Working Group CLIMATOLOGY

Report of

MAP CLIMATE WORKSHOP
31. MARCH, 1 APRIL, 2000, INTERLAKEN, SWITZERLAND

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1. Introduction and Motivation

One of the important supporting objectives of the Mesoscale Alpine Program (MAP) is the Research on Alpine Climatology and the climate of Alpine mesoscale weather systems. The information available in this topic has already provided climatological aids to the planning of the MAP field phase and facilitated the collection and exchange of high resolution operational meteorological data (non-GTS data). Activities on this objective have initiated valuable contacts among and between persons responsible for climate data in national and regional services and climate scientists working in the fields of Alpine Climatology and climate dynamics. The integration of Alpine-wide non-GTS data into a common database (the MAP database) and the establishment of international climate analyses are prominent achievements related to this objective.

Now that MAP programme started its third phase (see MAP Design Proposal, December 1996), the scientific community active in Alpine climatology studies and in particular MAP Working Group on Climatology, decided to organise a 2-day workshop at Interlaken on March 31 and April 1, 2000 in order to reinitiate the scientific discussion within MAP about Alpine Climatology. The main goal of this meeting was to provide an opportunity for an exchange among and between persons responsible for data and climate scientists and for a discussion of common future perspectives.

In more detail, the objectives of the workshop were:

- Strengthen the collaboration between data services and climate scientists
- Illustrate the needs for and possibilities from the use of non-GTS climate data
- Exchange experience with data analyses techniques
- Exchange experience with data management and processing practices
- Identify topics of common interest

- Discuss options for an improved use/exchange of non-GTS data by research scientist as well as derived data analyses by national operational services.

The event has consisted of sessions with invited oral and poster presentations as well as discussions within two Working Groups (hereafter named WG1 and WG2). The presentations have focused on climate data analyses and data management issues relevant for the study of Alpine climatology and climate dynamics during the instrumental and early instrumental period.

Topics of the working group discussions have been centred on data needs and management and statistical methods in climate data analysis. In particular people involved in WG1 activity were mainly devoted to develop options for creating an Alpine-wide climate-data platform, discussing technical alternatives to achieve this objective. WG2 was more addressed to define scientific topics and data quality and operational management issues.

In the following sections, after a brief summary of the scientific presentations (Section 2), the main results of the Working Group discussions will be presented (Section 3). Finally, in Section 4 a short description of possible future steps to achieve an Alpine climate data-exchange initiative is presented.

2. Summary of scientific presentations

Eleven oral presentations and sixteen posters covered the fields of climate monitoring, data processing, data correction and related problems in MAP countries, the evaluation of long term homogenised gridded data sets over the Alpine region, experiences with data bases of precipitation, upper air data and satellite data, climate change studies, model validations and information about climate related scientific projects. The overall conclusions of the contributions showed that the establishment of an alpine climate data base within MAP would be a great advantage for already running and climatological studies in the future. One good example for this is the comprehensive precipitation data base which led to an Alpine gridded analysis of precipitation based on measurements of about 6000 stations (Frei and Schaer, 1998).

Climate monitoring and processing of climate data: Climate monitoring in Alpine countries suffers from the deficiency of mountain stations in relation to low elevation stations for climatological purposes. Commercialised or privatised weather services plan their networks more for economical than climatological purposes. Mountain observatories cause higher costs, however the reliability of data sometimes is very low, and customers normally are asking for data of densely populated areas. Network structures and processing of data show similar characteristics in the alpine countries, the amount of online data from automatic weather stations will be more and more in the future, this will demand more efforts in the quality control.

Radiosonde data are far away from showing an excellent quality. It needs an enormous amount of work to correct them and build up homogeneous upper air data series. The long and troublesome way to a perfect Alpine Station Inventory table was presented too.

Precipitation data show systematic measurement errors (normally deficiencies) caused by wind and evaporation. The errors reach maximum values at high elevation stations due to high wind speeds and a high percentage of solid precipitation. For the year 1997 the MAP region shows highest aerodynamic corrections factors in February, April and December, single days of these months exceed correction factors of 1.5. The correction procedures used within BALTEX show a practicable way but are still not investigated for stations above 1500 m.

Daily rain gauge observations from MAP have also been used to compare daily precipitation fields of observations and satellite data. Satellite data seem to be useful for regions without in situ precipitation measurements, but cannot replace existing ones.

Comparisons of regional precipitation from GCM outputs and precipitation measurements: A comparison among several methods to estimate regional precipitation from GCM output has been showed for two mountainous regions (Oregon and Washington, the Alps): In contrast to the common believe grid-cell GCM precipitation can be a valuable parameter for regionalizing precipition even in mountainous regions. The best results of downscaling local precipitation are obtained when reanalysed precipitation is used as a predictor for

Singular Value Decomposition (SVD) instead of other predictors such as geopotential heights, temperature, humidity.

One main research topic in the Alpine countries is climate variability. Instrumental series of single countries were analysed and presented based on monthly homogenised data sets. Of greatest importance are studies combining large scale dynamics and the Alpine climate (e.g. NAO and PNA patterns, Blocking phenomena). All those studies would profit from an alpine wide climate data base.

For temperature, a gridded data set (grid distance1 deg longitude and 1 deg latitude), built up of about 100 homogenised series was developed within the EU funded ALPCLIM project. The gridded data set goes back to 1760 and will be open for scientific purposes. For precipitation such a data set is now in progress, air pressure and sunshine/cloudiness series are prospected for the future.

An outlook into the future pointed out that climate research will be confronted with topics like:

11 Possible variability and trend in a future greenhouse climate (model scenarios)

12 Seasonal climate forecasts (including information about extreme events)

13 Definition of a limited number of relevant climate modes or regimes

The overall need will be: intelligent diagnostic studies, excellent data and appropriate models.

And above all: Visions and creativity.

3. Summary of Working Group Discussions

It was part of the objectives of the MAP climate workshop to discuss the possibilities for an improved exploitation of data from Alpine climate monitoring networks for the purpose of climate research. The motivation for addressing this topic was threefold: Firstly, the monitoring networks of the region constitute one of the densest long-term observation systems over complex topography world-wide and hence provide considerable research potential relevant beyond the geographical circumference of the Alps. Secondly, scientific analyses of climate data are so far mostly scattered across individual Alpine nations which has complicated a compound viewpoint to mesoscale Alpine climate. The Mesoscale Alpine Program has fostered Alpine-wide exchange of meteorological and hydrological observations for research by establishing a formal data exchange policy, yet these structures do, at present, not include data covering decadal to centennial time-scales. Thirdly the workshop has gathered together active research scientists and representatives from national and regional weather services (i.e. monitoring institutions), which offered an unique opportunity for such a discussion. The discussion was organised in two working group sessions, devoted to:

WG1: Developing options for Alpine-wide climate data exchange in the context of actual scientific interests, and the formal/technical feasibility;

WG2: Exchange information on the current practice of climate monitoring and data processing.

It was recognized that progress in the exploitation of Alpine climate data could be achieved through the establishment of a corporate initiative involving scientists and monitoring services. For briefty this initiative will be termed the Mesoscale Alpine Climate (MAC) Inititative. The following summary reflects informal ideas for such an initiative emerging from the working group discussions. There are no formal implications for any of the institutions represented.

3.1 Working Group 1: Options for climate data exchange in the Alpine region

The discussion has evolved from the identification of scientific objectives, the specification of relevant parameters, the development of options for an Alpine climate-data platform (in cooperation between monitoring institutions and research groups), and finally the collection of ideas for funding such a corporate initiative.

3.1.1 Scientific Objectives

A range of scientific objectives were identified for which an exploitation of Alpine-wide climate observations would be desirable. Participants from the science community have promoted the idea of establishing Alpine-wide gridded climate analyses similar to products available globally and continentally. It was recognized that the latter products are insufficient in terms of spatial resolution and accuracy on the mesoscale in the Alps. The use of dense and long-term observational information in the Alps (in combination with sophisticated analysis and reconstruction techniques) could foster progress in the following active research areas:

- Derive a climatology of mesoscale weather phenomena.
- Quantification of decadal to centennial scale climate variations and derivation of a dynamical understanding of these variations in terms of synoptic to mesoscale weather systems.
- Development of mesoscale climate change scenarios using statistical downscaling techniques.
- Evaluation of remote sensing techniques such as satellite retrievals and precipitation radar.
- Evaluation of regional weather forecasting and climate models.
- Development and validation of climate impact models, such as hydrological runoff and vegetation models.

Extreme weather events are of particular interest within all the mentioned areas.

3.1.2 Parameters and characteristics of desired observational data

The identification of parameters has focussed primarily on the idea of mesoscale climate data analyses. Priorities have been assigned which reflect actual research interest of the discussion participants. Adaptations to the list and characteristics are likely after a more specific definition of research tasks with the build-up of a project consortium.

Observational parameters of interest:

- Precipitation, temperature, cloudiness/sunshine duration (high priority).
- Radiosoundings (high priority, much of the desired data was already collected).
- Snowfall, pressure, wind speed, river discharge (low priority).

For each of the parameters a combination of two different setups was found to be most suitable. The *short-term high resolution setup* comprises a standard period of recent climate (typically 40 years), highest possible spatial resolution (including non-GTS data) and a time resolution of one day. The *long-term coarse-resolution setup* covers the instrumental period (ideally 100 years or more), a mesoscale spacing (50-200 km where possible) and has daily or monthly time resolution. Issues of data quality and homogeniety play a prominent role for this category. The two setups can allow for analyses of mesoscale climate into the early instrumental period by statistical combination of short-term dense and long-term sparse observations.

3.1.3 Options for an Alpine climate-data platform

Two different models for the technical implementation of an Alpine-wide climate data platform have been discussed:

The *logistic model* constitutes of a central Internet-based platform comprising information on the data covered by the MAC inititative as well as general application guidelines specifying the access conditions and application procedure. This *information platform* aids the scientist (user) to plan his data-driven research tasks and to guide his access applications. The decision on applications and the data delivery will remain under full controle by the data provider. While the information platform could be implemented and maintained with relatively minor

resources, the costs incured from the data delivery would involve handling fees to be covered by the data recipient.

The *physical model* is a combination of the information platform with a standardized database and central storage of the data contributions from individual providers. While the formal access applications are still handled by the respective data providers, the delivery of the data will be executed by a dedicated database manager following the formal approval of the application. For the data provider this solution would involve a one-time delivery to the central database. Advantages of this option are the convenience of a quick retrieval in a standardized format and the low costs for deliveries after the initial setup. However the centralized database will require considerable resources for the setup and management. Also it will be more complicated for the data provider to update his data with changing standards of data quality.

Elements of the information platform:

- a data inventory (station network, parameters, time-period and temporal resolution of the data, indications on data quality standards)
- an exchange agreement of the initiative specifying the formal access conditions
- guidelines for application (contact points, application forms, indication on response times)
- a list of scientific projects in the framework of the Alpine climate-data platform

Elements of the formal access conditions:

- specification of research tasks by the applicant
- access for research purposes only
- commercial use prohibited
- data may not be given to third parties
- explicit reference to and acknowledgment of the data provider in publications
- distribution of derived data products requires explicit permission of data provider
- reports and publications must be sent to data provider (scientific feedback)

The models for the Alpine climate data platform as outlined are the result of discussions within the working groups. Refinements or alternative solutions will have to be discussed after further informal contacts with data providers, including institutions that have not been represented at the workshop. The results of these informal inquiries will be useful to formulate a detailed draft for an initiative towards an Alpine climate data platform and for seeking a formal collaboration with the Alpine data institutions (see section 4 below).

3.1.4 Resources and Projects

Two sources of potential funding for the MAC initiative and the establishment of an Alpine climate data platform have been identified:

European Union RTD Framework Program V: With the recent call for projects (submission deadline Feb. 2000) FPV has launched key action 2.4.1. entiteled 'Better exploitation of existing data and adaptation of existing observing systems'. The key action is embedded under the heading action 2.4 'European component of the global observing systems'. According to the brief description on the key action (available from the cordis web site: www.cordis.lu) the MAC initiative would fit perfectly:

The target is to ensure that existing data sets and technologies are effectively exploited. This includes: co-ordination of current observing facilities; improved data management and access to archives; development of

tools and techniques for the integration of existing data from different sources for multipurpose use; design and implementation of innovative applications using current observing capacity for the collection of data on new variables.

At present it is unclear whether this key action will be included in a future call of FPV. If so, such a call is likely to follow in April 2001 or later. Detailed information shall be requested with the FPV administration and our interest could be indicated.

EUMETNET: Here the option could be to develop a spin-off project of MAP-NWS.

The specific objectives of a scientific project embedded in either of the two frameworks was extensively discussed in working group 2 and are summarized briefly here: Potential elemtents of a project could be to (a) evaluate climate variability and climate trends in the Alpine region by the use of comprehensive international data and (b) to establish a climatology of mesoscale weather systems, with an emphasis on extreme events. The core of such analyses could constitute in the development of a mesoscale gridded analysis for the Alpine region, based on non-GTS data of the region. Particular emphasis should be given to the climatological time-scales of such analysis, which would involve the application of reconstruction techniques in exploitating the dense and coarse network coverages over short and long time periods respectively. A scematic of the process chain to be considered in the development of a research proposal is depicted in Fig. 1.

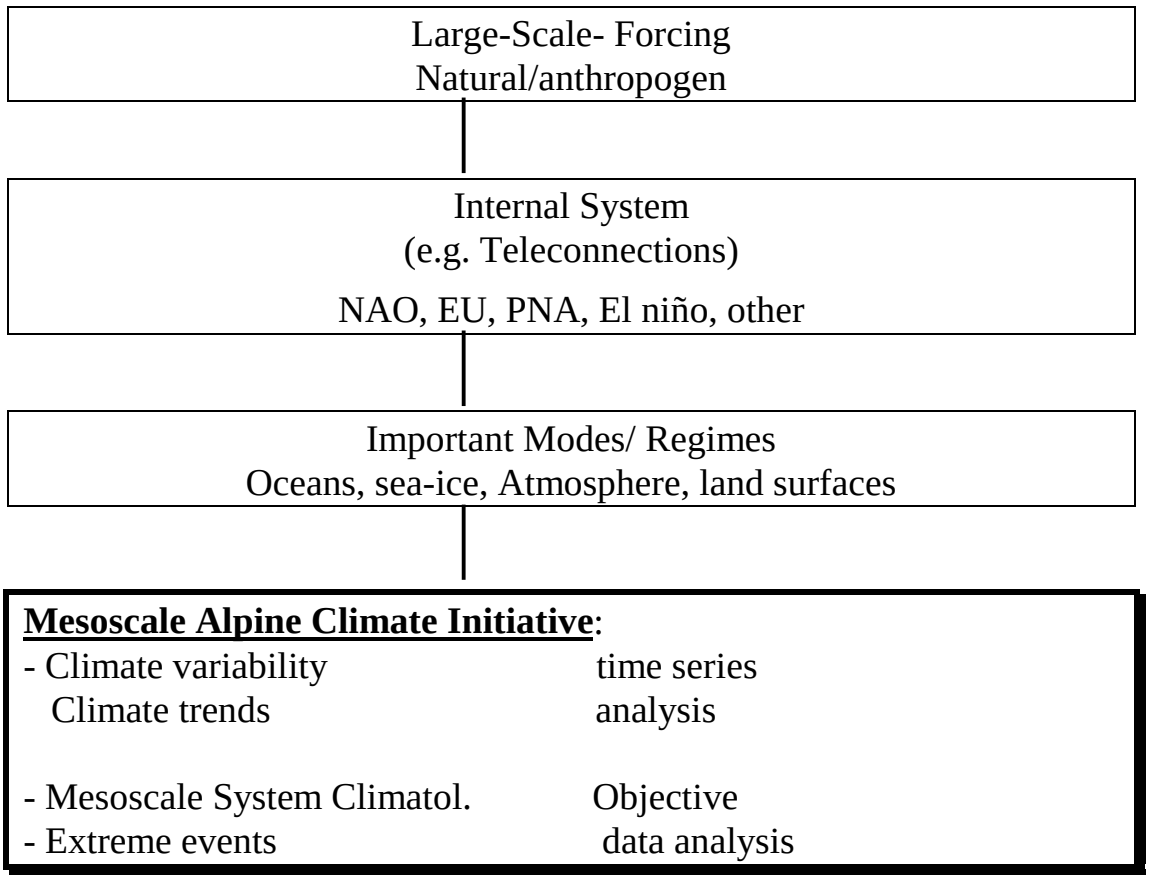

Fig 1: Process chain (drafted by H. Wanner)

3.1.6 Links

Further activities of the MAP WG: Climate (the MAC initiative) towards establishing an Alpine climate data platform shall be linked to the MAP WG: Routine network data (WGROUND). They shall also take into account previous experience with data exchange in the Alps, such as the MAP data exchange policy and the bilateral data

exchange between Italy and Switzerland. It will be important to harmonized Alpine efforts with WMO resolution 40. There is also the possibility to link the initiative to other international programs and data exchange efforts such as the European Climate Support Network (ECSN) of EUMETNET, embedded in the WCRP (see Fig. 2).

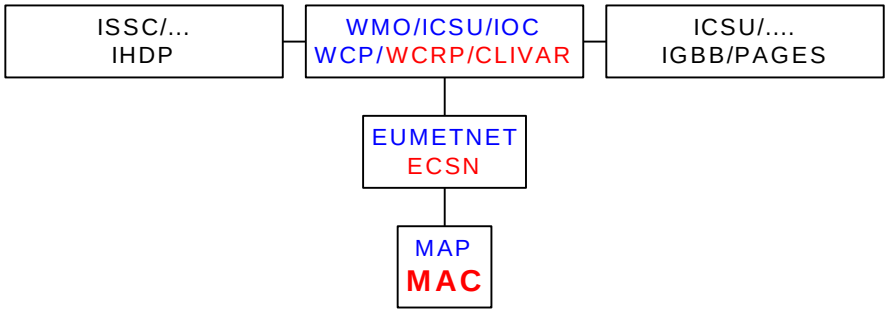

Fig 2: Organizational links of MAC initiative (drafted by Th. Gutermann)

3.2 Working Group 2

The discussion started with a review of the current practices of data quality control and monitoring used by climate data producers. A further topic was exchange of experience and tools.

3.2.1 Practices of data monitoring and data quality control and their consistency with actual scientific topics

The currently used practices to check and monitor the quality of climatological data by climate data providers follow more or less the same concept but there is large variety in details. Methods are ranging from very simple gross error checks in some automated networks to very careful inspection and homogeneization for single long data series. The conclusion was to complete and upgrade the existing survey which has been undertaken by the MAP WG ROUND (Routine Network Data) in order to get more information about the treatment of 'historical' data (for the actual state see: http://www.univie.ac.at/IMG-Wien/daquamap/qualres.htm) . So far, the survey within WGROUND has been focussed to the use of 'realtime' data in the context of MAP (e.g. validation of NWP products, diagnostic procedures etc.). This is important for one specific reason: Although the necessity of automatic QC has been recognized since the dawn of numerical weather prediction, *the QC design was considered by many specialists as a purely technical task having nothing to do with science* (Gandin and Collins, 1992). In contrast, QC always played a prominent role in climatology.

It was proposed to replace the term 'data quality' by 'fitness use' of the data for a particular purpose (e.g. at present state, radiosonde data are 'fit for use' in weather forecasting but there are significant limits for their use in climatology). This is pointed out in more detail in the Proceedings of the 1st Workshop on Quality Control of Meteorological Data in MAP, Vienna, Jan 26th -27th 1998.

It is not easy to find an answer to the question how consistent the presently used practices are with respect to the actual scientific topics, since in many cases it is not transparent to the user, which data have been treated and which the method has been used. Data users made two principal recommendations:

- Flags should indicate the treated/checked data and the method used.
- Raw data should be available (not in an Alpine Climate data pool, but a data inventory should give an overview, where one could get raw data).

Both points are difficult or in many cases impossible for older data, i.e. data which have been treated before the use of computer technology.

3.2.2 Exchange of experience and tools and improvement of the feedback processes on quality ensurance between data users and data producers

There was broad agreement to exploit synergies in data quality efforts by exchange of expertise and tools. The SEMINARs FOR HOMOGENIZATION AND QUALITY CONTROL IN CLIMATOLOGICAL DATABASES organized by the Hungarian Meteorological Service and supported by the WMO may serve as an example how the exchange of experience and tools can be implemented. The third seminar will be held in BUDAPEST, HUNGARY, 25-29 September 2000.

The MAP WGROUND may serve as a platform for a closer cooperation (i.e. exchange of information, experience, tools...) of data users and data producers with respect to an Alpine Climata Database. This topic will be discussed during the next WGROUND meeting at the end of May.

Despite the strong intention for cooperation the discussion made clear, that it will not be possible that all data producers will use identical checking procedures. Therefore, the differences mentioned in 3.2.1. will persist in some way. The proposal is rather to apply uniform procedures to all data on a central database as it is currently done on the MAP database.

Within the project DAQUAMAP, a big effort has been undertaken to establish a close collaboration between data producers and data users. To meet this goal, an information exchange procedure has been established and implemented (http://www.univie.ac.at/IMG-Wien/daquamap/infoexproc.html). The members of WG2 agreed that the 'Information exchange between station operators and the DAQUAMAP project team' is a good starting point for data users to give their feedback to data providers. Two topics should be added:

- Data users should always provide copies of their analyses or scientific papers to the data producers.
- Research institutions should try to arrange presentations and meetings between data users and (leading) climatologists (e.g. from global programs).

3.2.3 Future of climate monitoring by data institutions

see chapter 2., 2nd paragraph for a summary of this discussion.

4) Further steps for an Alpine climate data-exchange initiative

During a final plenary session of the workshop the outcome of the working group discussions was reviewed. It was recognized that there is considerable interest both from the climate science community and the data divisions of major Alpine services in a collaborative initiative for an Alpine-wide climate data exchange. The following procedure was discussed as a means to drive forward such an initiative:

1) Identify a list of institutions to be contacted as potential participants of the data exchange initiative. This task will be undertaken in close collaboration and exploiting the contact channels of the MAP working group ROUND (Routine Network Data).
2) Information of this initiative to the Directors of the EuropeanWeather Services ICWED/EUMETNET (to be done before the end of April 2000);

3) Evaluate the possibility of a meeting of the core group during the MAP Meeting in Bohinjska Bistrica (preferably in the evening of May 23th). Consider to meet with an ECSN representative during this meeting.

4) Learn from services which have already well established data delivery procedures. This will be an informal process assembling all necessary information (conditions for exchange, application procedures, etc.) for drafting an exchange agreement for the inititative. Account will also be made of the existing bilateral agreement between Italy and Switzerland.

5) Work out and synthesize formal conditions for data exchange and harmonize with WMO resolution 40.

6) Start to establish the information platform. The idea of the initiative shall be exposed for potential participants. Tentative information on potential participants, data availability and inventories could be included at an early stage but require consultation with individual participants.

7) Formally communicate the initiative to data providers. Convince and get support to establish and maintain an information platform. Formalize the exchange agreement.

8) Establish consortium and work out proposal for funding the information platform or central database. Options envisaged at the workshop are an EU 5th RTD project or an EUMETNET project as a spin-off from MAP-NWS.

A core group was defined which will undertake early steps of this initiative. At present members of the core group are: Carlo Cacciamani (ARPA-SMR, Bologna), Christoph Frei (ETH, Zürich), Ingeborg Auer (ZAMG, Vienna), Sergio De Benedictis (SIMN, Parma), Christian Häberli (MeteoSwiss, Zürich), Bruno Rudolf (DWD, Offenbach), V. Pelino (CNMCA-UGM, Rome). The constititution is however likely to change as a result of further consultations with data services and research institutions which could not attend the workshop.

Appendix A: Workshop Program

MAP Climate Workshop

March, 31 and April 1, 2000,

Zentrum Artos, Interlaken, Switzerland.

Friday 31 March:

9:00-9:15 Opening address (Carlo Cacciamani, Christoph Frei)

9:15-11:00 Oral presentations (chair: Teresa Nanni)

9.15 **Challenges in the Alpine climatology - past, present and future**
Wanner H., Institute of Geography, University of Bern.

9.35 **Climate Variations in Italy in the last 130 years**
Maugeri M. Istituto di Fiscia Generale Applicata, Milano
Nanni T., Insitute ISAO of CNR, Bologna.

9.55 **Homogenised and gridded long-term data sets of the Alpine region**
Böhm R., Central Institute of Meteorology and Geodynamics, Vienna.

10.15 **Climate monitoring in Slovenia**
Cegnar T., Hydrometeorological Institute, Ljubljana.

10.35 **Is precipitation from GCM simulations a useful predictor for regional precipitation over mountainous terrain?**
Widman M., Institut für Hydrophysik, GKSS, Geesthacht.

11:00-11:30 Coffee Break

11:30-12:30 Oral presentations (chair: Heinz Wanner)

11.30 **Attempts and Failures of an Upper Air Climatology in the Alpine Region**
Häberli C., Institute for Meteorology and Geophysics, University of Vienna.

11.50 **Prospects from Alpine-wide climate data: Experience with a comprehensive precipitation database.**
Frei C., Climate Research ETH, Zürich.

12.10 **Satellite based daily precipitation estimates and their verification using MAP data**
Rudolf B., German Weather Service DWD, Offenbach.

12:30-14:00 Lunch Break

Oral presentations (chair: Tanja Cegnar)

14.00 **Winter Alpine precipitation variability and links with large-scale circulation pattern**
Cacciamani C., Lazzeri M., Quadrelli R., Tibaldi S., ARPA-SMR, Bologna

14.20 **Investigation on climate parameters over mountain stations in Italy.**
Capaldo M., Giuffrida A. ,Pelino V., CNMCA-UGM, Rome

14.40 **Forging an international climate data pool: First experiences and perspectives**
Binder P., Swiss Meteorological Institute SMA, Zürich

15:00-15:30 Poster Presentations (chair: Bruno Rudolf)

1 **Winter-time Mediterranean precipitation variability and its links with upper air large-scale circulation anomalies**
Pavan V., CINECA, Bologna

2 **A spatial interpolation of meteorological data in an Alpine valley by GIS.**
Portolan V., Colombo M., Toller G., Eccel E., Ciampa M., Istituto Agrario di S. Michele all'Adige.

3 **A national system of climatological data oriented to environmental problems: data base structure, choice of the principal indicator and their calculation, spreading of the information.**
Galliani G., ARPA-SMR, Bologna and F. Desiato, ANPA, Rome

4 **Ongoing projects of climatological survey in Austria**
Auer I., Zentralanstalt für Meteorologie und Geodynamik, Vienna

5 **Meteorological measurements and data processing in Croatia**
Srnec L. and Likso T., Met. and Hydrol. Service, Zhagreb

6 **Changes in temperature extremes and their possible causes at the SE boundary of the Alps**
Gajic-Capka M., Zaninovic K., Meteorol. and Hydrol. Service, Zhagreb

7 **Precipitation monitoring in Soca valley during SOP**
Dolinar M., Hydrometeorological Institute, Ljubljana

8 **How to create a perfect Alpine station inventory table**
Groehn I., Institute for Meteorology and Geophysics, University of Vienna

9 **A new global precipitation climatology**
Rudolf B., German Weather Service DWD, Offenbach

10 **Application of GPCP data on ENSO 1997/98**
Rudolf B., German Weather Service DWD, Offenbach

11 **Analysis of fresh water input into the Arctic ocean**
Rudolf B., German Weather Service DWD, Offenbach

12 **The Global Precipitation Climatology Centre - data processing flow chart**
Rudolf B., German Weather Service DWD, Offenbach

13 **Precipitation climate maps for the Alpine region: High-resolution analyses from comprehensive rain-gauge and totalizer data**
Schwarb M., Daly C., Frei C., Climate Research ETH, Zürich

14 **Reconstruction of mesoscale Alpine precipitation fields from sparse observations**
Schmidli J., Frei C., Schär C., Climate Research ETH, Zürich

15 **Concept, infrastructure, equipment etc. The new German high-alpine research station Schneefernerhaus**
Enders G., Meteorologisches Institut, München

16 **Problems of precipitation correction in mountains.**
Rubel F. Institute of Medical Physics and Biostatistics, University of Vienna.

Posters are displayed on the side walls of the plenary room.

15:30-16:45	Coffee Break and Poster Viewing
16:45-17:15	Introduction of working groups and key questions (Carlo Cacciamani and Christoph Frei)
17:15-19:00	Discussion in working groups (Session 1) moderators: WG1: Peter Binder, WG2: Ingeborg Auer
19:00	End of Activities

Saturday 1 April:

9:00-9:30	Plenary reports from working groups
9:30-10:30	Discussion in working groups (Session 2). Moderators: WG1: Peter Binder, WG2: Ingeborg Auer
10:30-11:00	Coffee Break
11:00-13:00	Reports from working groups, Plenary discussion on joint future activities Closure of the workshop
13:00	Lunch

Workshop Chair:	Carlo Cacciamani and Christoph Frei
Organizing Committee:	Christoph Ritz and Urs Neu (ProClim, Administration) Ingeborg Auer (Austria), Pierre Bessemoulin (France) Carlo Cacciamani (Italy) Bruno Rudolf (Germany) Tanja Cegnar (Slowenia) Branka Ivancan-Picek (Croatia) Heinz Wanner, Christoph Frei (Switzerland)

Appendix B: Key Questions for Working Group Discussions

The MAP climate workshop will gather representatives of regional and governmental services and climate research institutes with the objective to strengthen the collaboration among and between these institutions. For this purpose it is intended to conduct working group discussions on subjects of common interest. Considering the list of participants and presentation it appears reasonable to devote these discussions to issues of climate data monitoring and processing as well as the use and exchange of observational data and their analyses. At this stage of planning we consider two working groups for which a tentative list of key questions is given below. We kindly ask the participants to give some thoughts to these questions in preparation to the workshop.

WG1: Options for climate data exchange in the Alpine region

The purpose of this working group is to discuss options for an improved exchange of climate data among and between data and climate research institutions in the Alpine region. The discussions shall be devoted to an exchange of views on the following related questions:

1. What data is of prime interest to actual key questions of Alpine climate research?
2. Can we identify categories of data for which an improved exchange would be scientifically desirable and legally feasible?
3. Under which formal conditions are data owners prepared for an exchange of data with the climate science community and other data institutions?
4. How could these conditions be implemented into a formal exchange agreement?
5. How could an exchange be technically implemented?
6. Can we identify future steps towards such implementations?

WG2: Monitoring and processing of climate data:

This working group is intended to provide an exchange between the climate science community and data institutions regarding the requirements and current practice of climate data monitoring and quality managment. Questions to be covered are:

1. What are current practices of data monitoring and quality processing by climate data institutions?
2. How consistent are these practices accross the Alpine region as a whole?
3. How consistent are these practices with respect to actual scientific topics?
4. Could we exploit synergies in data quality efforts, by exchange of expertise and tools?
5. What are future prospects of climate monitoring by data institutions?
6. Are there planned extensions of homogenisation and digitisation efforts?
7. How could we improve feedback processes on quality ensurance from the data users?
8. Can we identify categories of data standards particularly relevant for actual scientific