Cloud and water vapour products as derived at DWD using the SAFNWC/MSG software package

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Outline

- Quality assessment of **CM-SAF** cloud data sets as derived using the SAFNWC/MSG software package
  - Introduction
  - Product overview
  - Validation results for cloud cover
  - Validation results for cloud top height
- Use of the PGE13 SEVIRI Physical Retrieval (SPhR) within the **WACMOS** Project
- Summary and Outlook
- User Requirements

CM-SAF

- The Satellite Application Facility on Climate Monitoring (CM-SAF) aims at providing satellite-derived geophysical parameter data sets suitable for climate monitoring.

- The product portfolio encompasses:
  - cloud parameters
  - surface albedo
  - radiation fluxes at the top of the atmosphere and at the surface
  - atmospheric humidity products

- Both SAFNWC-MSG and PPS Software Package is used to operationally derive cloud products

CMSAF Cloud Products and Regions

Products

Cloud Macrophysical Properties

Cloud Fractional Coverage
Cloud Type
Cloud Top Properties

Cloud Microphysical Properties

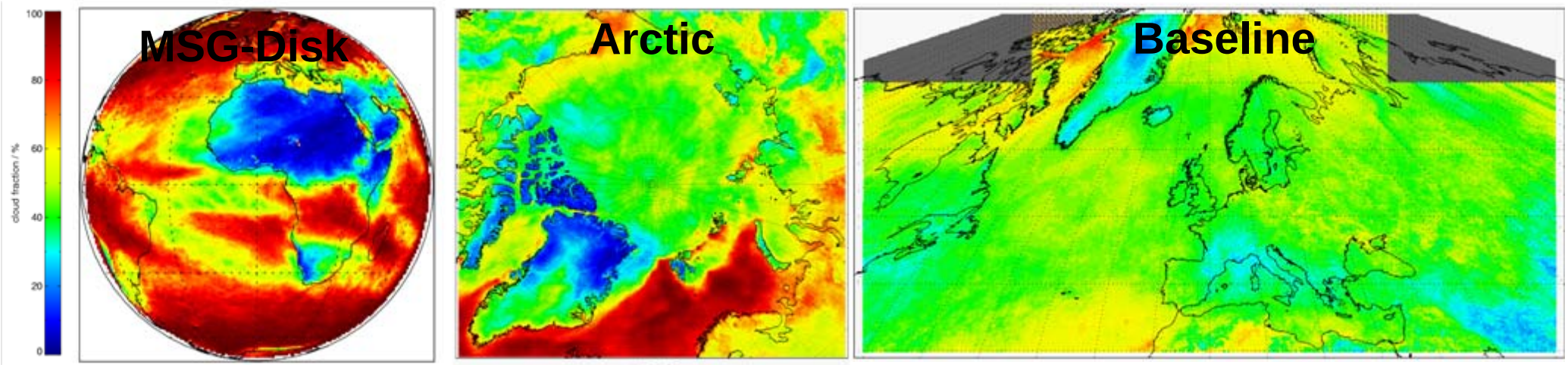
Cloud Optical Thickness
Cloud Water Path
Cloud Phase

Temporal & spatial resolution

Daily and monthly means (15 km) for polar and geostationary data (+ diurnal cycle for the latter)

Area coverage / satellites:

European/North Atlantic area (Meteosat, METOP/NOAA)
Meteosat full disk (Meteosat)
Inner Arctic Area (METOP/NOAA)



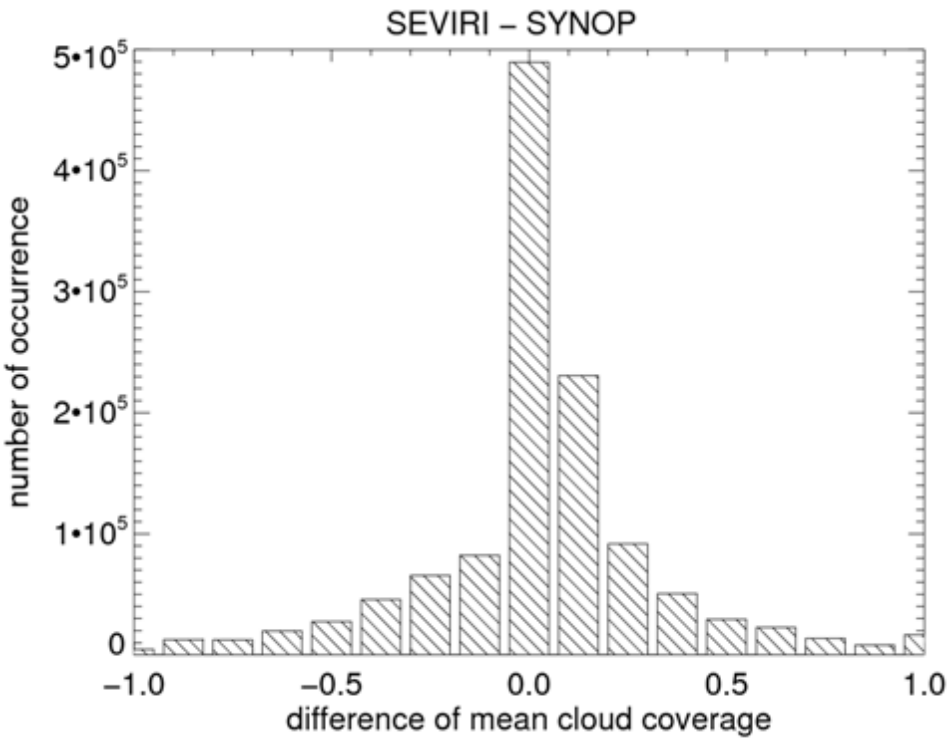
Validation results for cloud cover

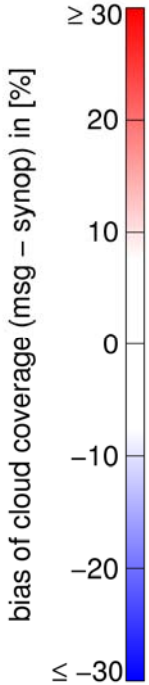
Data

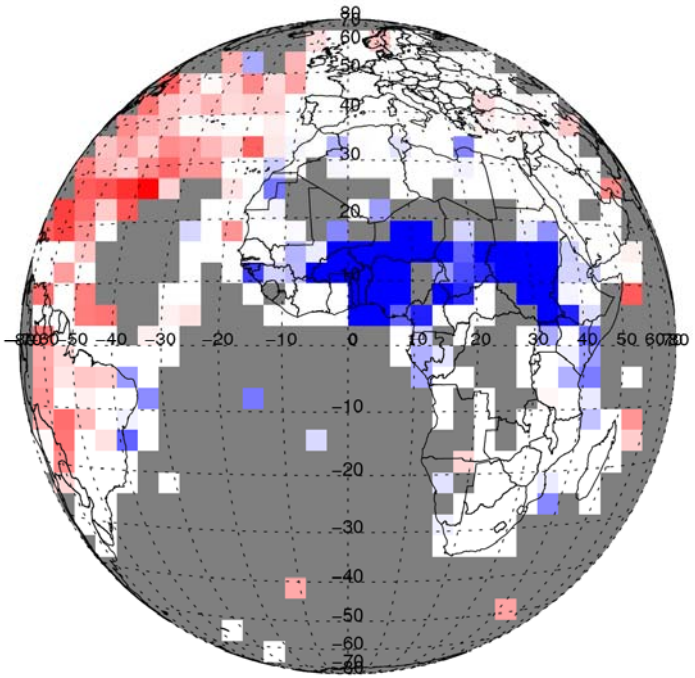
- 4 months of 2007: Jan, Apr, Jul, Oct
- MSG slot hh45 (3x3 Pixel)
- Synoptic observations at full hours

Statistics

No of match-ups	1004720
Mean SEVIRI	62 %
Mean Synop	60 %
Bias	2 %
Stddev	29 %



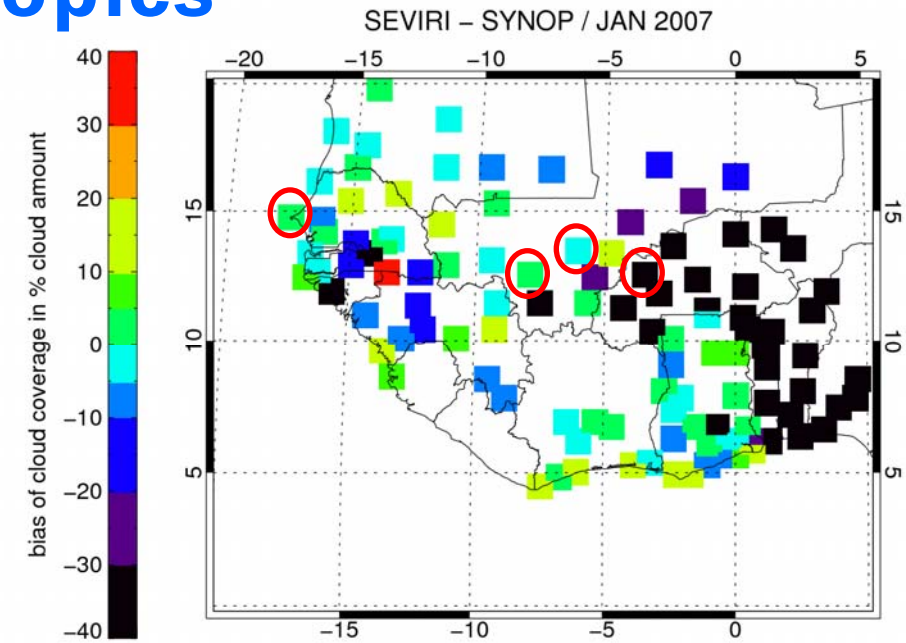


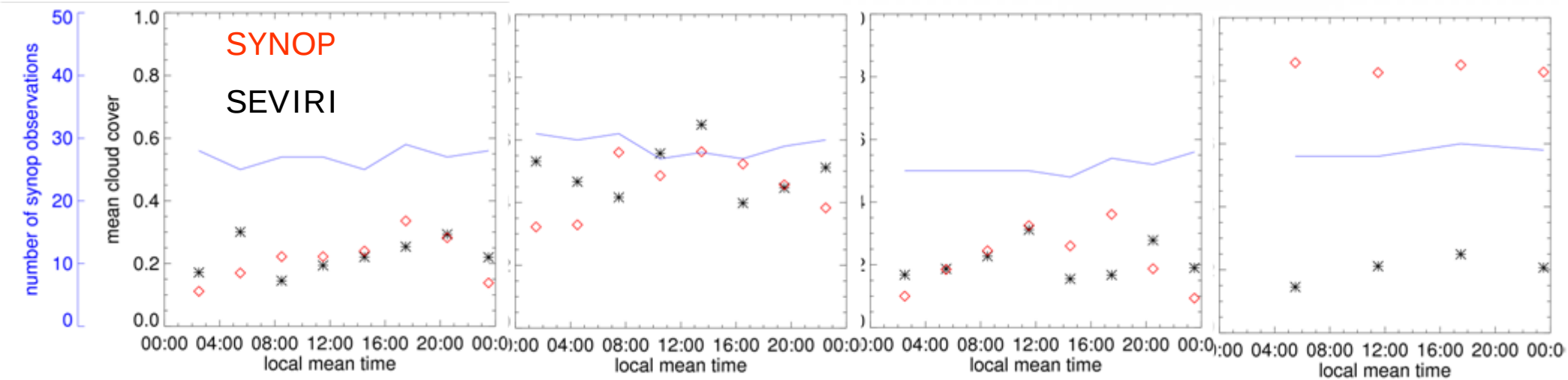


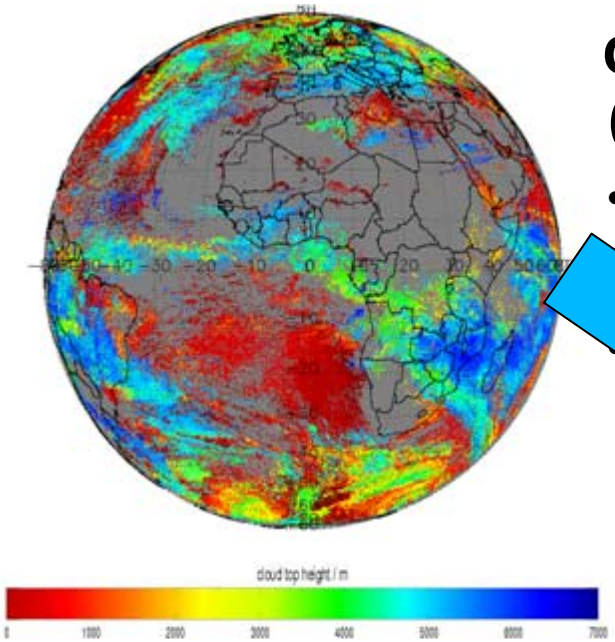
CFC validation results: Tropics

Statistics

No of match-ups	58590	
Mean SEVIRI	47 %	(27 %)
Mean Synop	58 %	(71 %)
Bias	-11 %	(-44 %)
Stddev	41 %	(42 %)

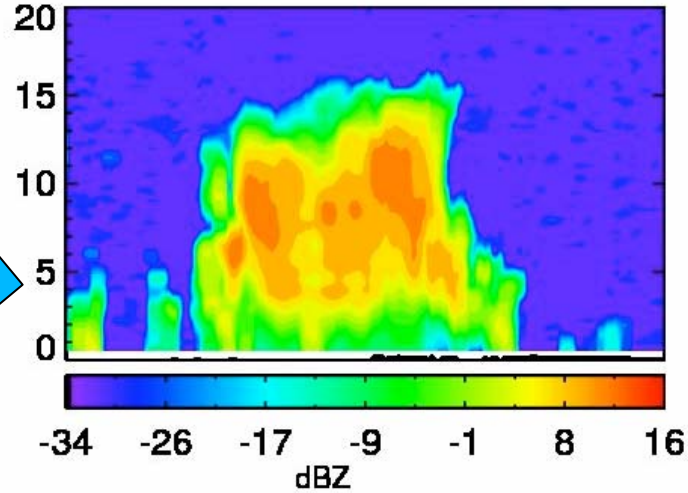






Cloud Profiling Radar (CPR)

- 94GHz nadar looking radar
- vertical resolution 500m
- zo… …km



AVAC-S

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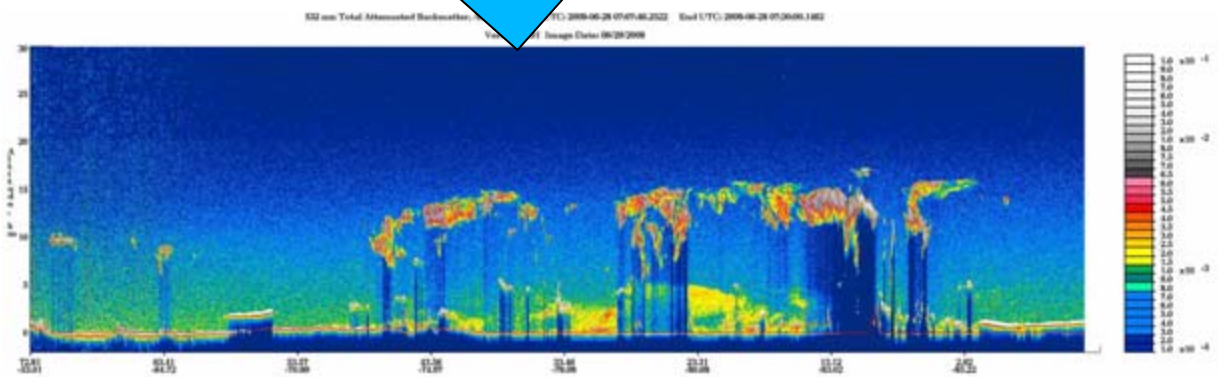
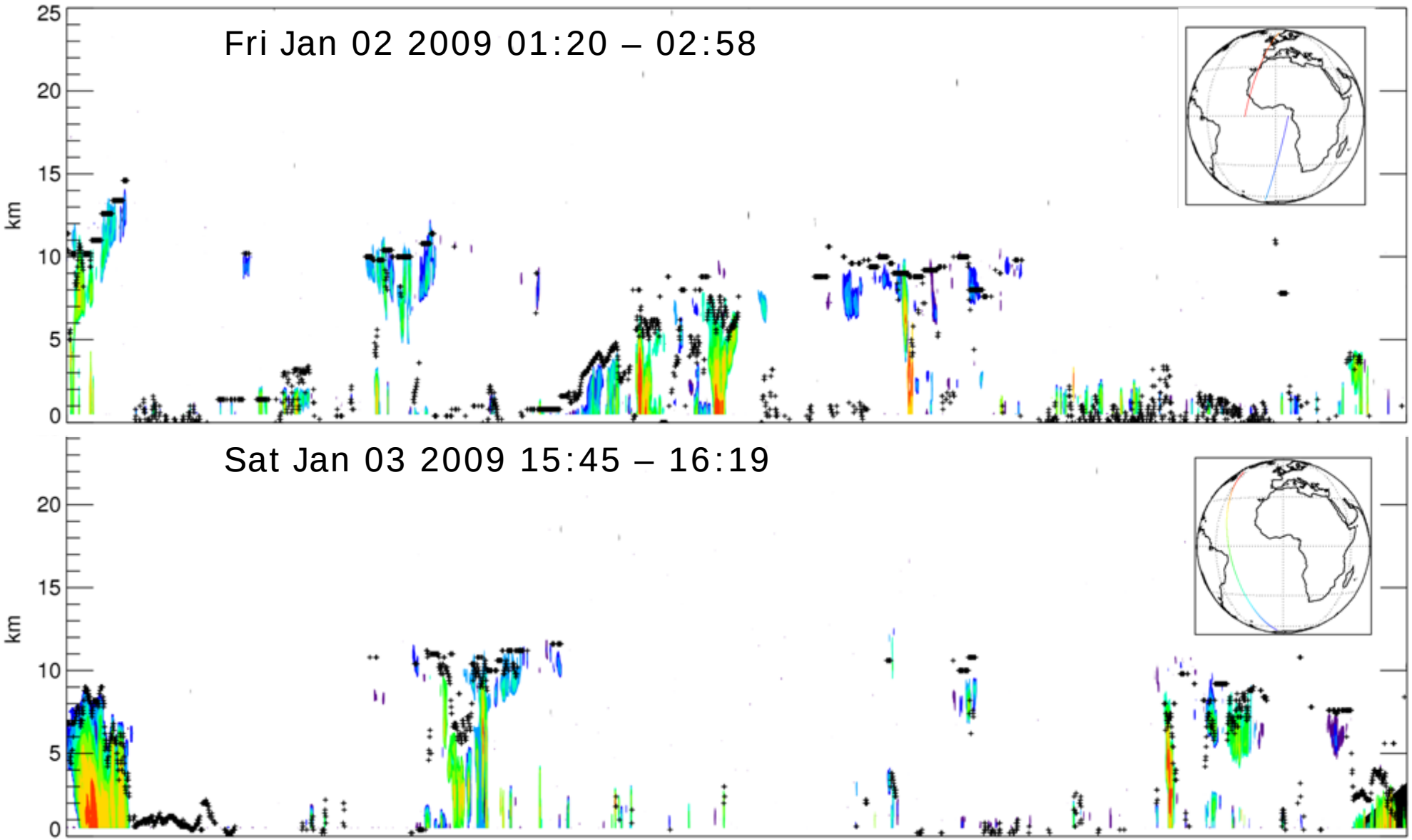
…rization lidar

- …nm
- …ude, 30-60 m vertical resolution
- …0
- …tal reso… …333m

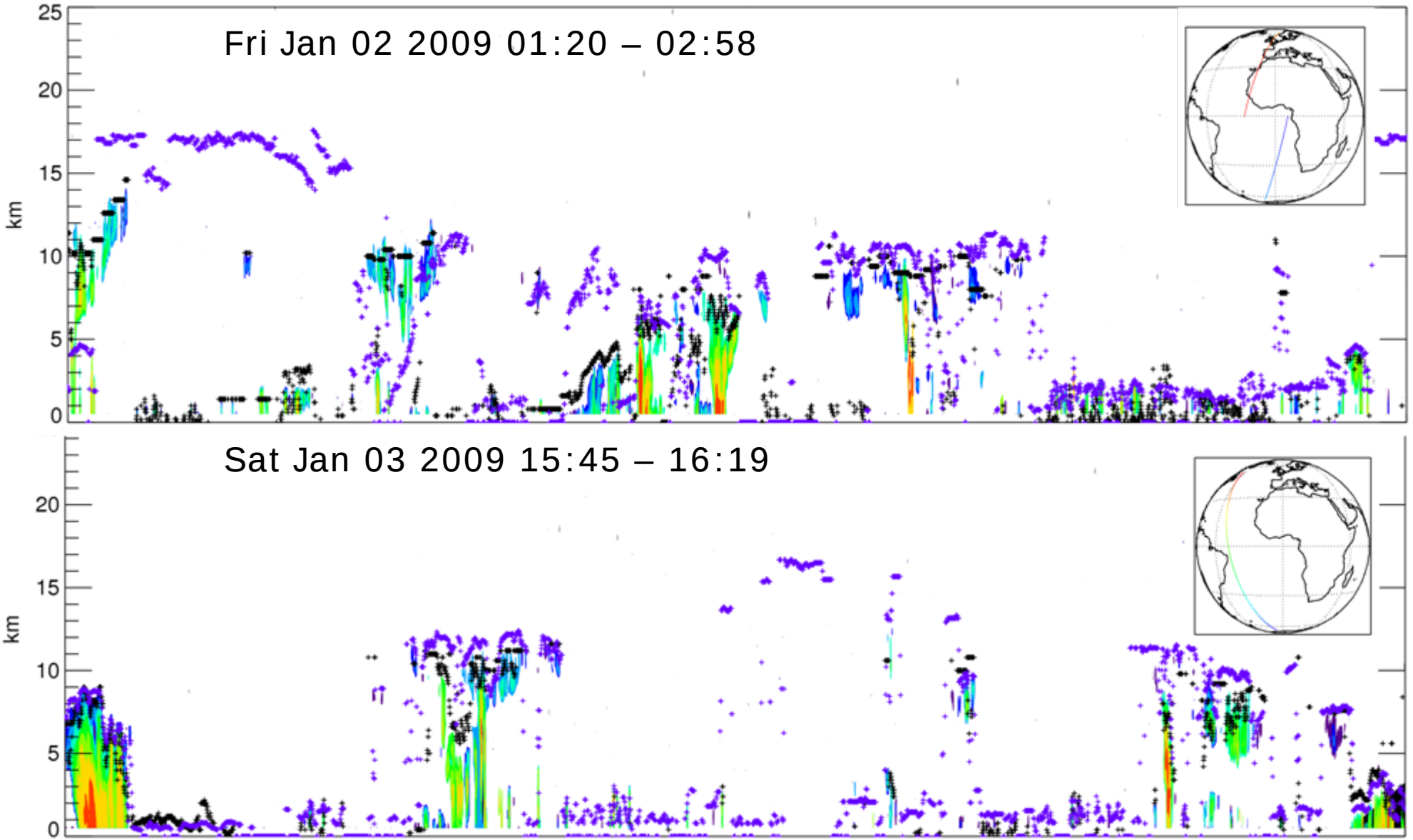


SEVIRI CTH

- Level2
- parallax correction applied

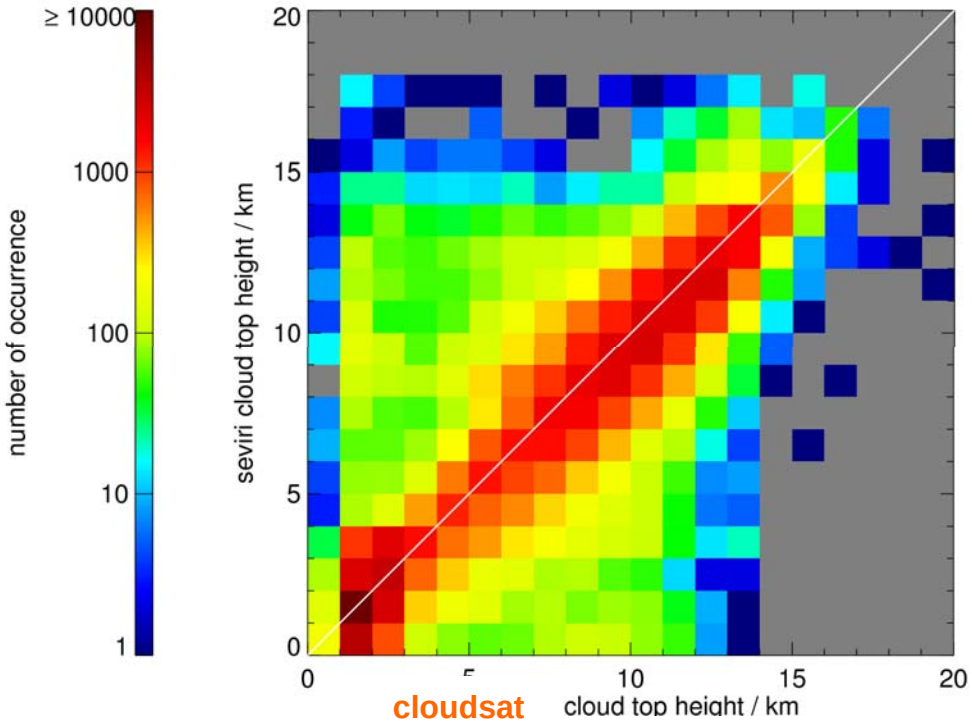


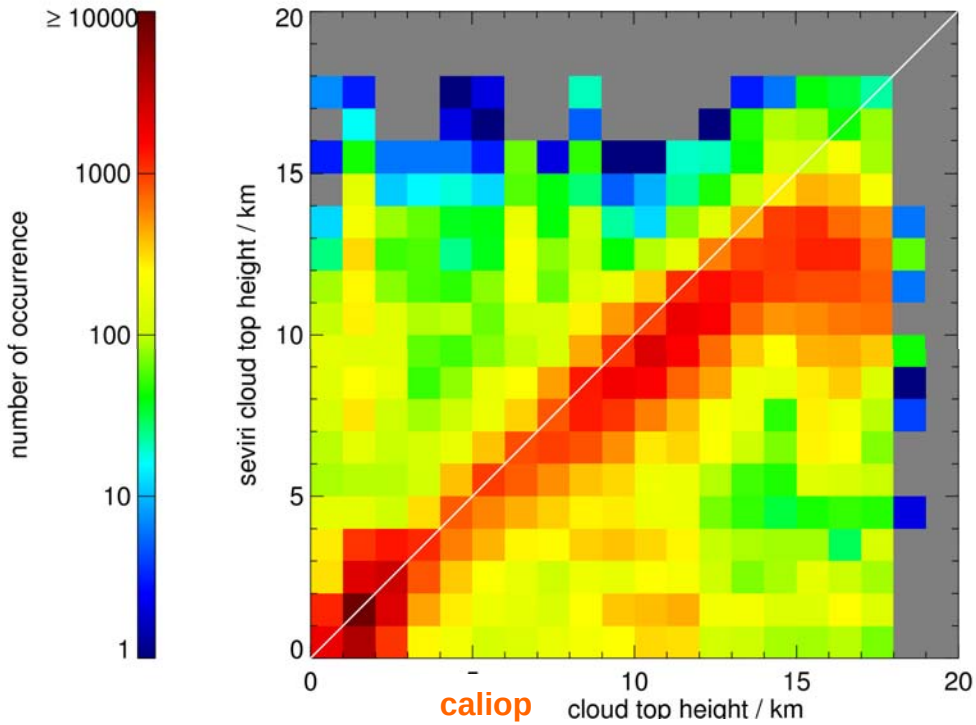
Cross section plots of matched reflectivity from Cloudsat and Cloud top height estimates from SEVIRI



Cross section plots of matched reflectivity from Cloudsat and Cloud top height estimates from SEVIRI and Calipso

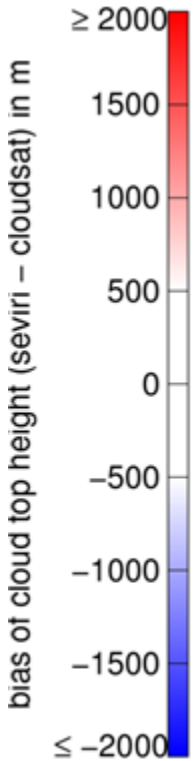
Comparisons vs. Cloudsat/Calipso (Jan 09)

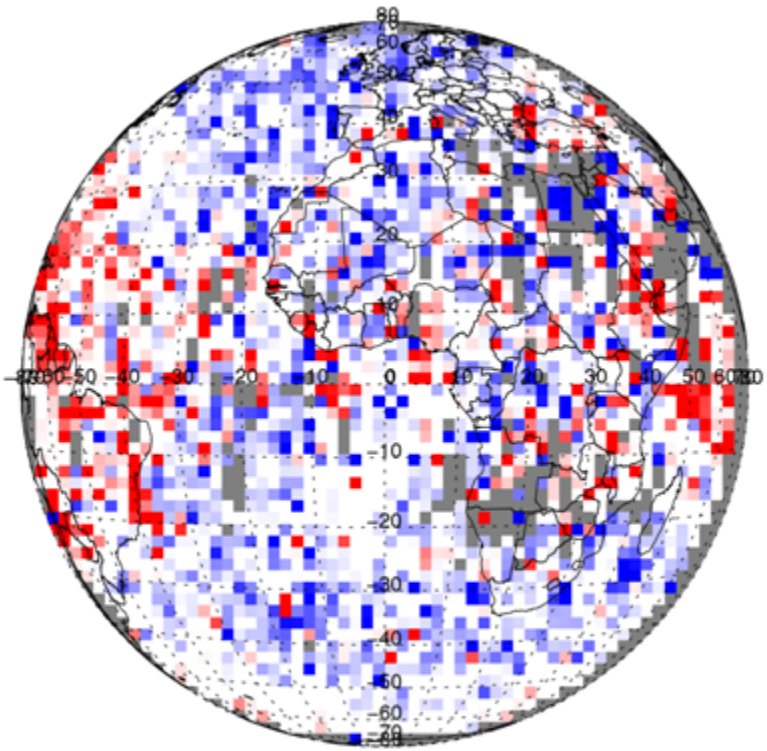




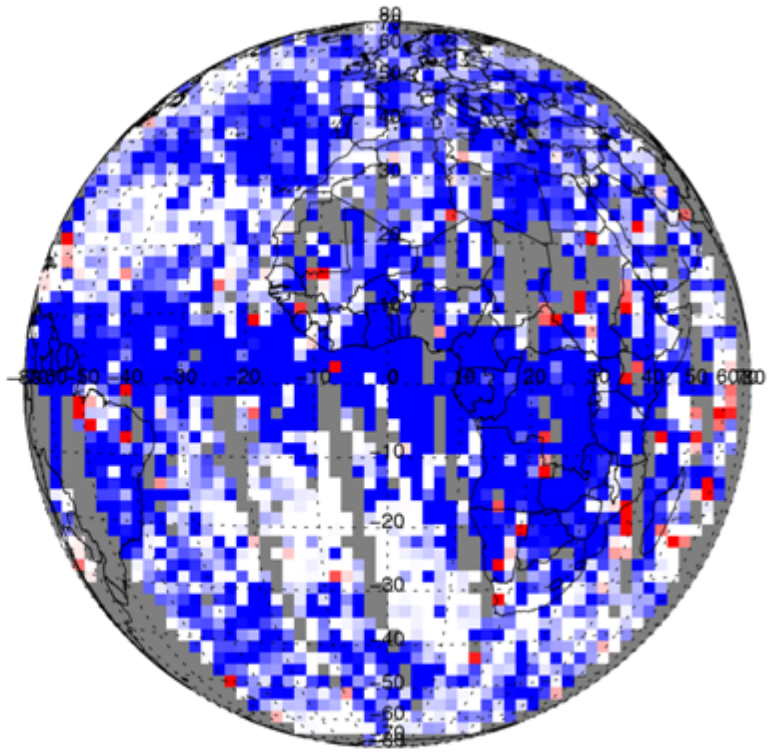
102055	**Count**	114656
6955 m	**Mean SEVIRI**	6642 m
7230 m	**Mean CPR/Caliop**	8358 m
-275 m	**Bias**	-1716 m

Regional Plots for Jan 2009





SEVIRI – CloudSat/CPR



SEVIRI – Calipso/Caliop

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The WACMOS Project

- **Water Cycle Multi-Mission Observation Strategy**
- Funded by ESA as a Support to Science element (STSE) and an ESA contribution to the GEWEX.
- Topics: Evapotranspiration, Soil Moisture, Clouds and Water Vapour
- Motivation: WACMOS is motivated by the increasing potential of synergic capabilities and the increasing needs for coherent long-term geo-information datasets.
- Goal: Develop and validate a Product Portfolio of water multi-mission based enhanced datasets maximising the use of ESA data.

esa

wacmos
support to science element

STSE
Support To Science Element

www.wacmos.org

DWD's contribution to WACMOS

- **Develop and validate two water vapour products by combining** SEVIRI + IASI **and** SEVIRI + MERIS**, respectively.**

SEVIRI + IASI

Product: tropospheric WV profiles for at least 3 vertical layers

Region: Full MSG disc
$(0.25°)^2$ grid

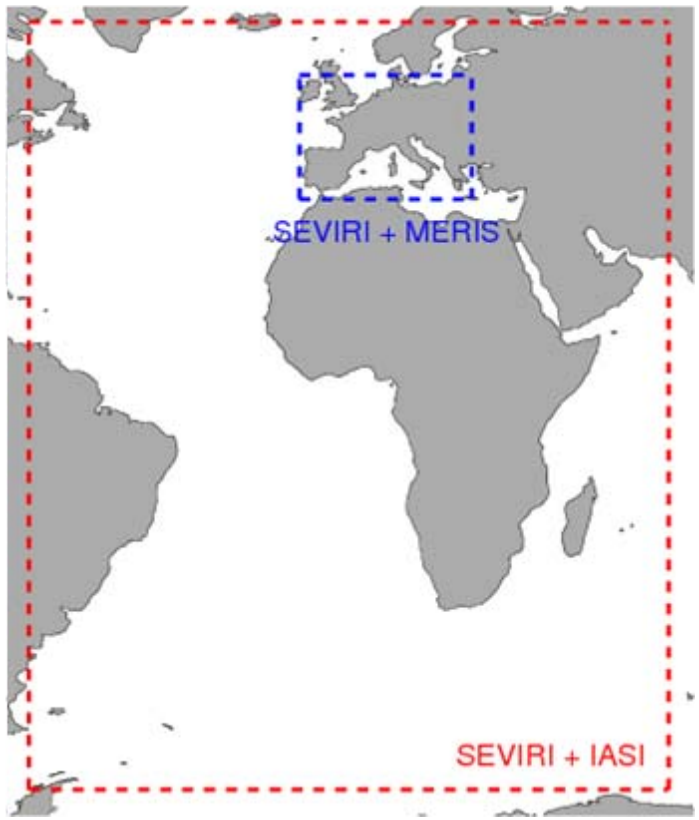
Time: 01.06.2008 – 31.05.2009
3-hourly resolution

SEVIRI + MERIS

Product: total column water vapour

Region: Central Europe
$(0.025°)^2$ grid

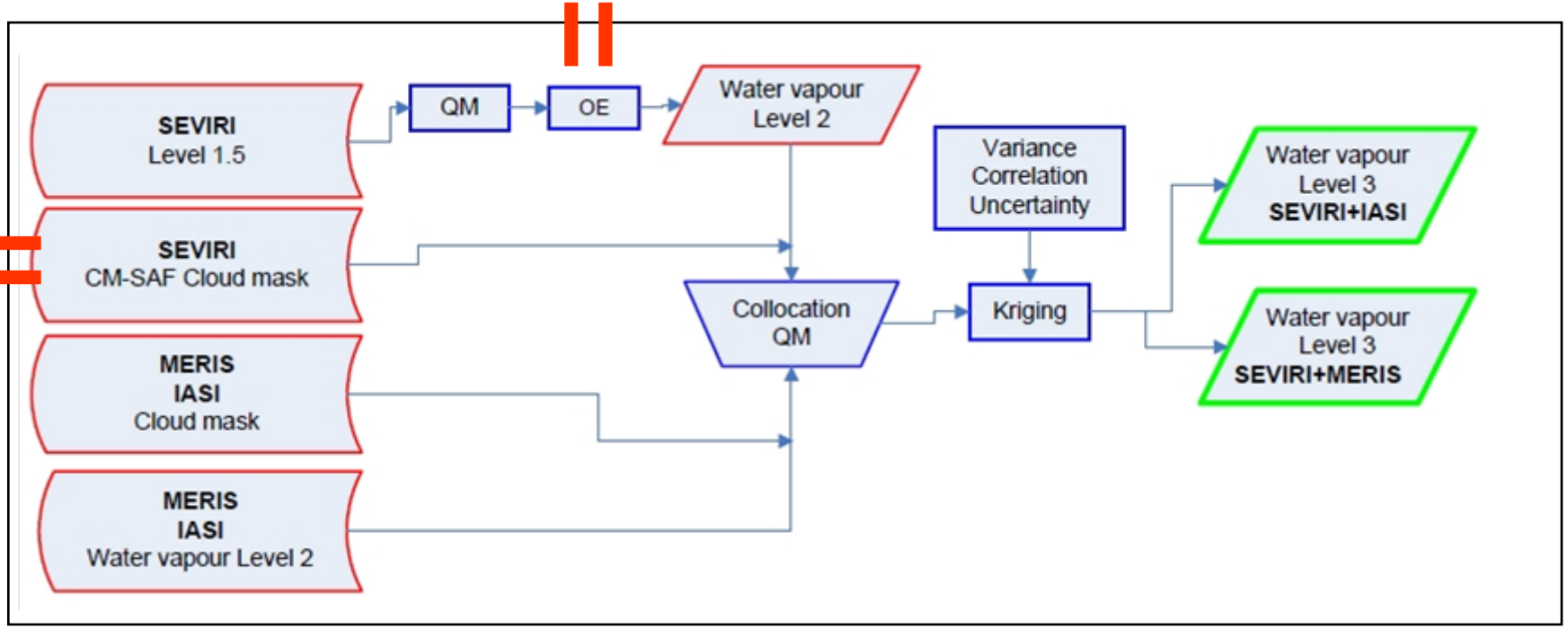
Time: 01.06.2008 – 30.11.2008
3-hourly resolution



Flowchart illustrating data and processing steps

Product Generator Element (PGE) 13
SEVIRI Physical Retrieval (SPhR)

MSG PGE01 CMa



More details given in the presentation by Miguel A. Martinez (AEMET)

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CM-SAF Summary and Outlook

- currently, in the processing SAF NWC MSG and SAF NWC PPS is used
- the validations with independent instruments and data sets demonstrate that quality and stability of the CM-SAF cloud products is compliant with scientific requirements
- Cloud datasets derived in near real time are usable for diurnal to seasonal monitoring and process studies.
- In CDOP 2, CM-SAF will focus on the generation of data sets based on carefully intercalibrated radiance data which can be used for climate variability analysis up to inter-annual scale.
- Cloud climate data records:
  - **Meteosat Second Generation SEVIRI** data sets 2004-2011
  - global historic **NOAA AVHRR** data sets 1982-2010

CM-SAF requirements

„Climate Version“ of SAF-NWC MSG and PPS is needed“
(PPS with the GAC interface, this has been achieved in CDOP I)

- full possibility to apply (own) inter-calibration and homogenisation to radiances and BT before product processing.
- possibility to apply SAF NWC MSG to all GEO‘s
- IR-only cloud detection possibility is needed to avoid day/night inconsistencies
- netcdf convention is preferred

WACMOS Summary

- DWD currently uses the PGE13 SEVIRI Physical Retrieval (SPhR) within ESA's WACMOS project.
- The PGE 13 SPhR extension allowing to save the error of the clear-sky pixels is also necessary for our work.
- A usage of the PGE13 in other projects, like e.g. the SEVIRI re-processing is intended.

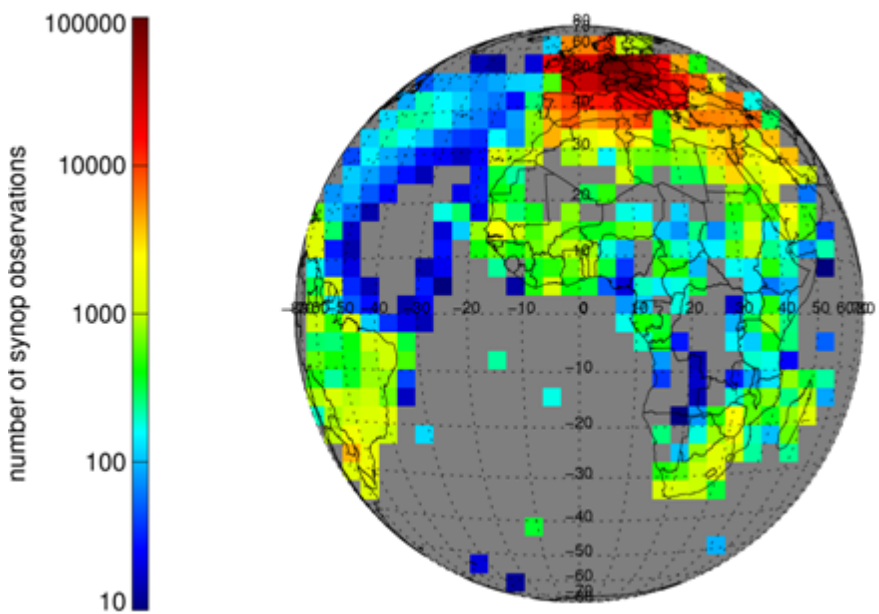
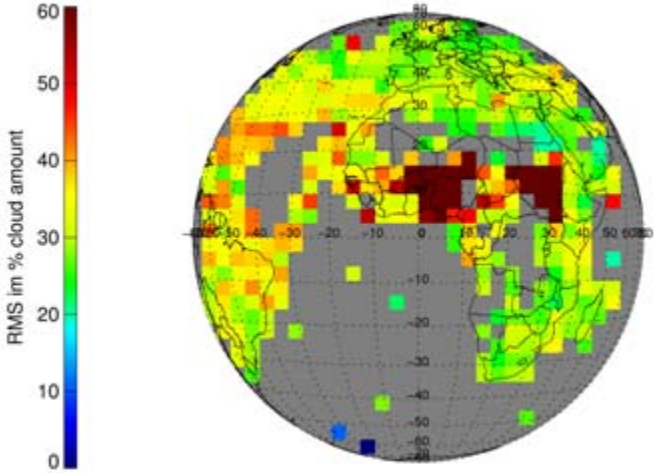
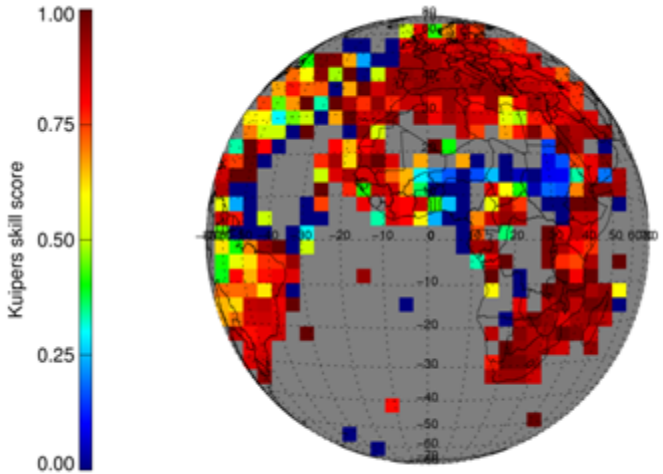
Comments

- The retrieval for the whole MSG disk is pretty time consuming. Reduction possible ?
- We recommend to include a flag allowing the error output in the future MSG software releases.

Thanks to the NWC SAF team, especially *Miguel A. Martinez* (AEMET), and *Jun Li* (CIMSS UW Madison) for their great support !!

Thank you !

To obtain CM-SAF data & more information:
http://www.cmsaf.eu

More information on the WACMOS project can be found on
http://www. wacmos.org

Cloud Fractional Coverage SEVIRI vs. SYNOP