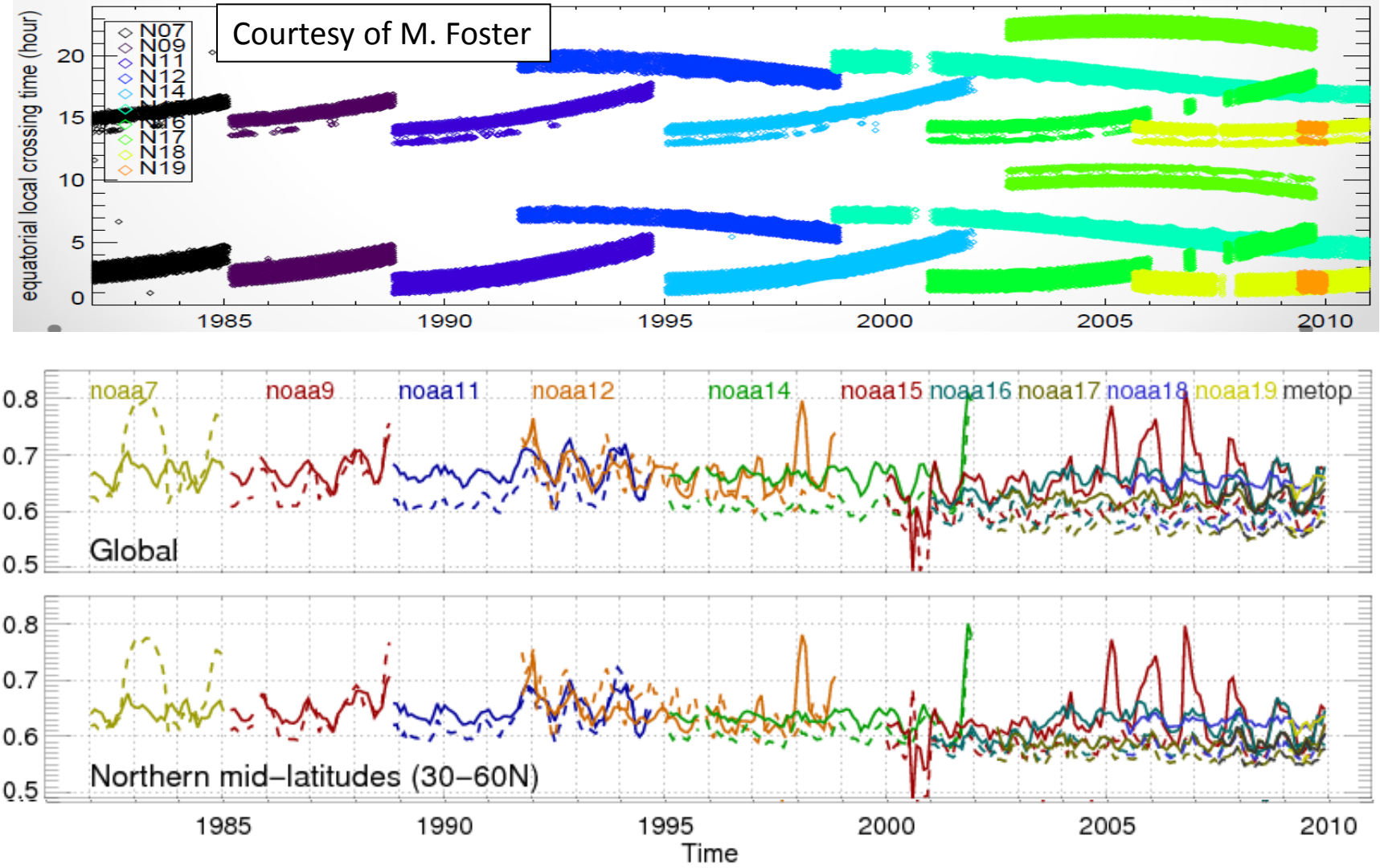
Joint Cloud Property Histograms





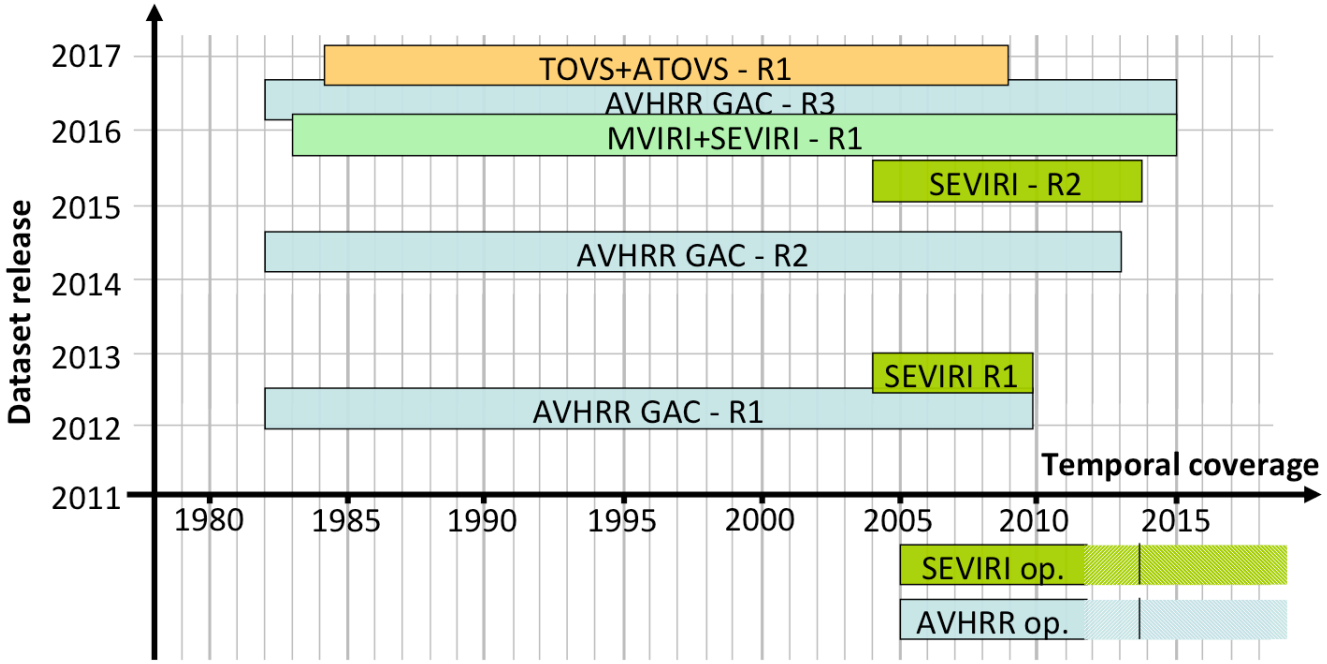


Known problems - example



Future cloud-related activities

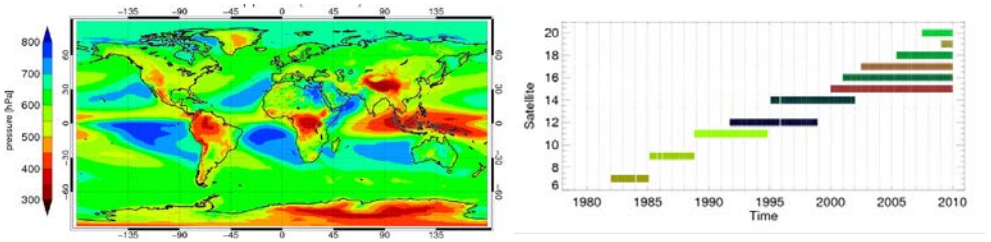
- **Several reprocessing cycles** for SEVIRI and AVHRR cloud property datasets will be carried out using updated retrieval schemes and radiance records (new METEOSAT IR cal. (?) and AVHRR IR cal. (e.g. Mittaz and Harris, 2009))
- Two additional cloud datasets will be included in CM SAF's portfolio: **MVIRI+SEVIRI** cloud cover dataset, **TOVS+ATOVS** high cloud amounts



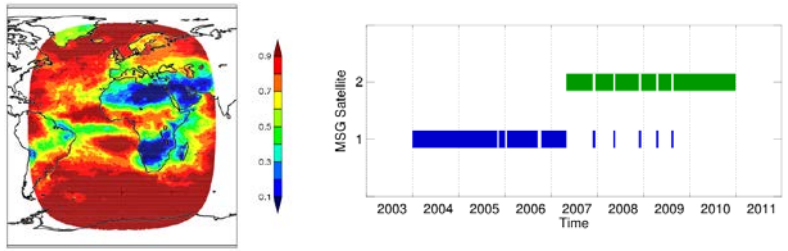
Summary

- In addition to the operational products, CM SAF is generating more and more **climate data records** for **radiation** (e.g. MVIRI, SEVIRI, AVHRR), tropospheric **humidity and temperature** (SSM/I, ATOVS), and **clouds** (SEVIRI, AVHRR, (A)TOVS), with periodic reprocessings.

- 1st generation of AVHRR cloud properties datasets was finished



- 1st SEVIRI cloud property datasets will be finished soon



- In the near future TOVS & ATOVS based datasets (with focus on high clouds) will be generated.

- All products and datasets are comprehensively evaluated and documented (www.cmsaf.eu)

References

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- **Heidinger**, A.K., W.C. Straka, C.C. Molling, J.T. Sullivan and X.Q. Wu, **2010**: Deriving an inter-sensor consistent calibration for the AVHRR solar reflectance data record. Int. J. Rem. Sens., 31(24), 6493-6517
- **Mittaz**, P.D. and R. Harris, **2009**: A Physical Method for the Calibration of the AVHRR/3 Thermal IR Channels 1: The Prelaunch Calibration Data. J. Atmos. Ocean. Tech., 26, 996-1019, doi: 10.1175/2008JTECHO636.1
- **Roebeling**, R.A., A.J. Feijt and P. Stammes, **2006**, Cloud property retrievals for climate monitoring: implications of differences between SEVIRI on METEOSAT-8 and AVHRR on NOAA-17, J. Geophys. Res., 111, D20210, doi:10.1029/2005JD006990.
- **SATBD1**, **2009:** Algorithm Theoretical Basis Document - Cloud Fraction, Cloud Type and Cloud Top Parameter Retrieval from SEVIRI, reference no.: SAF/CM/DWD/ATBD/ CFC_CTH_CTO_SEVIRI, Version: 1.0, 10 September 2009, available at www.cmsaf.eu
- **Schulz**, J., et al., **2009**: Operational climate monitoring from space: the EUMETSAT Satellite Application Facility on Climate Monitoring (CM-SAF), Atmos. Chem. Phys., 9, 1687-1709

Thank you