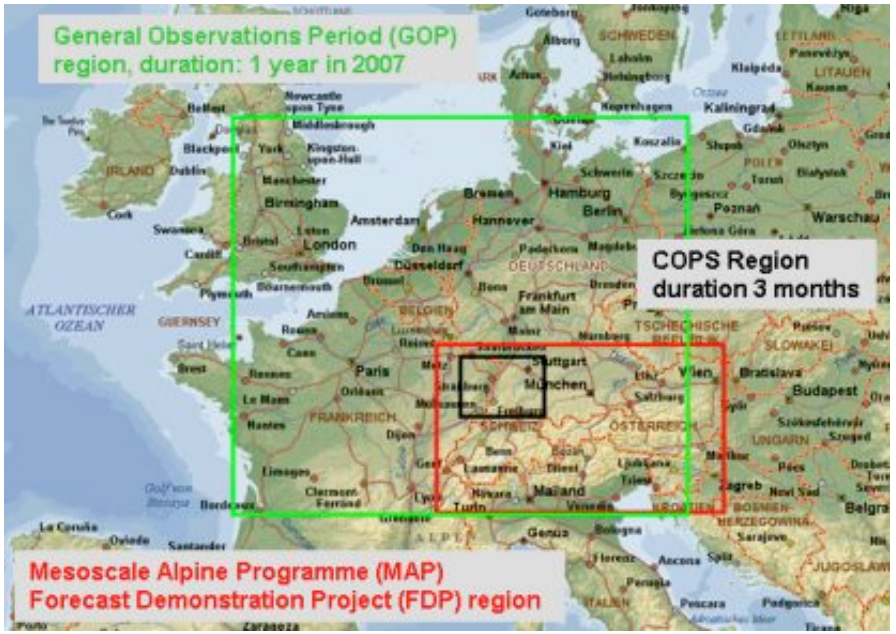
General Observation Period 2007: Concept and first results

Crewell, S., V. Breininger, M. Mech, T. Reinhardt, C. Selbach, H.-D. Betz, E. Brocard, G. Dick, E. O'Connor, J. Fischer, T. Hanisch, T. Hauf, A. Hünerbein, A. Mathes, G. Peters, H. Wernli, V. Wulfmeyer .....

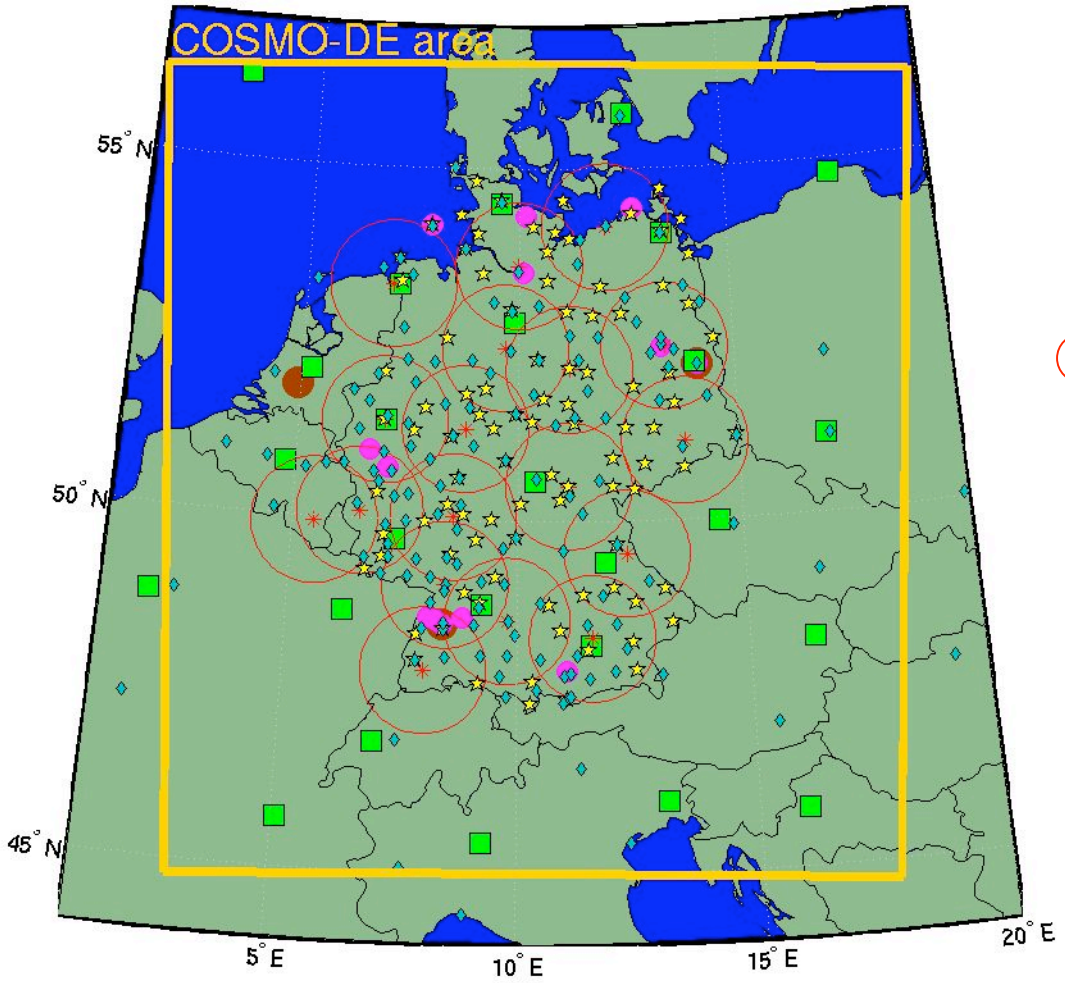
GOP Organization and Performance

The **General Observation Period**
— January to December 2007 —
encompasses **COPS** in time and space



- gather as <u>many data</u> about the atmospheric state as possible within an area covering Germany and it neighboring states.
- to provide information of all kinds of precipitation types
- to identify systematic model deficits
- to select case studies for specific problems
- to relate the COPS results to a broader perspective (longer time series and larger spatial domain)

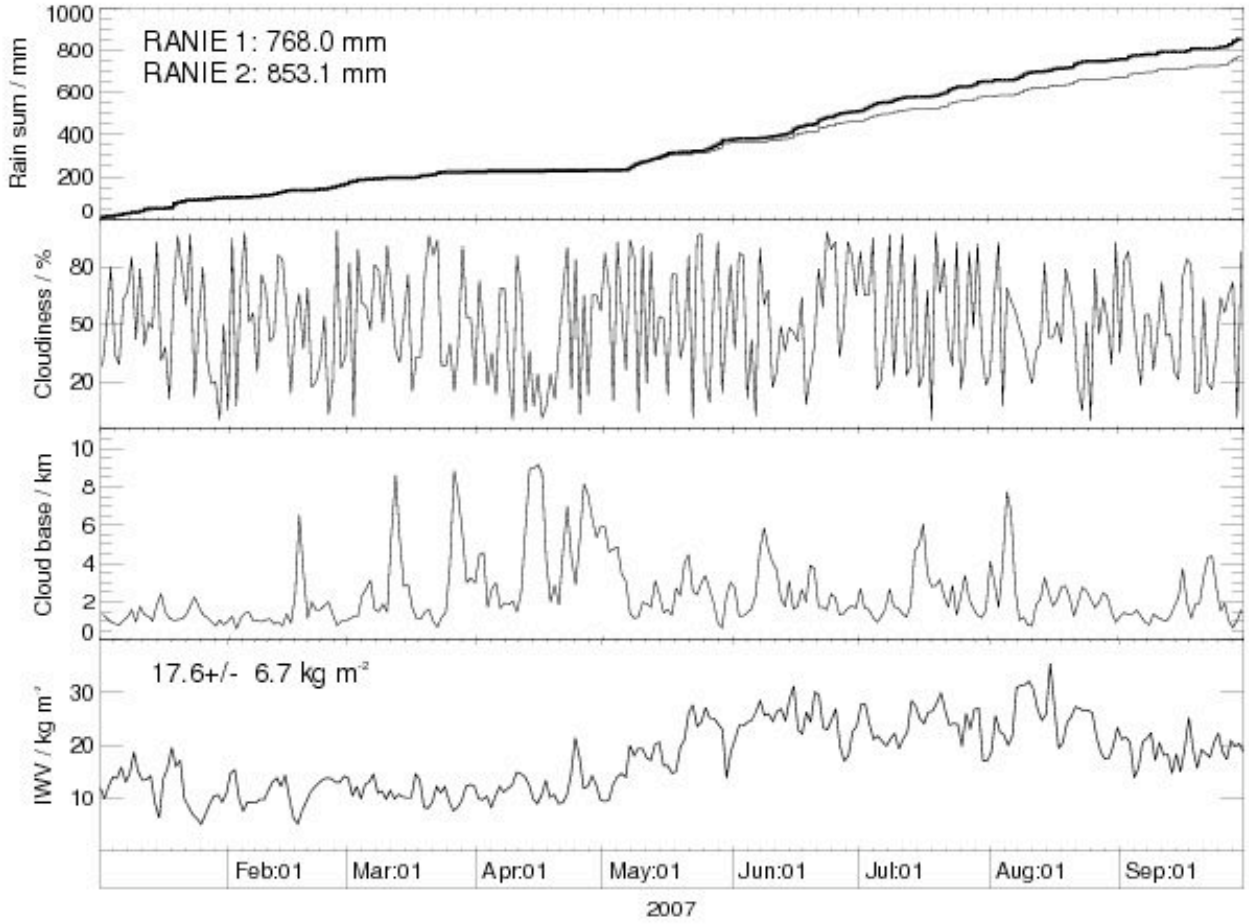
GOP Area and Instrumentation



- Radiosonde
- Cloudnet
- Micro Rain Radar
- GPS
- Ceilometer
- Wetterradar

and Satellites

GOP Overview 2007



Average values
for Germany

RANIE1 - gauge only
RANIE2 - gauge/radar

Compare to
climatology

- Precipitation was rather variable in 2007 (dry April, wet July)
- About 10 % difference in total precipitation of both RANIE products
- Warm winter leads to high integrated water vapor (IWV) in the beginning of 2007

GOP Ingredients: Precipitation

- **GOP-1** Rain gauges

  several hundred independent observations by water authorities, environmental agencies

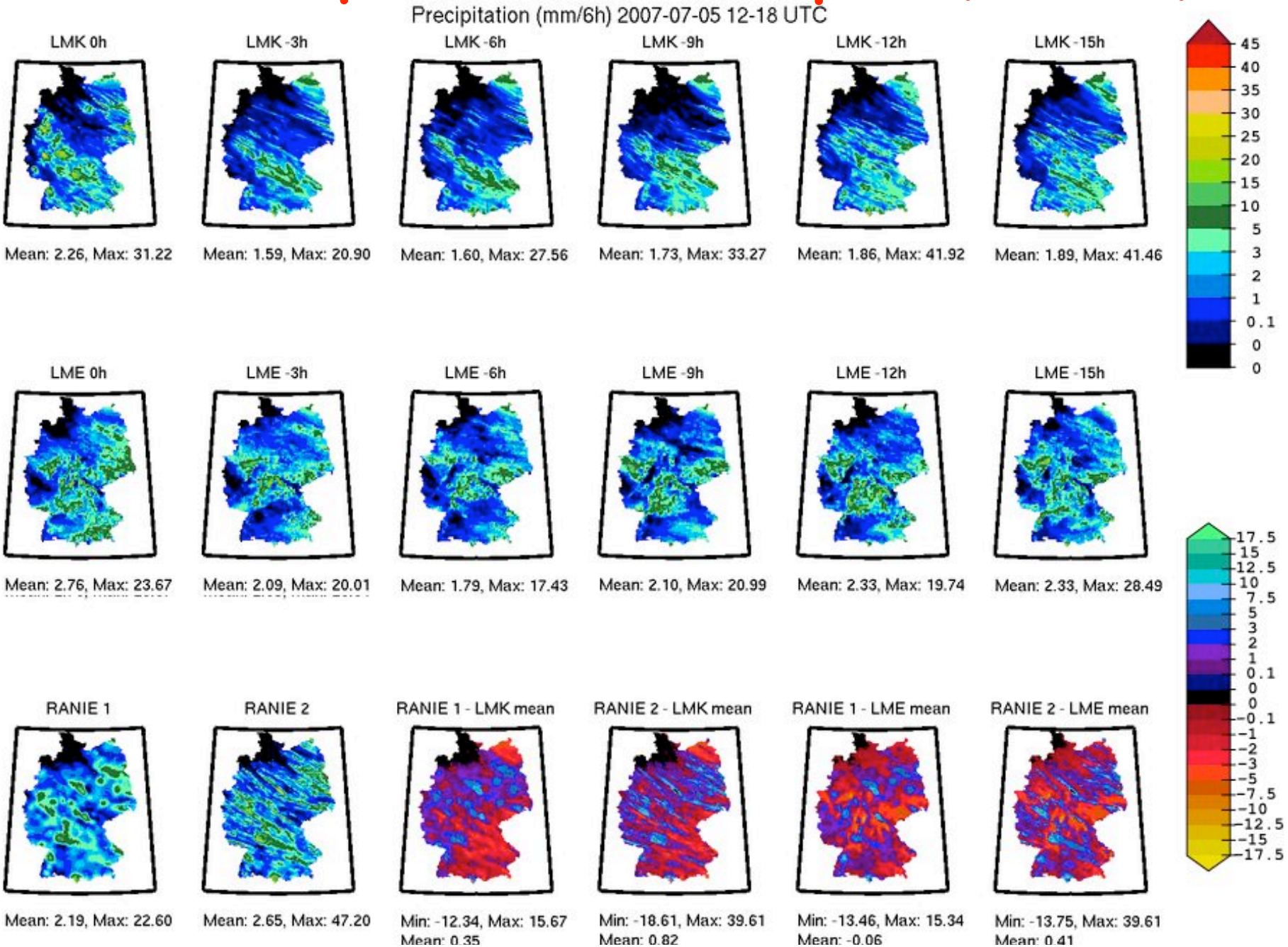
- **GOP-2** Weather Radar

  DWD radar network and research radars, 3D volume scans

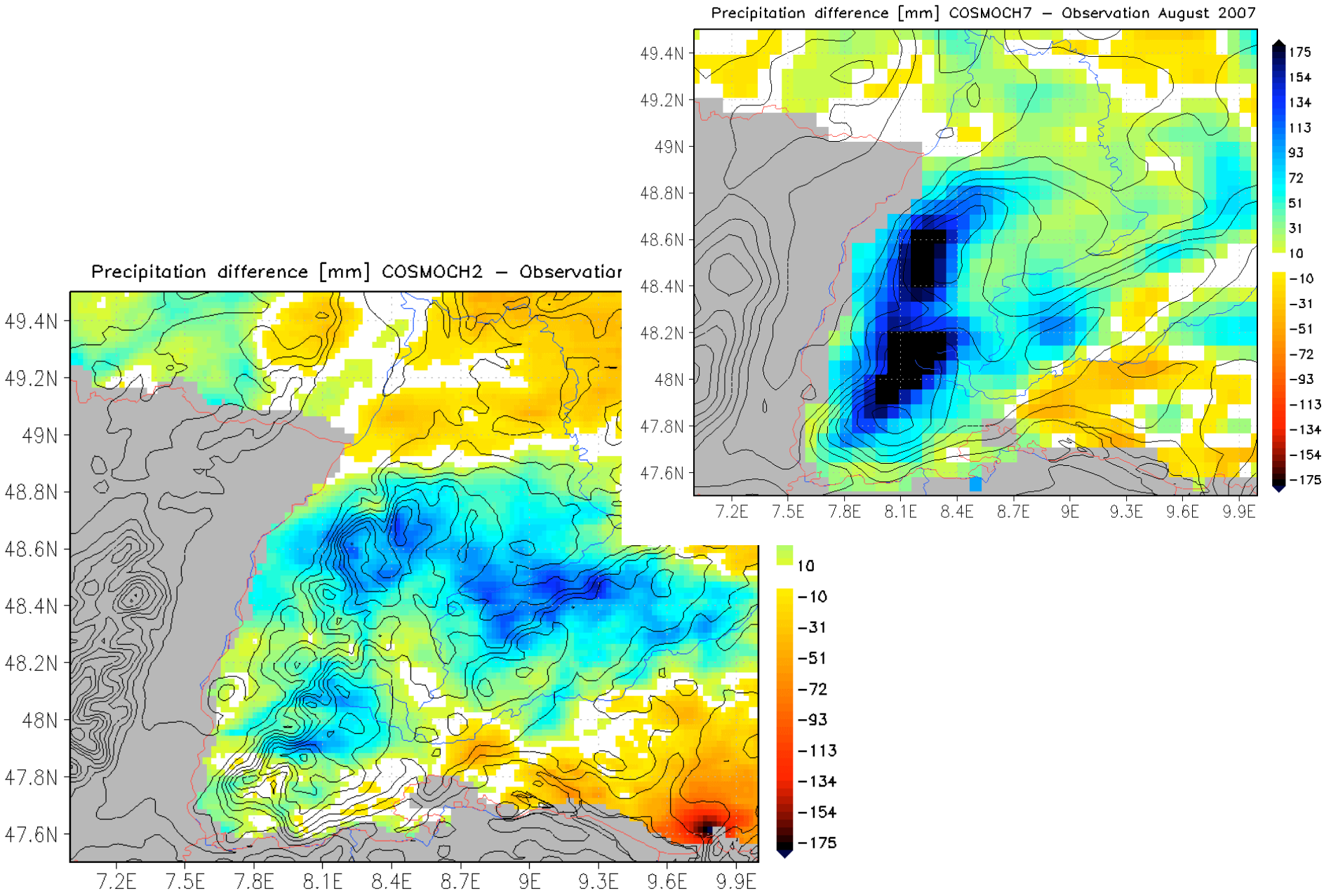
- **GOP-3** Drop Size Distribution DSD

  vertical structure at about 15 locations with Micro Rain Radar (MRR)

GOP-1 quicklooks: examples (RANIE)

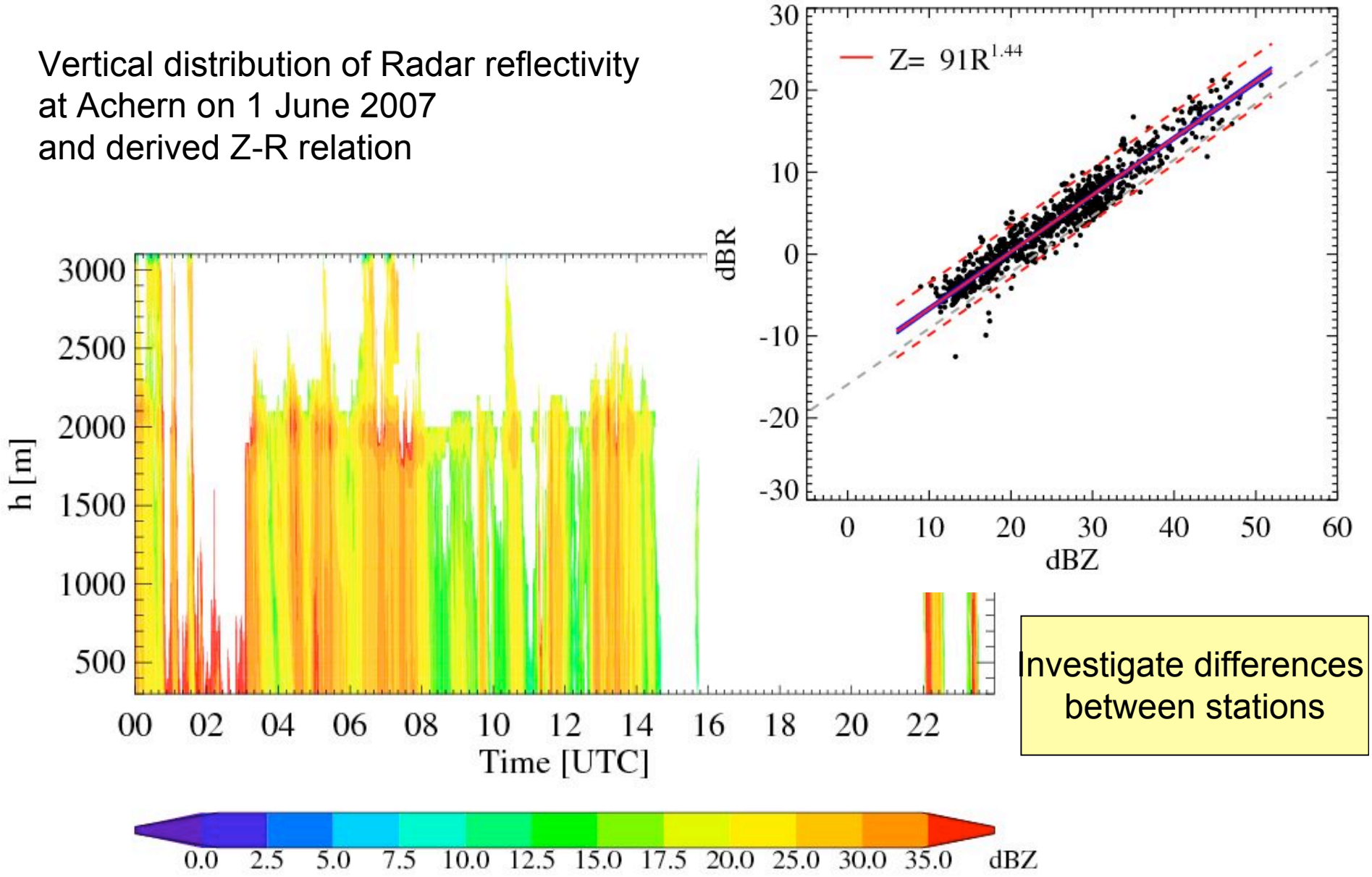


Precipitation Comparison



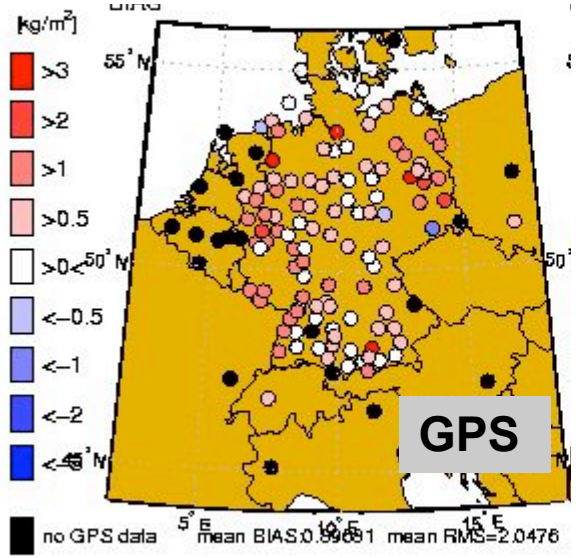
GOP-3 Micro Rain Radar

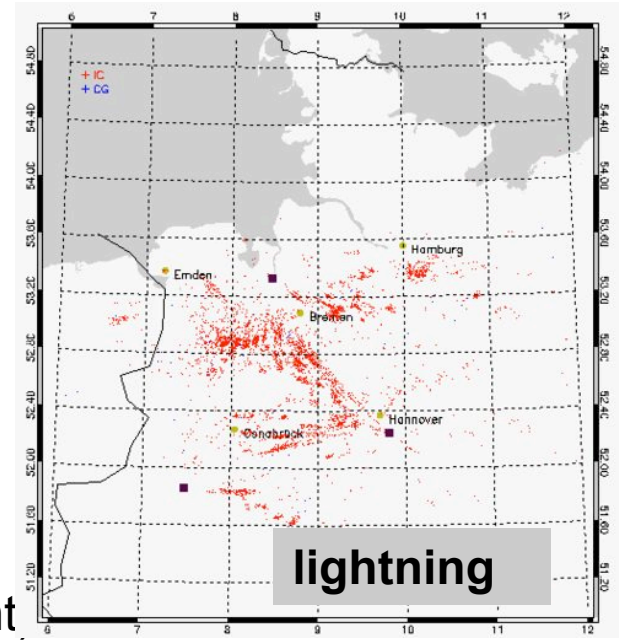
Vertical distribution of Radar reflectivity
at Achern on 1 June 2007
and derived Z-R relation



Investigate differences between stations

GOP Ingredients: Auxillary Information





- **GOP-4** Lidar (aerosol, cloud base, mixing layer height)

  EARLINET stations, about 100 lidar ceilometer stations in Germany

- **GOP-5** GPS water vapour column

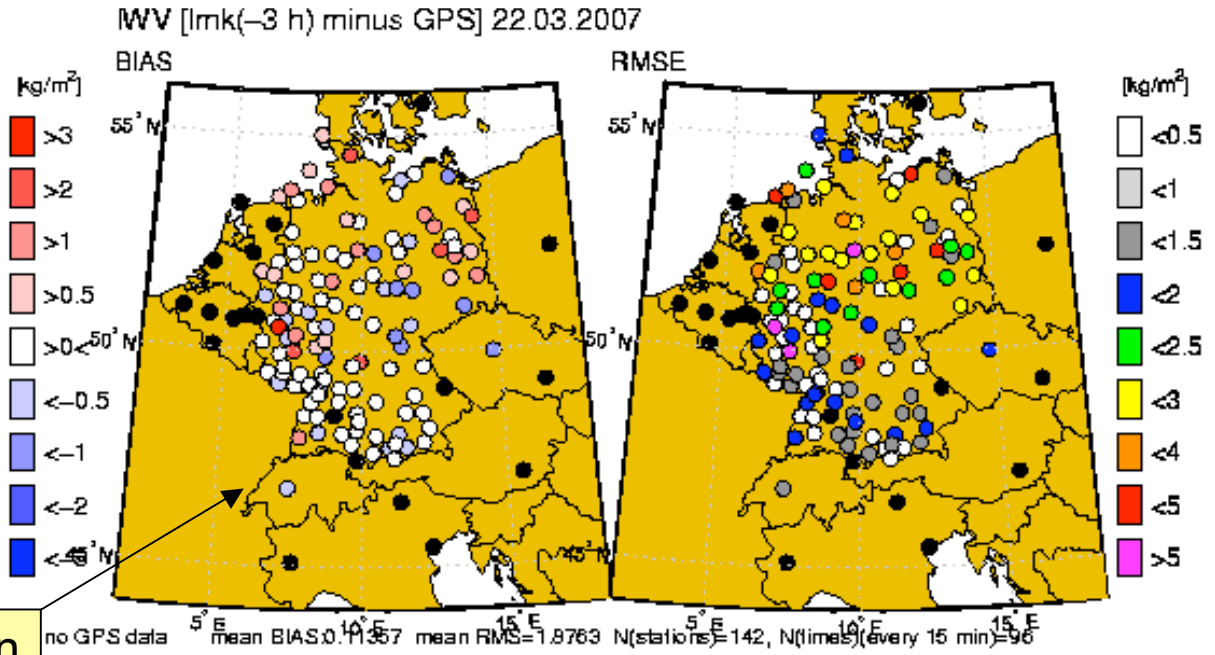
  GFZ routine stations with 15 min resolution
  - additional stations in COPS area
  Swiss Agnes network (~30 stations) with 1 h

- **GOP-6** Lightning networks

  German VLF and VHF networks

2007-03-22
3-h old
Forecasts:

Mean bias:
0.113 kg/m^2



2007-03-22
3-h old
Forecasts:

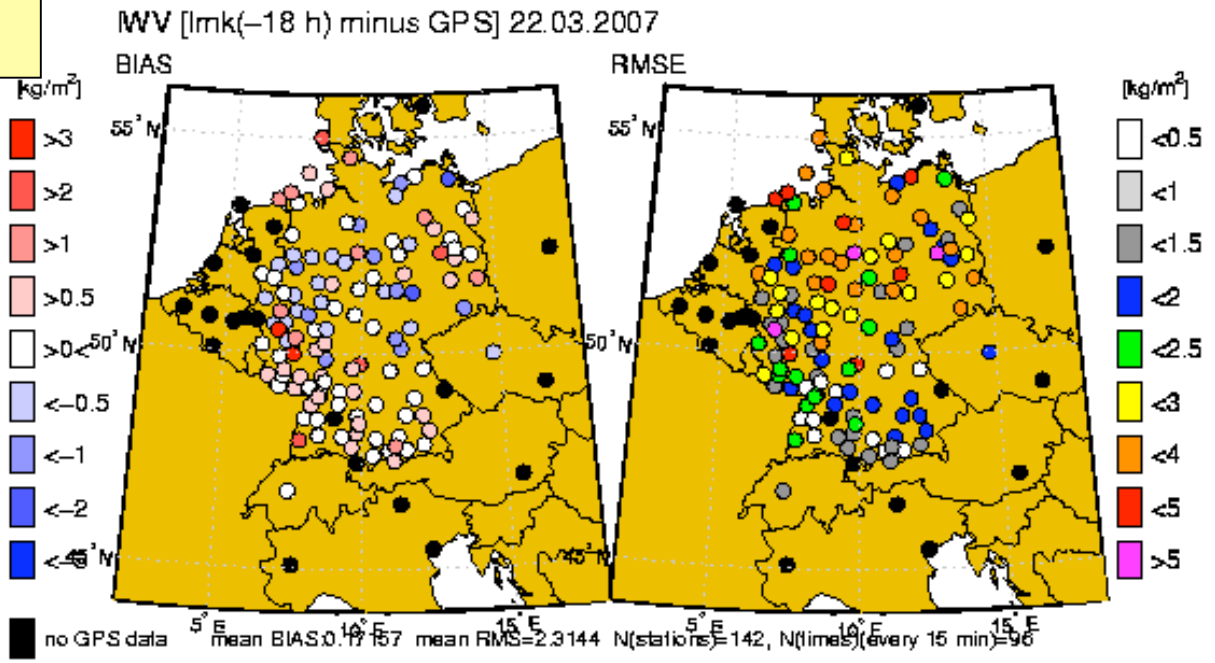
Mean RMSE:
1.876 kg/m^2

High resolution networks in Switzerland,.. available

Daily comparisons

2007-03-22
18-h old
Forecasts:

Mean bias:
0.172 kg/m^2

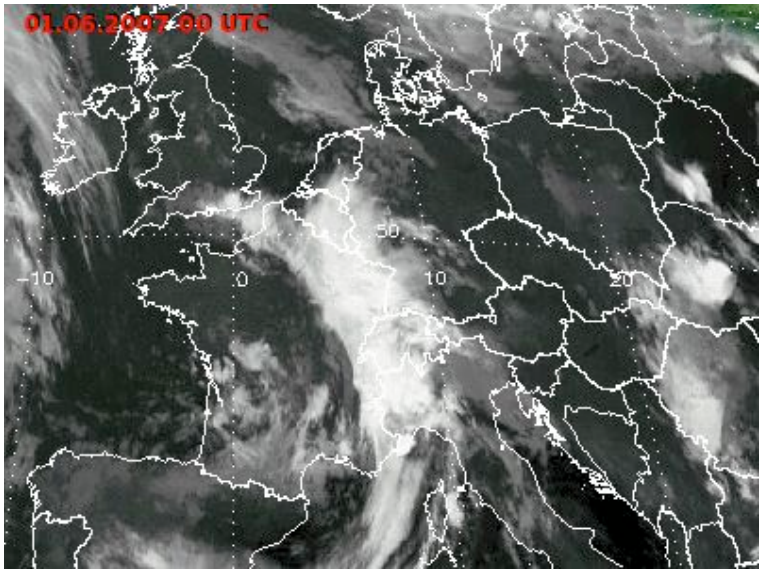


2007-03-22
18-h old
Forecasts:

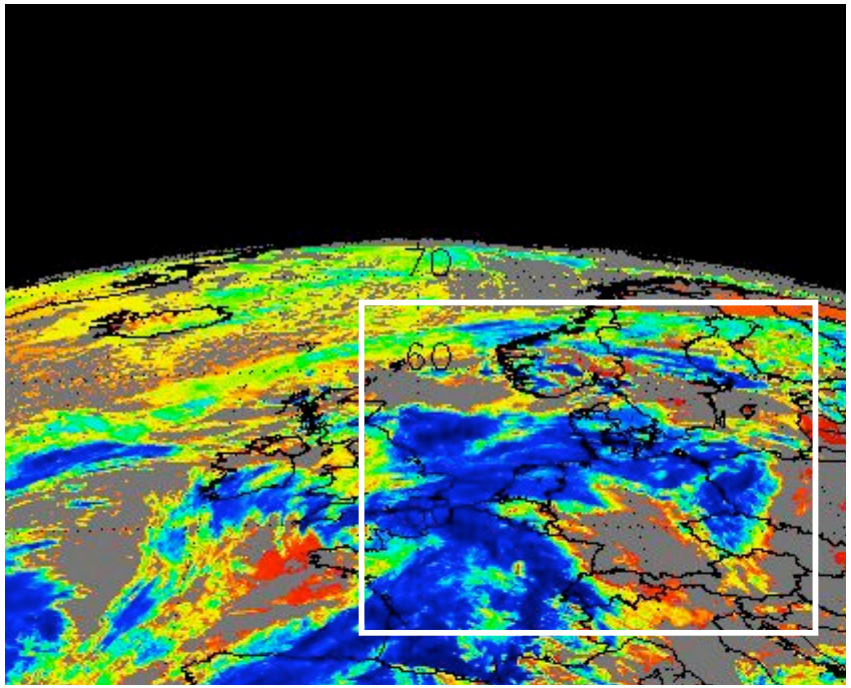
Mean RMSE:
2.314 kg/m^2

GOP-7 Satellites

MSG:
- cloud mask
- cloud top pressure (+temperature?),
- optical depth
- IR brightness temperature

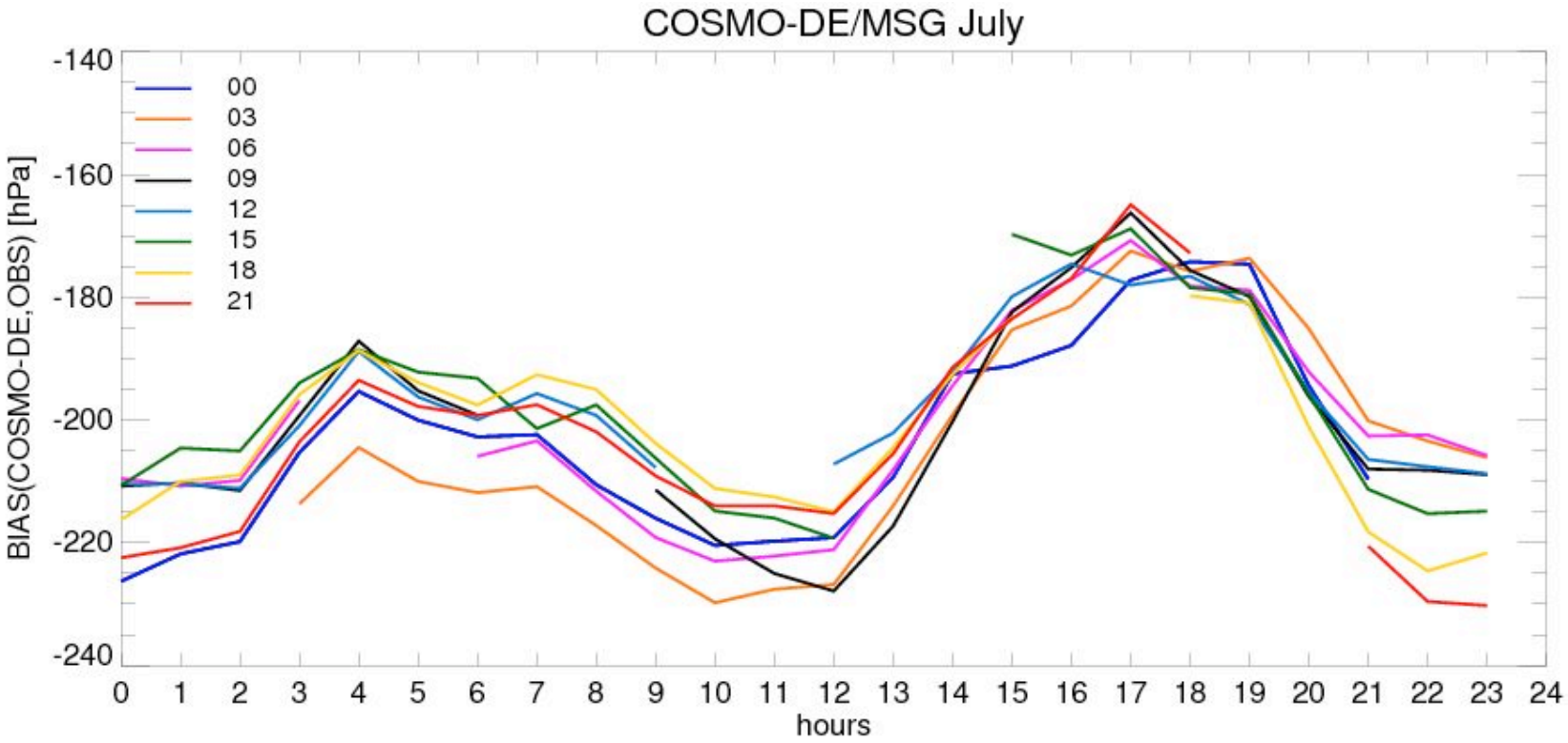


MODIS:
- cloud mask
- cloud optical thickness **τ**
- liquid water path **LWP**
- effective radius $\mathbf{r_{eff}}$
- geometric cloud thickness **H**
- IWV
- aerosol?



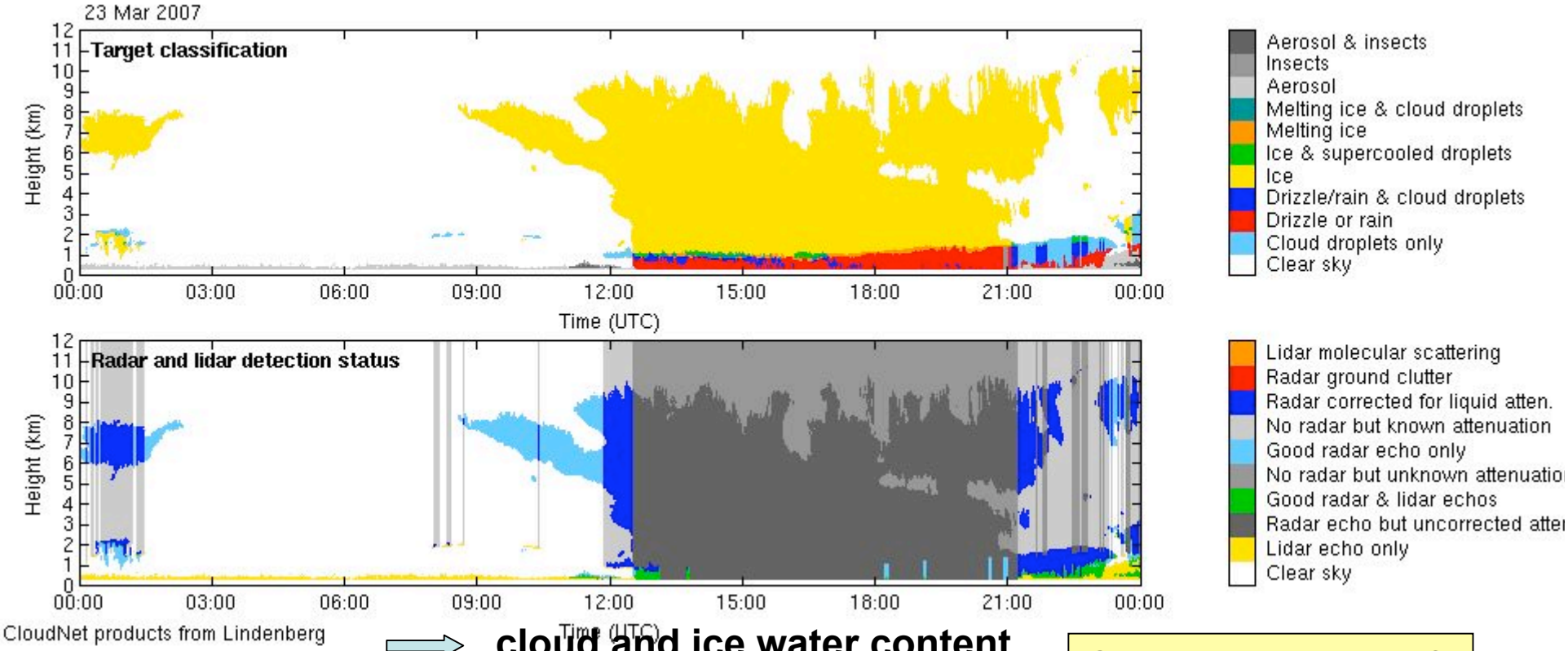
MERIS:
- cloud mask
- cloud optical thickness **τ**
- cloud top pressure (+temperature?)

GOP-7 MSG Cloud Top Pressure



GOP-8 Meteorological Stations

- Forest stations Tuttlingen and Hartheim
- Meteorological observatories and instituts (Bern, Bonn, Hohenheim, Karlsruhe, Oberpfaffenhoffen, Payerne, Zimmerwald,..)
- Radiosounding and synop stations
- Cloudnet stations and COPS supersites (Radar, lidar & microwave)



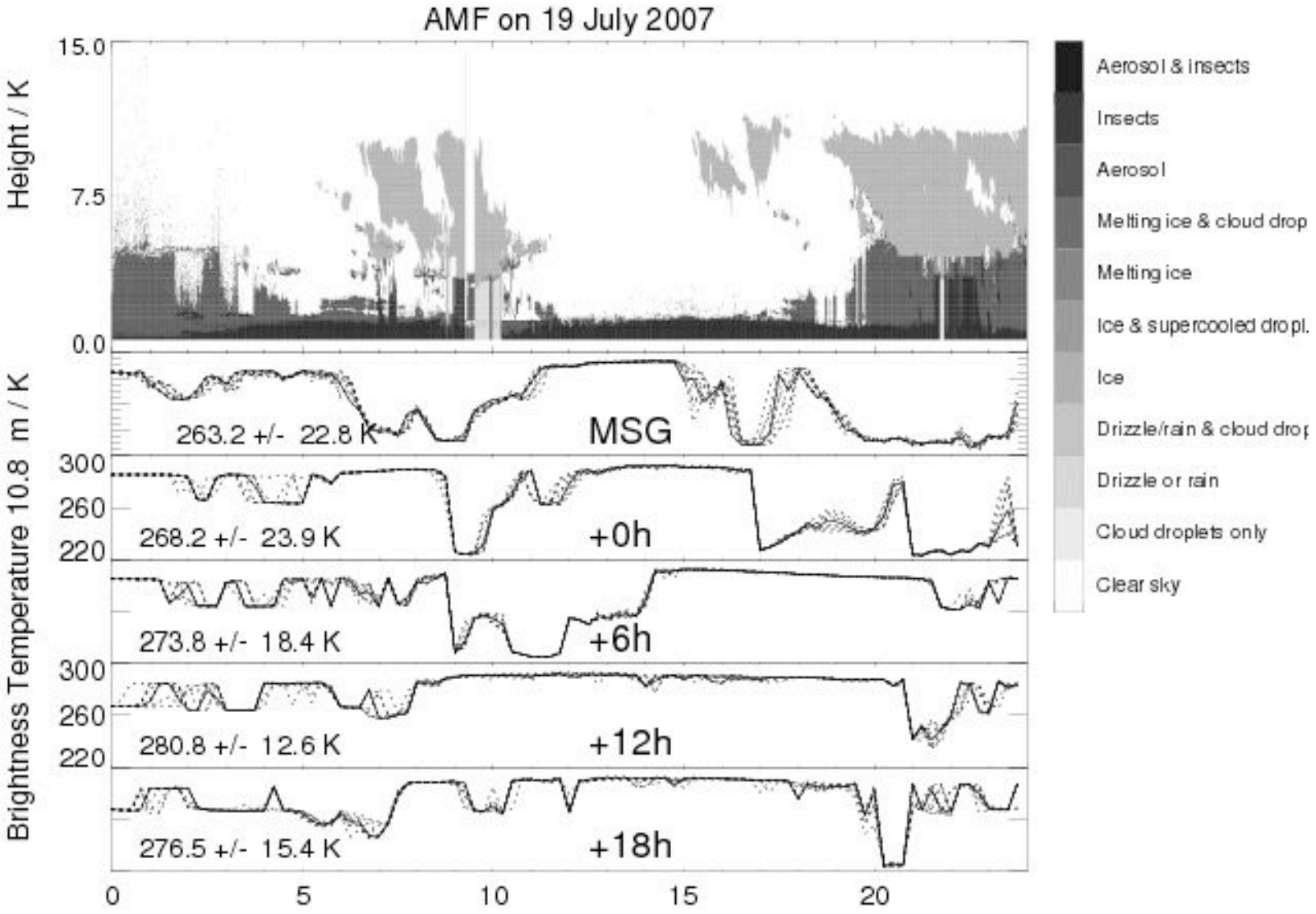
CloudNet products from Lindenberg

⇒ **cloud and ice water content**

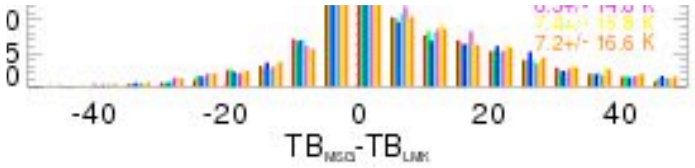
Calculate drizzle pdf

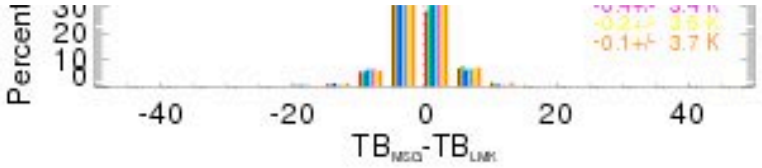
Ewan O'Connor

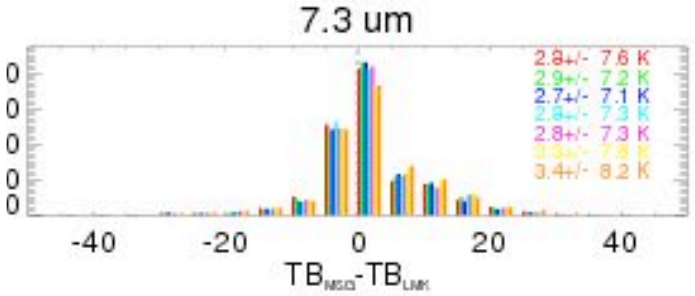
MSG & Cloudnet

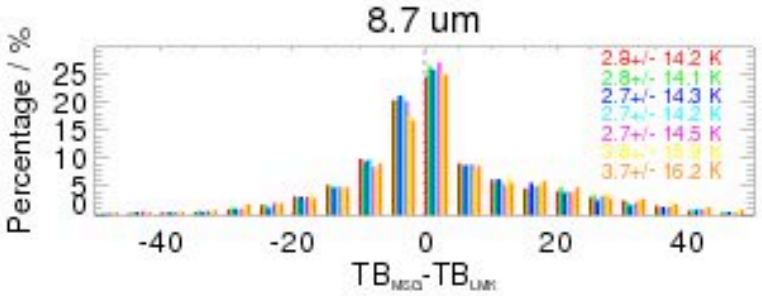


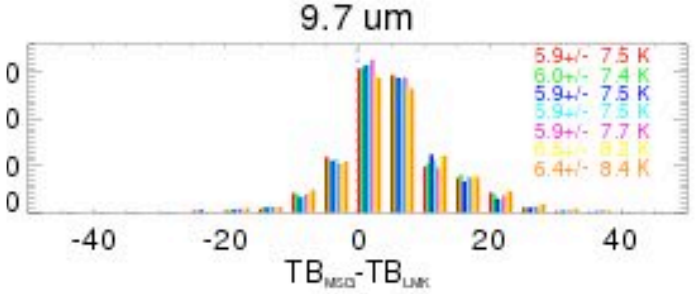
MSG Statistics

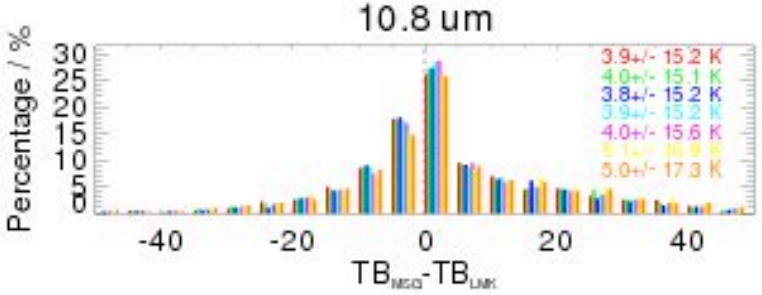


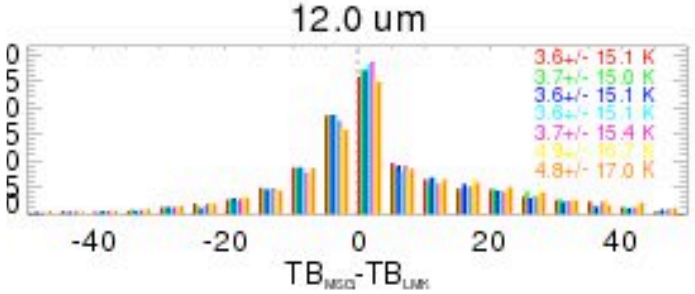


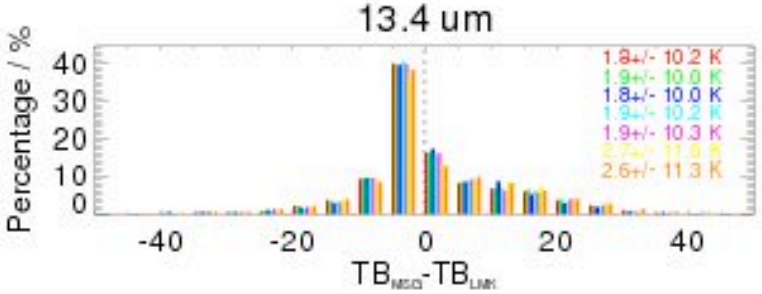




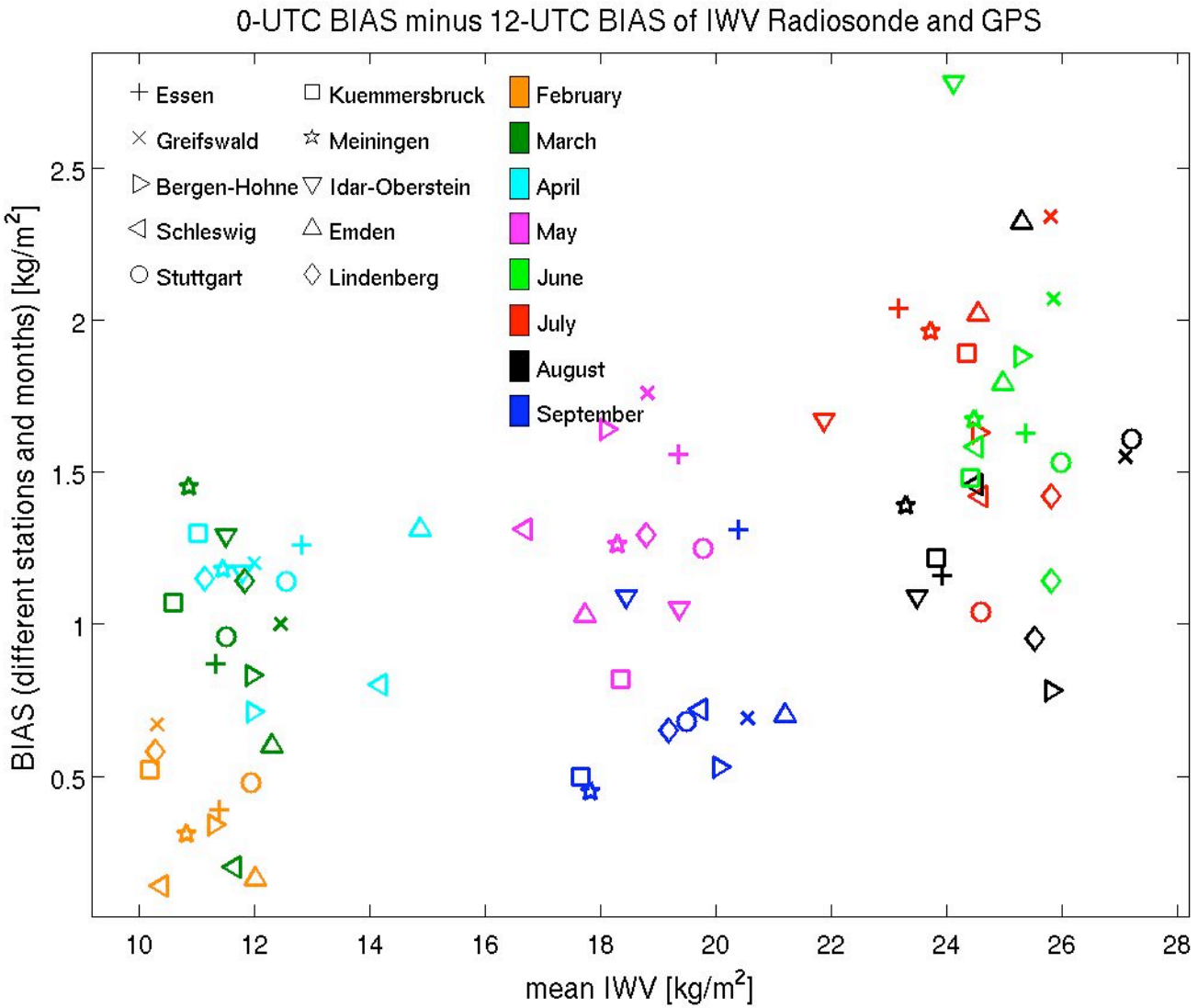




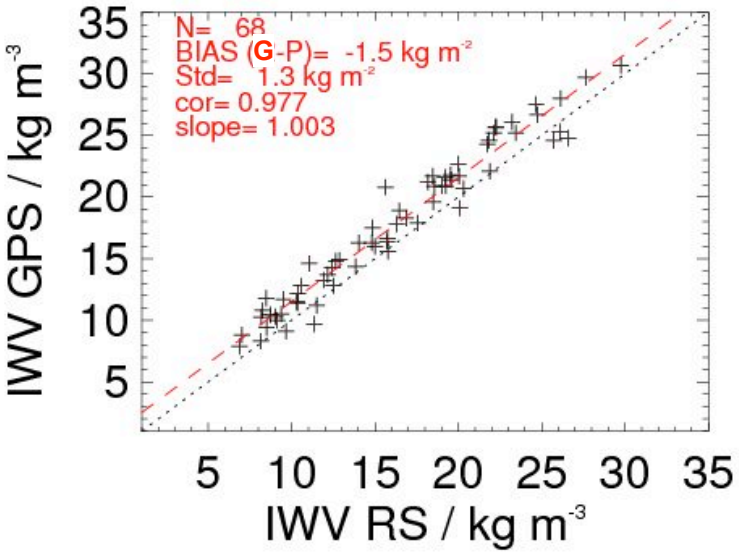


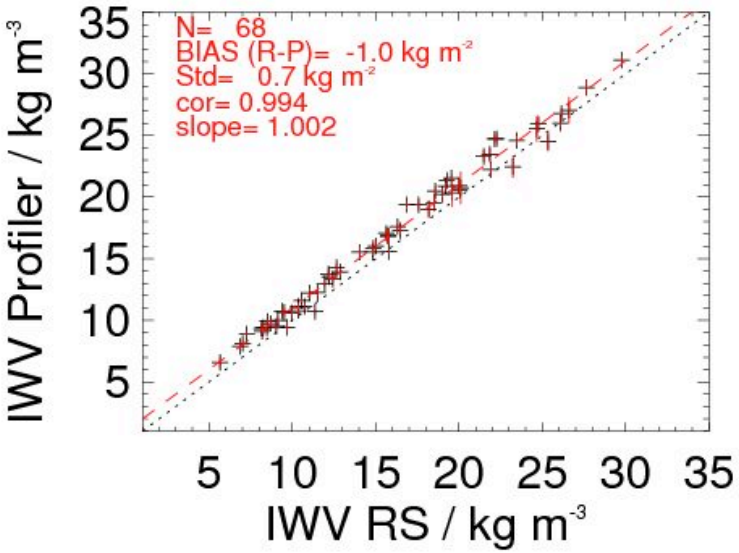


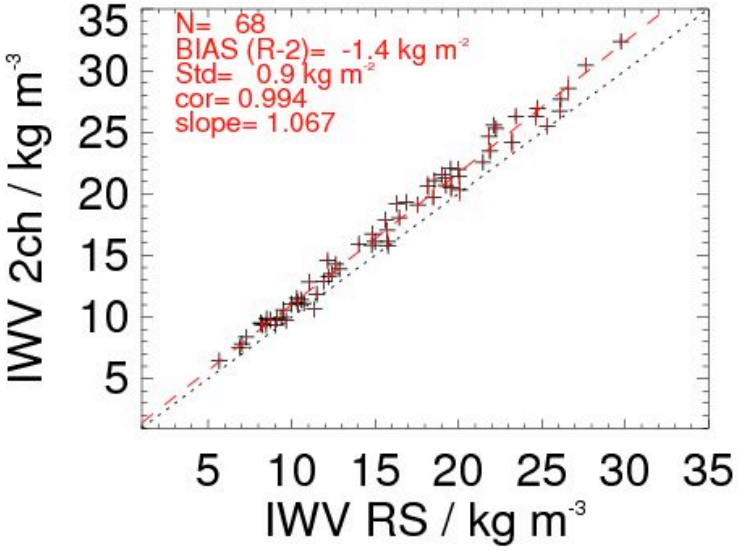
Consistency checks Humidty

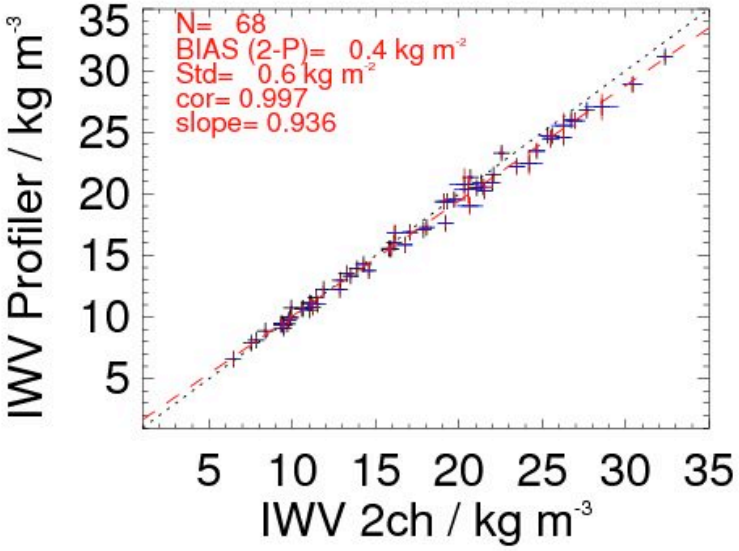


IWV Comparison AMF 12 UTC









Radiosonde Dry Bias

AMF April to June
Bias/Std. Deviation in Integrated Water Vapor in kg m^{-2}

	0 UTC	6 UTC	12 UTC	18 UTC	All
N	61	66	68	65	263
RS - GPS	**0.3** 1.1	-0.1 0.8	**-1.5** 1.3	-0.3 0.8	-0.4 1.2
RS - Profiler	**0.0** 0.8	-0.7 0.7	**-1.0** 0.7	-0.4 0.6	-0.5 0.8
RS - 2 ch	**0.2** 0.5	-0.5 0.6	**-1.4** 0.9	-0.6 0.6	-0.6 0.9

GOP-8 Radiosondes

Temperatur

- COSMO-DE und COSMO-EU zeigen ähnliche Vertikalstruktur im Bias während der Wintermonate - im Sommer COSMO-DE besser? Beispiel Juni
- Für den 12 UTC ist die älteste (+21h) Vorhersage immer die kälteste
- Für den 0 UTC sind von Januar bis April die bodennahen Schichten zu kalt
- Bei der Betrachtung einzelner Stationen über alle Starttermine zeigt sich eine Abkühlung mit zunehmender Vorhersagezeit
- Im Juni und August ist das COSMO-EU stabiler als das COSMO-DE
- September/Oktober zeigen interessante Grenzschicht -Struktur

Feuchte

- Größter Feuchtebias immer in der mittleren Troposhäre
- COSMO-EU trockener als COSMO-EU
- Unterschiede in der Vertikalstruktur des Bias bzgl. Sommer/Winter analog zur Temperatur
- Um 0TC ist die Grenzschicht zu trocken
- Jüngste Vorhersage immer am trockensten?

Lokal-Modell Kürzestfrist (LMK)

Pre-operational phase

since 14 August 2006

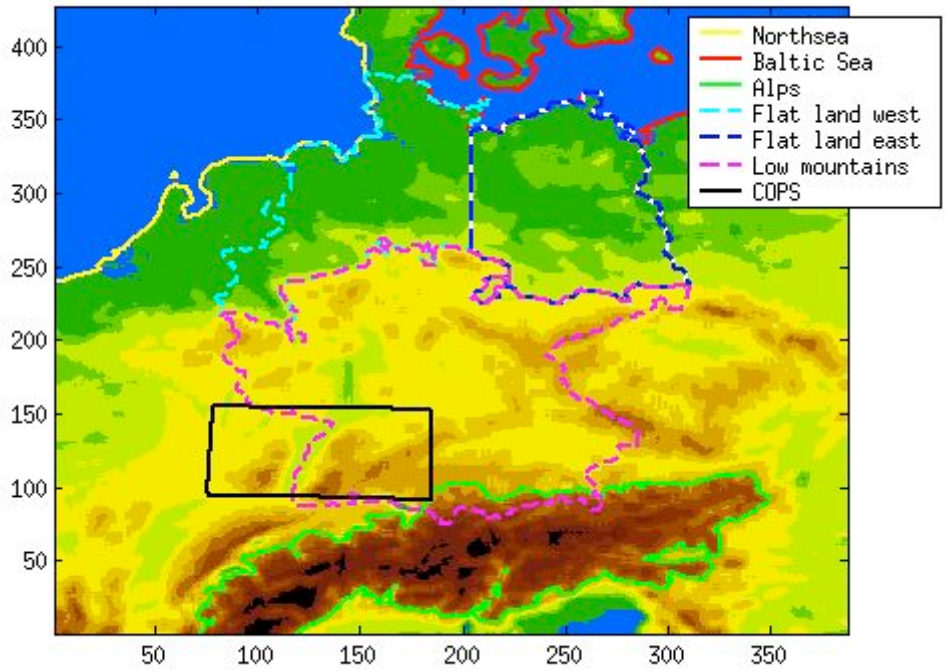
Δx = 2.8 km (resolved deep convection)

ΔT=30 sec

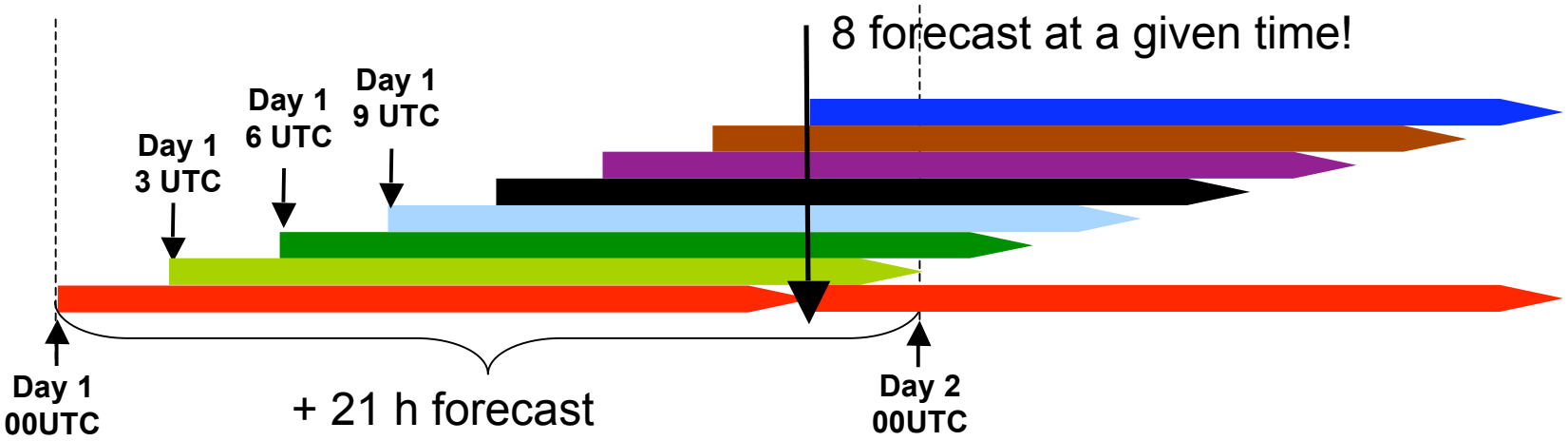
50 vertical levels

domain size: ~ 1200 * 1300 * 22 km³

boundary conditions from LME



Lagged forecast ensemble



GOP-9 Management

- Optimized exploitation of existing instrumentation; (inter-)national contacts

- Provison of data suitable for statistical model evaluation/analysis
  - high quality
  - continuous observations or well defined temporal sampling
  - error characteristics (instrument limitations)
  - consideration of spatial and temporal scales

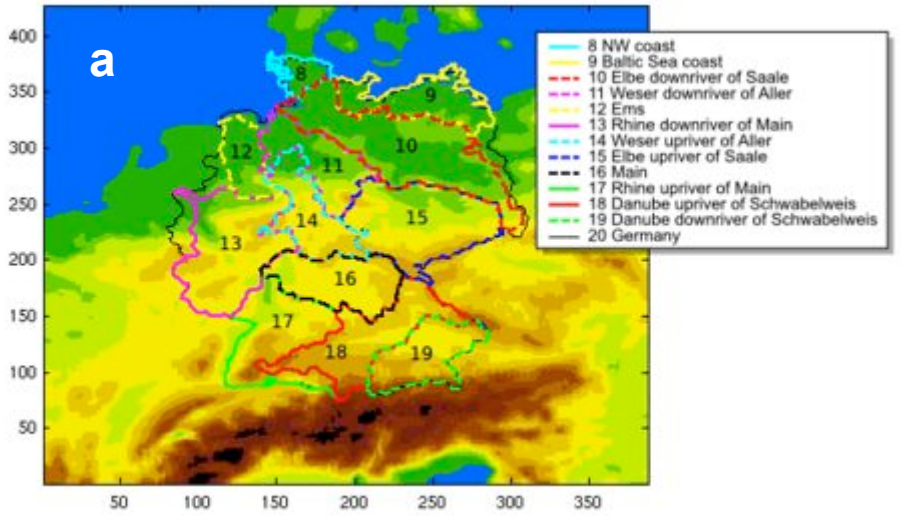
- Near-real time availability for close interaction with PQP projects

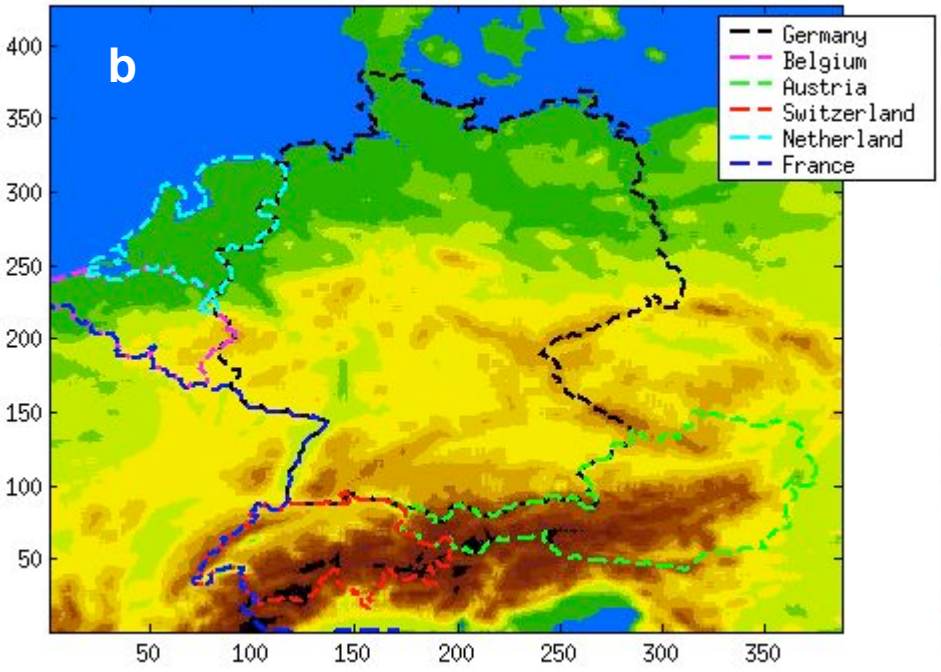
⇨ **quicklooks and "online evaluation" of COSMO-DE (EU) forecasts**

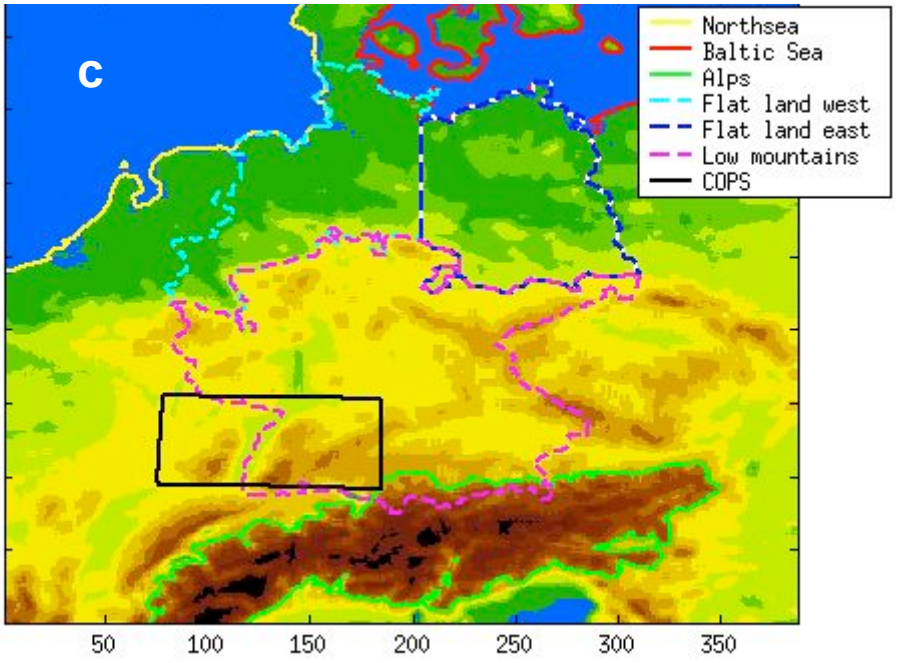
- time series output at ~ 50 stations
- model fields
- areal statistics ~ 20 regions

Evaluation Areas

- Hydrological catchments within Germany
- Countries
- Geographical regions







GOP Status: Model evaluation

- **GOP-1: Rain gauges**
  - RANIE product (UCologne) ⇐
- **GOP-2: Weather Radar**
  - *International Composite (KU Leuven)* ⇐
  - *RADOLAN (UMainz)*
- **GOP-3: Drop Size Distribution** AQUARADAR
- **GOP-4: Lidar**
  - DWD network ⇐
- **GOP-5: GPS**
  - daily comparisons ⇐
- **GOP-6: Lightning networks**
- **GOP-7: Satellites** ⇐
  - under development
- **GOP-8: Meteorological stations**
  - Radiosoundings ⇐
  - Cloudnet stations

GOP web site

http://gop.meteo.uni-koeln.de

GOP – General Observation Period

Spur: » gop

GOP

- Observations
  - GOP 1
  - GOP 2
  - GOP 3
  - GOP 4
  - GOP 5
  - GOP 6
  - GOP 7
  - GOP 8
- Meteorological Stations
- Data Organisation
- Model Evaluation
- Data Quicklooks
- Participants
- Links

- Internal
  - Pin Board
  - Contact Status

Übersicht
Letzte Änderungen
Links hierher
Zeige Quelltext
Ältere Versionen
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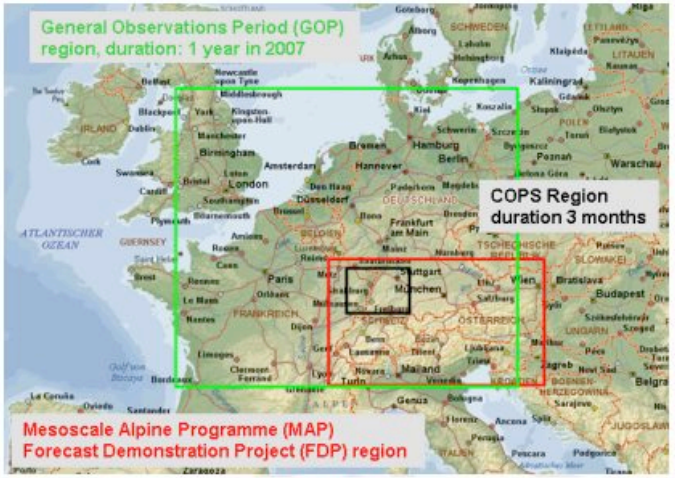
GOP 2007

The main goal of the General Observation Period (GOP) within the Priority Programm on Quantitative Precipitation Forecasting is to gather a comprehensive data set suitable for testing hypotheses and new modeling techniques developed within PQP. The GOP encompasses the Convectively and Orographically induced Precipitation Study COPS performed in south-west Germany in summer 2007 both in time and space to provide information of all kinds of precipitation types and to relate the COPS results to a broader perspective (longer time series and larger spatial domain). The duration of one year will open up the possibility to statistically approach model problems and better pin down specific model weaknesses: Some problems e.g. initial and boundary conditions might cancel out when longer time series are considered. The GOP will therefore provide a basis for reaching the PQP goal: Determination and use of the potentials of existing and new data as well as process descriptions to improve QPF. To achieve this goal the GOP will



- gather as many data about the atmospheric state as possible within an area covering Germany and it neighboring states. The Alpine states (e.g. Austria and Switzerland) are of special interest to include the complex orography and to connect with D-PHASE,
- optimize the exploitation of existing instrumentation by gathering routine measurements normally not available to the scientific community,
- focus on continuous/coordinated observations using existing instrumentations which are suitable for statistical evaluation,
- focus on measurements, which are available in near real-time to enable a timely use within the PQP
- perform a rigorous quality control, cross-checking, and error estimation of the data,
- tailor the observations to model output (e.g., LM, D-PHASE forecasts),
- enable an easy access to data, quicklooks and first order analysis to the PQP.

send mail to GOP Coordinators

GOP1

RANIE 1 product: gauge only
RANIE 2 product: gauge and radar

Daily precipitation quicklooks for 6 hours each (for Germany):

jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec

Monthly precipitation quicklooks for Germany:

Germany 00-06 UTC	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
Germany 06-12 UTC	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
Germany 12-18 UTC	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
Germany 18-24 UTC	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
Germany 00-24 UTC	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec

Monthly precipitation mean against:

forecaststart	jan	feb	mar	apr	mai	jun	jul	aug	sep	oct	nov	dec
forecastage	jan	feb	mar	apr	mai	jun	jul	aug	sep	oct	nov	dec

Monthly time series for each 6 h score (for 17 regions):

Score	Range	Best Value
ETS, Equitable threat score	-1/3 to 1	1
FAR, False alarm ratio	0 to 1	0
FBI, Frequency bias	0 to infinity	1
PEC, Percent correct score	0 to 1	1
POD, Probability of detection	0 to 1	1

Germany	jan	feb	mar	apr	mai	jun	jul	aug	sep	oct	nov	dec
Flat land west	jan	feb	mar	apr	mai	jun	jul	aug	sep	oct	nov	dec
Flat land east	jan	feb	mar	apr	mai	jun	jul	aug	sep	oct	nov	dec
Low mountains	jan	feb	mar	apr	mai	jun	jul	aug	sep	oct	nov	dec
COPS	jan	feb	mar	apr	mai	jun	jul	aug	sep	oct	nov	dec

Comparison of the GPS iwv to COSMO-DE and COSMO-EU

Jan	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Feb	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28			
Mar	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Apr	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
May	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jun	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Jul	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Aug	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Sep	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Oct	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Nov	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Dez	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

monthly statistics

Mean IWV (models and observations)

jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec

Mean Bias and RMSE

jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec

statistics of all stations together

monthly

following times ...

february,14 2007 to april,3 2007
april,4 2007 to august,31 2007
february,14 2007 to august,31 2007

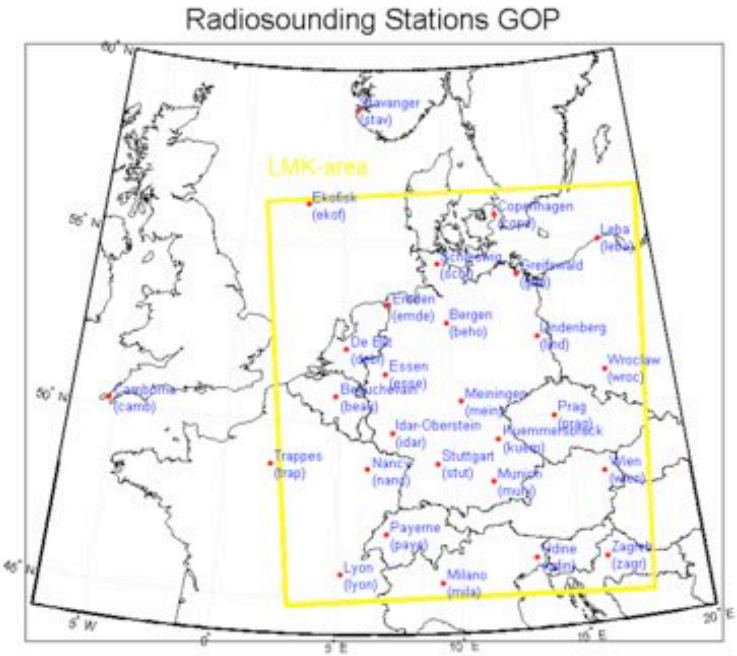
Comparison Radiosonde - COSMO-DE and COSMO-EU

Sorted by ascends

jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec

Sorted by stations

Beauvechain	Bergen-Hohne	Camborne
Copenhagen Jaegers	De Bilt	Ekofisk Platform
Emden-Koenigspolder	Essen-Muelheim	Greifswald
Idar-Oberstein	Kuemmersbruck	Leba
Lindenberg	Lyon Satolas	Meiningen
Milan Linate	Munich-Oberschleissheim	Nancy Essey
Payerne	Prague Libus	Udine Campoformido
Schleswig	Stavanger	Stuttgart-Schnarrenberg
Trappes	Wien Hohe Warte	Wroclaw Maly Gadow
Zagreb Maksimir		



Monthly statistics

temperature profiles:

LMK	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
LME	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec

humidity profiles:

LMK	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
LME	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec

windspeed profiles:

LMK	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
LME	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec

wind direction:

GOP in Phase III

Special observations

- 3D-weather radar data (COPS)
- Micro rain radar network for DSD information
- DWD ceilometer netork (QUEST +?)
- Satellite + model information for easy access (time series, regions ..)
- Meteorological Stations (Cloudnet, Tuttlingen&Hartheim..)

Keeping the GOP environment running

- Continuation of data gathering with focus on
  - existing, continuous data
  - suitability for on-line model evaluation
- Implement PQP ideas into the GOP environment
- Enhanced cooperation with DWD to ultimately transfer GOP environment into operational net