

# **Protocol of the 1<sup>st</sup> COPS Meeting**

**Meeting Dates:** September 13-14, 2004

**Preparation date:** September 30, 2004

**Place:** University of Hohenheim

**Authors:** Volker Wulfmeyer and Andreas Behrendt, IPM, UHOH

**List of Participants:** Attached

**Agenda:** Attached

## **1. Introduction**

From September 13-14, 2004, the 1st Workshop on the Intensive Observations Period (IOP) within the Priority Program (PP) 1167 QPF of the German Research Foundation (DFG) (see <http://www.meteo.uni-bonn.de/projekte/SPPMeteo/>) took place at the University of Hohenheim, Stuttgart, Germany. This campaign is called COPS (Convective and Orographically-induced Precipitation Study) (see [www.uni-hohenheim.de/spp-iop/](http://www.uni-hohenheim.de/spp-iop/)).

The agenda and the list of participants are attached. People from 9 countries contributed to the meeting. International collaboration and strong communication between modelers and instrument PIs was fostered. As COPS is strongly linked to nearly all PP 1167 projects, all PIs of this research program were invited. About 70% of the PIs participated in the workshop.

After a general introduction in the PP 1167 “Quantitative Precipitation Forecast (QPF)”, the role and the goal of the Intensive Observations Period (IOP) COPS, which is imbedded in the PP 1167, were introduced. A strong link to the user community, e.g. to hydrologists, within COPS was initiated, as there are one of the most important drivers for deriving QPF requirements. It was pointed out by several workshop participants that an improvement of QPF shall not be specified rather than the investigation of predictability itself and its limits are one of the major research areas within COPS.

Within the session “key processes” limits of their current understanding were addressed hindering progress in QPF. These included the 4-d measurements of the pre-convective state of the atmosphere, complex flow in orographic terrain, boundary layer processes in inhomogeneous terrain as well as aerosol and cloud microphysics.

Two additional sessions dealt with “Links to International Programs” and recent progress in “Instrumentation”. An exciting combination of presentations were given, showing the state-of-the-art of atmospheric field studies, measurements, and their applications.

If the authors agree, copies of their presentations will be available soon via the COPS web site.

## **2. Main results**

### **a) COPS Highlights**

The overarching science goal of COPS reads:

**Advance the forecast of orographically-induced convective precipitation by 4-d observations of its life cycle**

This research goal was developed within the presentations and was appreciated within the WG discussions (see below). Some refinements may take place within the development of a Science Overview Document (see below).

The specialties of COPS are:

1. Synergy of new instrumentation permitting 4-d observations with all its new capabilities for process studies.
2. Application of high-resolution models with advanced parameterizations.
3. Data assimilation (also in real-time) and the performance of ensemble forecasts.

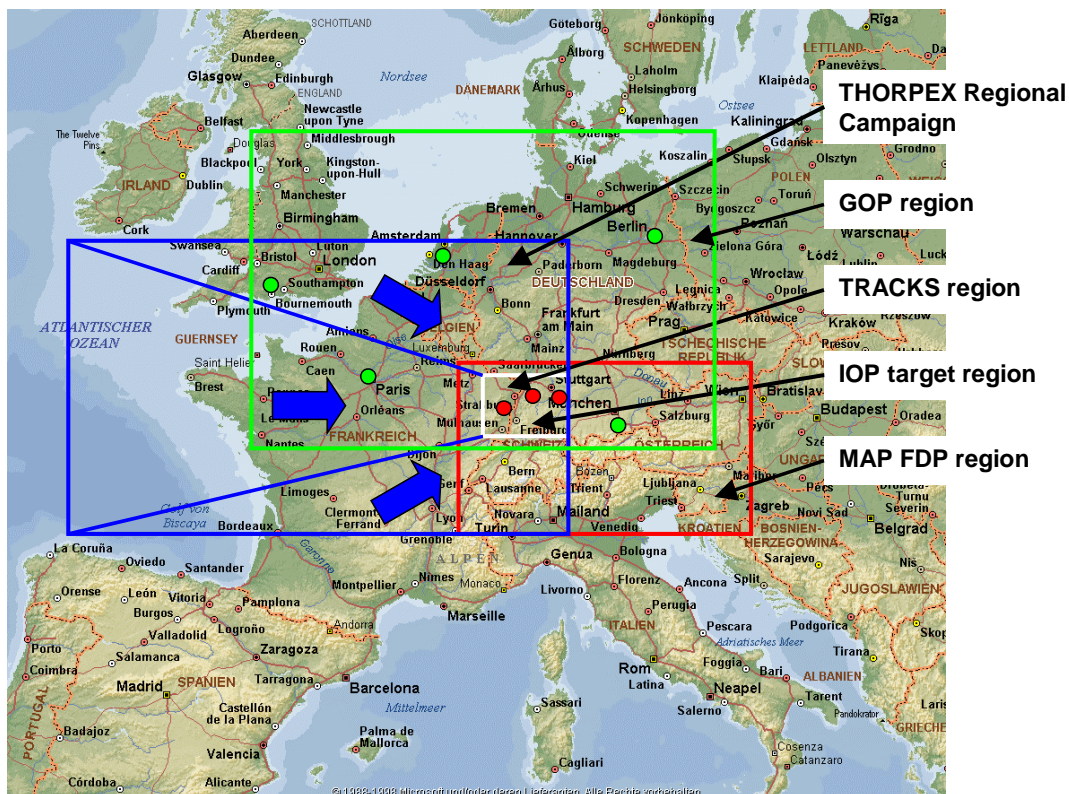
This approach enables to use COPS results within nearly all projects of the PP 1167. Furthermore, links to the modeling community will be extended for setting up different mesoscale models to be applied during COPS. These applications include weather

forecasts for briefings, model validation, and data assimilation, if possible in real-time. New data shall also be assimilated such as radar and aerosol data.

Potential models discussed to be used during the campaign were from DWD (GME and LM), ECMWF, Meteo-France (AROME and MESO-NH), KNMI, Meteo-Swiss, NCAR (MM5 and WRF with future potential of aerosol data assimilation), among others. Further suggestions are appreciated.

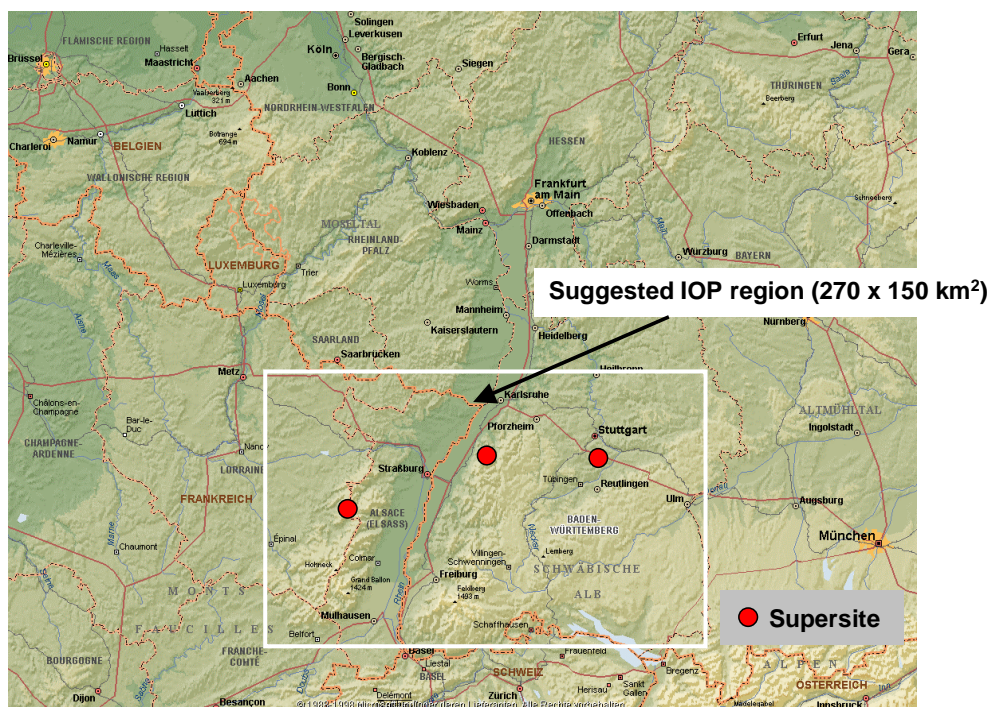
Real-time data assimilation was discussed extensively at the workshop. The major part of the workshop participants supported strongly real-time data assimilation efforts and comparison of the performance of different models.

## b) COPS Region



**Fig.1:** IOP region and links to international research programs

At the 1<sup>st</sup> Meeting of the COPS International Science Steering Committee (ISSC), its members unanimously supported to perform the campaign in the southwestern part of Germany in summer 2007 (see Figs. 1 and 2). This clear decision is fundamental for fulfilling the schedule for the preparation of the SOD for NSF proposals (see below). The PP 1167 are called to place strong arguments against this decision until October 8, 2004, 12 UTC. Otherwise, this decision is considered adopted by the PIs.



**Fig.2:** Zoom into IOP region

The region in south-west Germany/Western France (Black Forest Mountains, Swabian Alb (= Swabian Jura), Vosges Mountains) is excellently suited for COPS. The meteorological situation in this area is well documented. There are already dense operational networks of weather radars, rain gauges and river run-off stations. Detailed studies on precipitation climatology and experiences with field experiments are available. Another very important aspect is the potential collaboration with a MAP FDP (Mesoscale Alpine Programme Forecast Demonstration Project), for instance in connection with real-

time data assimilation efforts. This choice of the region sets COPS to a logical relation to previous projects such as IHOP\_2002 ([www.atd.ucar.edu/dir\\_off/Projects/2002/IHOP.html](http://www.atd.ucar.edu/dir_off/Projects/2002/IHOP.html)) and CSIP ([www.env.leeds.ac.uk/csip/](http://www.env.leeds.ac.uk/csip/)), as QPF is investigated in regions with different mechanisms of initiation of convection as well as of orography.

Boundaries of the COPS region shown in the presentations of Wulfmeyer and Behrendt are not fixed but may be subject of slight changes according to scientist requests.

### **c) Set up of working groups**

At the meeting, four ad-hoc working groups have been established. After a short discussion, this structures emerged quickly after the presentations were finished. The working groups (WGs) read:

1. Initiation of convection (IC), chair: Christoph Kottmeier
2. Aerosol and cloud microphysics (ACM), chair: Jost Heintzenberg
3. Precipitation processes and life cycle (PPL), chair: Martin Hagen
4. Data assimilation and weather forecast (DAW), chair: George Craig

Additionally WGs may emerge in the future when the Operations Plan must be developed. This activity is expected within the course of the year 2005 and will be coordinated by the COPS Project Office.

Initial workshop results of the WGs are attached and will also be available via the COPS web site.

## **4. International collaboration**

International collaboration was considered essential for the success of the campaign. Several links to other research programs were discussed and shall be established particularly by ISSC members. Currently, the most important links to international programs are GEWEX and THORPEX; links to the US are ARM, IHOP\_2002, and

USWRP. In Europe, the campaign shall be coordinated with CSIP, MAP FDP, and TRACKS. The campaign shall be supported by EUCOS, EUFAR, EUMETSAT and the Meteorological Services such as DWD, ECMWF, KNMI, Meteo-France, Meteo-Swiss, and ZAMG Austria. Further suggestions and support are highly appreciated.

## **5. Data management**

Archiving of all operational data which are interesting for COPS should start asap. Susanne Crewell is working on the archiving of radar data. Volker Wulfmeyer requested the archiving of LM results. The group Modeling & Data shall be asked for supporting data archiving and logistics during the campaign.

The data policy during COPS will be as open as possible. Similar standards as taken from WMO policies or IHOP\_2002 will be used.

## **6. Funding of key instrumentation**

The COPS core experiment is supported by DFG with 1.6 M€. However, prerequisite of this support are excellent proposals concerning IOP and GOP.

Joined activities of DFG, CNRS, German Helmholtz Centers, NASA, NCAR, NOAA, NSF, etc. should be started to get additional support. Particularly, synergies of remote sensing systems shall be deployed and applied during the campaign.

Key instrumentation of the German Helmholtz Centers (Forschungszentrum Karlsruhe (FZK), Deutsches Zentrum für Luft- und Raumfahrt (DLR), GKSS Research Centers and others) comprises, to name just a few, the airborne remote-sensing and in-situ instrumentation at DLR, POLDIRAD, the FZK radar, lidar, and in-situ instrumentation, and the GKSS cloud radar MIRACLE.

NSF support is essential for getting NCAR instruments for COPS, particularly S-PolKa, Eldora, REAL, and MAPR. Aircraft measurements using HIAPER would be very beneficial for large scale mapping of atmospheric variables, too. Unique NASA instruments are LASE, SRL, RASL, and GLOW, among others. Excellent instruments of

NOAA, which are extremely beneficial for the campaign, are HRDL, Mini MOPA, and CODI. From French organizations like CNRS, LEANDREII and from Cabauw in the Netherlands, scanning cloud radars like TARA will be requested. This list will be extended during the next few months.

EUFAR has allocated money for COPS-like activities, applications have to be submitted by interested PIs.

### **7. Requested support of the PP 1167 community**

Please support the preparation of COPS and the development of a Science Overview Document (SOD). We see the following possibilities:

- a) Advertise this campaign at meetings and conferences.
- b) Apply your instrumentation during COPS. All kinds of measurements set up in networks or partly concentrated in super sites equipped with special combinations of remote sensing systems will be beneficial for the campaign. Due to the open data policy, this will be a win-win situation for all participants.
- c) Contribute to the preparation of the campaign by becoming member of one of the working groups.
- d) Contribute to the SOD by helping drafting paragraphs of each working group.

### **8. Preparation of SOD**

Strong links to THORPEX, GEWEX, MAP FDP, USWRP and the weather forecast centers should be established. Letters of reference shall be requested. US institutions are very interested to participate. Letters of intent for NSF proposals have to be submitted as early as December 2004.

Due to this boundary condition, the development of a Science Overview Document (SOD) must be accelerated. This SOD is essential for supporting NSF proposals and must be available until the end of November 2004. On the one hand, this makes a well-developed document accessible at an early stage of the preparation of the campaign. On

the other hand, this requires an immediate concentrated effort of the COPS ISSC, the PP 1167 PIs, and other interested parties.

The ISSC suggests the following procedure and time table:

October 1, 2004: Skeleton of SOD will be distributed by COPS Project Office. SOD shall include results of COPS Working Groups, lead authors will be announced.

October 30, 2004: First draft of SOD, iteration between authors and working group participants.

November 15, 2004: Final iteration of SOD between ISSC members.

November 30, 2004: Final version of SOD

**Please note further this important date for the preparation of COPS:**

**Next COPS workshop: June 27-28, 2005**