1 Operations Overview

as of 20 May 1999

1.1 Summary of scientific projects and objectives

The operations during the MAP Special Observing Period will be organized in 8 Scientific Projects, referred to as P1 to P8. This section presents a brief outline of the 8 projects. The list of detailed scientific questions addressed by the projects can be found in the MAP Science Plan (Bougeault et al., 1998), as well as the rationale for developing these projects.

TABLE 1-1. Scientific projects of MAP

acronym	scientific project	main target area	key observational platforms (selection)
P1	orographic precipitation mechanisms	Lago Maggiore; north-east Italian / Slovenian region	research radar array including Ronsard, S-Pol and DOW; NOAA P-3, NCAR Electra, Fokker 27, DLR Falcon
P2	Incident upper-tropospheric PV anomalies	western Europe	wind profiler network; DLR Falcon
P3	hydrological measurements for flood forecasting	Lago Maggiore	hydrographic network; soil moisture measurements; airborne micro-wave sensing
P4	dynamics of gap flow	Brenner Pass	scanning Doppler lidar; radiosoundings; profilers; NOAA P-3, NCAR Electra, Fokker 27, Dornier 228; micro-barographs
P5	unstationary aspects of Foehn in a large valley	Rhine Valley	radiosoundings; wind profilers; scanning Doppler lidar; Merlin IV, Dimona; constant level balloons
P6	three-dimensional gravity wave breaking	over the Alps	DLR Falcon, NCAR Electra, UK C-130; NWP MC2
P7	potential vorticity banners	south of the Alps in northerly flow; north of the Alps in southerly flow	NCAR Electra, NOAA P-3, Merlin IV, Fokker 27
P8	structure of the planetary boundary layer over steep orography	Rhine Valley; Riviera Valley (Ticino)	instrumented towers, Dimona

1.1.1 P1: Orographic Precipitation Mechanisms

Project P1 addresses the basic mechanisms of creation or enhancement of precipitation by special configurations of topography in complex terrain. It involves studies of the small scale dynamics of precipitating systems, including convective systems, in interaction with the topography, and studies of the detailed growth mechanisms of precipitation particles.

To accomplish these scientific objectives, a nested observational strategy has been designed. The networks of operational radars and rain gauges in northern Italy provide a broad general spatial context. MAP aircraft will conduct flights over the region covered by these radars. The NOAA P-3 and NCAR Electra will provide airborne dual-Doppler measurements and cloud physics sampling in specific subregions of the area covered by the Italian radars. The French Fokker 27 aircraft will supplement these measurements with low-level upstream temperature, moisture and wind data. The German DLR Falcon will provide high-level ice-particle sampling. In the Lago Maggiore region, more detailed observations will be provided by 7 ground-based research radars. The French Ronsard radar and the Swiss Monte Lema radar will provide a background of dual-Doppler radar data over the region, and the US S-Pol radar will allow to increase the resolution of these measurements and to map the microphysical structure within the dual-Doppler array through dual-polarization measurements. Three small specialized radars will provide vertical profiles of reflectivity (the

US S-band OPRA, the Swiss X-band, and the German K-band). The US Doppler-on-wheels (DOW) will obtain Doppler radial velocity measurements of the winds in specific river valleys to indicate how the flow is modified on the valley scale. Whenever possible, the aircraft missions will be flown over this highly instrumented region in coordination with the 7 ground-based radars. The aircraft missions may also be conducted in other regions of high occurrence of precipitation such as the north-east Italian/Slovenian mission area, or upstream of the Lago Maggiore area.

1.1.2 P2: Incident Upper-Tropospheric PV Anomalies

Project P2 will focus on the dynamics of the large potential vorticity anomalies approaching the Alps from the west at the tropopause level. Their role as precursors of severe precipitation in the Alps will be assessed, along with their modification by the diabatic heating due to the Alpine precipitation and the significance of small-scale structures seen on water-vapour satellite images.

The observational strategy for this project will rely on the French network of profilers, which will provide continuous measurements of the three wind components during the passage of the anomalies, and on the German DLR Falcon aircraft, which will perform several missions within the PV anomalies, taking in-situ, dropsonde, and lidar measurements.

1.1.3 P3: Hydrological Measurements for Flood Forecasting

Project P3 will demonstrate the real time or near-real time forecasting capabilities of a hydrological flood model, forced by special precipitation measurements or by a mesoscale meteorological model, over the Ticino and Toce river watersheds in the Lago Maggiore area. The significance of the soil moisture initial conditions and of the available information on water storage in reservoirs will be particularly examined. The strategy will rely on the high resolution sampling of precipitation by raingauges and radars, and the concentration of this information in real time to run the hydrological model. It is also expected that hydropower companies will supply real-time information on water storage modifications. Finally, the soil moisture will be sampled by in-situ probes and airborne micro-wave measurements on some selected areas.

1.1.4 P4: Dynamics of Gap Flow

Project P4 will investigate the three-dimensional velocity distribution within the Brenner Pass and the Wipp valley, and its time and space variability, in relation with the flow above mountain top. It will address some key questions of stratified fluid dynamics, such as the possible formation of a hydraulic jump downstream of the gap, and the consequences of this jump.

The observational strategy will rely on a mix of ground-based and airborne measurements. Ground-based measurements will include several profilers and special radio-sounding systems, a network of microbarographs, and the NOAA scanning Doppler lidar. Flight missions by the NCAR Electra and NOAA P-3 aircraft, by the French Fokker 27, and by the German Dornier 228, will allow to acquire both in-situ measurements of the flow and vertical cross-sections by downward looking lidars.

1.1.5 P5: Unstationary aspects of Foehn in a Large Valley

Project P5 will address the four-dimensional variability of the Foehn flow in the Rhine valley. It will investigate several dynamical processes which determine the spatial extension and time variations of the Foehn, such as the modification of the air mass by radiation, and the interaction with the upper level flow.

The observational strategy will again rely on a mix of ground-based and airborne measurements. Several special radio-sounding stations and profilers will be activated in the Rhine valley, along with a meso-net of surface stations, including radiation measurements. The French Scanning Doppler lidar will allow a 3D exploration of the wind field within a large part of the valley. Flight missions of the French Merlin IV aircraft and of the Swiss Dimona motorglider will be conducted at low altitudes during major Foehn events. Finally, constant level balloons will be used to reconstitute the flow trajectory from the upstream side of the Alps towards the Rhine valley.

1.1.6 P6: Three-Dimensional Gravity Wave Breaking

Project P6 will seek answers to basic questions regarding the creation of clear-air-turbulence by breaking gravity waves, such as their space and time distribution, predictability by meso-scale models, the vertical distribution of momentum fluxes in presence of breaking gravity waves, and the associated potential vorticity generation. It will also experiment new observational strategies, combining remote-sensing and in-situ techniques, and try to optimize measurement strategies for later projects.

The observational strategy will rely on aircraft and mesoscale models. One or several mesoscale models will be used in real time to guide mission design towards areas offering best chances of encountering such events. Measurements will be taken by the German DLR Falcon (possibly carrying the new WIND Doppler lidar system, or the DIAL water vapour lidar), by the NCAR Electra, carrying the SABL Lidar, and the UK C-130. The latter will use dropsondes to document extensively the upstream air mass wind and stability.

1.1.7 P7: Potential Vorticity Banners

Project P7 will investigate the high resolution structure of the Alpine wake at or close to mountain top level. Numerical models are suggesting that the wake is organized in well defined potential vorticity banners, extending downstream over several hundred kilometres. The reality of these objects will be verified and their generation mechanisms will be investigated.

The observational strategy will rely on coordinated multi-aircraft missions, involving the NCAR Electra, the NOAA P-3, and the French Merlin IV and Fokker 27. Airborne lidars will be used to document the 3D structure of the PV banners by vertical cross-sections at various distances from the mountain crest.

1.1.8 P8: Structure of the Planetary Boundary Layer over Steep Orography

Project P8 will seek answers to a number of broad questions on the structure of the orographic PBL, such as its height, the three-dimensional distribution of turbulent fluxes within a steep valley, the interaction of BL turbulence with the local winds, and the exchange of air mass and atmospheric constituents between the BL and the free troposphere.

The observational strategy will rely on a mix of surface-based and airborne measurements, taken in the valleys of the Rhine river and Riviera (Ticino). A cross section of surface-based towers through the valley will document the flow at various levels above the ground during the whole SOP, along with sodars and lidars. Turbulent fluxes will be deduced from scintillometers. Measurements at low altitude by the Dimona motorglider and tethered balloons will complement those during the IOPs.

1.1.9 List of Participating Institutions

as of 1 September 1999

TABLE 1-2. List of institutions participating in MAP with contact addresses.

institution	contact	address	phone	e-mail
IFA-CNR	Giangiuseppe Mastrantonio	Via Fosso del Cavaliere 100 I-00133 ROMA	+39-06 4993 4351	gmastro@ sung3.ifsi.rm.cnr.it, gmastro@ lux.ifsi.rm.cnr.it
	Fernando Congeduti		+39-06-49934335/9	fernando@ atmos.ifa.rm.cnr.it
Aeronautical Met. Service Austro-Control	Herbert Pümpel	Förstenweg 180 A-6020 Innsbruck	+43-512-1703 46 44	herbert.puempel@ austrocontrol.at, hpuempel@ via.at
ARPA-SMR	Carlo Cacciamani	Viale Silvani 6 I-40122 Bologna	+39-051-28 46 26	c.cacciamani@ smr.arpa.emr.it
ARPAV CSIM	Marco Monai	Via Marconi 55 I-35037 Teolo (PD)	+39-049-999 81 11	meteo@ csim.campiello.it
Atmospheric Science Programme Department of Geography	Douw G. Steyn	The University of British Columbia CAN-V6T 1Z2 Vancouver, B.C.	+1-604-822-6407	douw@geog.ubc.ca
Atmospheric Sciences University of Washington	Robert Houze	Box 351640 USA-98195-1640 Seattle, WA	+1-206-543-6922	houze@ atmos.washington.edu
Centro Meteo-Idrologico Regione Liguria c/o Dipartimento di Fisica	Nicoletta Tescaro	Via Dodecaneso 33 I-16146 Genova (GE)	+39-010-353 6478/ 6381	Tescaro@ cmirl1.ge.infn.it
Centro Meteorologico Regionale ERSA Friuli Venezia-Giulia	Stefano Micheletti	Villa Chiozza, loc. Scodovacca, Via Carso 3 I-33052 Cervignano d.F. (UD)	+39-0431-34281	smich@ forecast.ersa.fvg.it
Centro Meteorologico Regionale	Giuseppe Frustaci	Viale Aviazione 1 I-20138 Milano	+39-02-7390 43 10	Giuseppe_Frustaci@ rcm.inet.it
CETP, CNRS/UVSQ Centre universitaire de Vélizy	Georges Scialom	10-12 Avenue de l'Europe F-78140 Vélizy	+33-1-3925 3914	scialom@ cetp.ipsl.fr
CNRM/GMME Météo France	Philippe Bougeault	42, avenue G. Coriolis F-31057 Toulouse	+33-5-61 07 93 58	philippe.bougeault@ meteo.fr
CNRS-INSU	Daniel Vidal-Madjar	3, Rue Michel-Ange F-75116 Paris	+33-1-44964380	daniel.vidal-madjar@ cnrs-dir.fr
Colorado Research Associates (CoRA)	Greg Poulos	3380 Mitchell Lane USA-80301 Boulder, CO	+1-303-415-9701 201	gsp@ colorado-research.com
Dep. of Atmospheric Sciences, AK-40 University of Washington	Dale R. Durran	USA-98195 Seattle, WA	+1-206-685-	durrand@ atmos.washington.edu
Dep. of Geophysics and Geology Yale University	Ron B. Smith	P.O.Box 6666 USA-06511-8130 New Haven, CT	+1-203-432 3161	ronald.smith@ yale.edu
Department of Geography ETH	Christoph Schär	Winterthurerstrasse 190 CH-8057 Zürich	+41-1-635 51 99	schaer@ geo.umnw.ethz.ch
Dept. of Civil Engeneering	Nick Kouwen	University of Waterloo CAN-N2L 3G1 Waterloo Ontario	+1-519-888 4567	kouwen@ sunburn.uwaterloo.ca
Dept. of Civil Engineering Princeton University	Matthias Steiner	USA-08544-5263 Princeton, NJ	+1-609-258 4614	msteiner@ radap.princeton.edu
Deutscher Wetterdienst Zentralamt GB FE	Günter Rampe	Postfach 100 465 D-63067 Offenbach /Main	+49-69-8062 27 14	grampe@ dwd.d400.de
Dip. di Scienze e Tecnologie Avanzate	Claudio Cassardo	Corso Borsalino 54 I-15100 Alessandria	+39-0131-283723/11-6707407	cassardo@ ph.unito.it
Dipartimento di Fisica Generale Università di Torino	Renzo Richiardone	via Giuria 1 I-10125 Torino	+39-011-670 7444	richiardone@ ph.unito.it

TABLE 1-2. List of institutions participating in MAP with contact addresses.

institution	contact	address	phone	e-mail
Dipartimento di Ingengeria Civile e Ambientale Università di Trento	Dino Zardi	Via Mesiano 77 I-38050 Trento	+39-0461-88 2682	Dino.Zardi@ ing.unitn.it
ECMWF	Martin J. Miller	Shinfield Park UK-RG2 9AX Reading, Berkshire	+44-118-9499 070	martin.miller@ ecmwf.int
ENEL/SRI Environmental Area	Alberto Marzorati	Via Reggio Emilia 39 I-20090 Segrate Milano	+39-02-72248711	MARZORATI@ cram.enel.it, pellegrini@ cram.enel.it
Environment Centre University of Leeds	Stephen Mobbs	UK-LS2 9JT Leeds	+44-113-233 5158	stephen@ lec.leeds.ac.uk
Environmental Technology Laboratory NOAA/ERL (ET2)	Robert Banta	325 Broadway USA-80303 Boulder, CO	+1-303-497-5535	rbanta@ etl.noaa.gov
ERSAL Lombardia Servizio Agrometeorologico	Luigi Mariani	Palazzo Canova Milano 2 I-20090 Segrate Milano	+39-02-217621	anamar@ tin.it
Flugabteilung DLR-Oberpfaffenhofen	Heinz Finkenzeller	D-82230 Wessling	+49-8153-28 29 81	heinz.finkenzeller@ dlr.de
Hellenic National Meteorological Service (HNMS)	A. Economou, Director-General	P.O. Box 73502 GR-16603 Hellinikon Athens	+30-1-96 29 415/15 810	
Hydrometeorological Institute of Slovenia	Dusan Hrcek	Vojkova 1B SI-61000 Ljubljana	+386-61-327 461	dusan.hrcek@ rzs-hm.si
Institut f. Meteorologie und Geophysik Universität Innsbruck	Georg Mayr	Innrain 52 A-6020 Innsbruck	+43-512-507 54 59	Georg.Mayr@ uibk.ac.at
Institut fuer Meteorologie und Klimaforschung, Uni Karlsruhe	Klaus D. Beheng	Postfach 69 80 D-76128 Karlsruhe	+49-(0)721-608-3595	klaus.beheng@ phys.uni-karlsruhe.de
Institut für Meteorologie und Geophysik der Universität Wien	Reinhold Steinacker	Silbergasse 45/7 A-1190 Wien	+43-1-368 11 37	reinhold.steinacker@ univie.ac.at
Institut für Physik der Atmosphäre	Hans Volkert	DLR-Oberpfaffenhofen D-82230 Wessling	+49-8153-28 25 70	hans.volkert@dlr.de
Institute for Atmospheric Science ETHZ	Hans Richner	ETH Hönggerberg CH-8093 Zürich	+41-1-633 27 59	richner@ atmos.umnw.ethz.ch
Institute for Atmospheric Science ETHZ	Huw C. Davies	ETH Hönggerberg CH-8093 Zürich	+41-1-633 35 06	davies@ atmos.umnw.ethz.ch
Instituto Nacional de Meteorologia (INM), Centro Meteorologico de Baleares	Agustin Jansa	c/ Muelle de Pelaires, s/n Porto Pi. E-07071 Palma de Mallorca	+34-971-40 58 14	jansa@ inm.es
Instituto Nacional de Meteorologia (INM)	Eduardo Coca Vita, Director General	Apartado de Correos 285 E-18071 Madrid	+34-91-581 98 82	conchita.martinez@ inm.es
INSU/DT elu C section 12	Christian P. Allet	4, Av Neptune F-94107 St-Maur Cedex	+33-1-45-11 41 14/5	allet@ dt.insu.cnrs.fr
IROE-CNR	Paolo Pampaloni	Via Panciatichi 64 I-50127 Firenze	+39-0	pampa@ iroe.fi.cnr.it
ISAO-CNR	Andrea Buzzi	Via Gobetti 101 I-40129 Bologna	+39-051-639 95 99	A.Buzzi@ isao.bo.cnr.it
	Vincenzo Levizzani		+39-051-639 95 78	v.levizzani@ isao.bo.cnr.it
ISIATA-CNR	Umberto Giostra	s.p. Lecce-Monteroni km 1.2 I-73100 Lecce	+39-0832-320721	u.giostra@isiata.le.cnr.it
Istituto Agrario di S. Michele	Emanuele Eccel	via Mach 1 I-38010 S. Michele all'Adige (TN)	+39-0461-61 53 81	eccel@ismaa.it
	Giambattista Toller		+39-0461-61 53 74	toller@ismaa.it

TABLE 1-2. List of institutions participating in MAP with contact addresses.

institution	contact	address	phone	e-mail
Lab. d'Aerologie CNRS/UPS	Frank Roux	14, avenue Edouard Belin F-31400 Toulouse	+33-5-61 33 27 52	rouf@aero.obs-mip.fr
	Serge Chauzy		+33-5-61 33 XX XX	chas@aero.obs-mip.fr
Laboratory of Energy Systems EPFL	Jacques-André Hertig	EPFL-DGC-LASEN Ecublens CH-1015 Lausanne	+41-21-693 24 93	Jaques.hertig@epfl.ch
LMD CNRS/ENS/X/UPMC	Pierre H. Flamant	F-91128 Paris	+33-1-69 33 45 50	flamant@ lmd.polytechnique.fr
LSEET Université de Toulon	Jean-Luc Caccia	BP 132 F-83957 La Garde Cedex	+33-4 94 14 24 15	caccia@lseet.univ-tln.fr
Mesoscale Research Division NOAA, NSSL	David P. Jorgensen	325 Broadway USA-80303 Boulder, CO	+1-303-497-6246	davej@ucar.edu
Metair AG Atmosphärenphysik	Bruno Neininger	Sonnenberg 27 CH-6313 Menzingen	+41-41-755 38 04/79 340 77 33 (Natel D)	metair1@zugernet.ch
METEO TRENTINO, Provincia Autonoma di Trento Ufficio Neve Valanghe e Meteorologia	Roberto Barbiero	Via Galilei 24 I-38100 Trento	+39-0461-497445	roberto.barbiero@ provincia.tn.it
Meteorological and Hydrological Service of Croatia	Branka Ivancan-Picek	Gric 3 CRO-10000 Zagreb	+385-1-4565 678	picek@cirus.dhz.hr
Meteorologisches Institut der Universität	Roger K. Smith	Theresienstrasse 37 D-80333 München	+49-8923-94 43 83	roger@ meteo.physik.uni-muenchen.de
Naval Research Laboratory	James D. Doyle	7 Grace Hopper Avenue USA-93943-5502 Monterey, CA	+1-408-656-4716	doyle@nrlmry.navy.mil
NCAR RAF	Allen J. Schanot, Jr.	P.O. Box 3000-JEF USA-80307-3000 Boulder, CO	+1-303-497-1063	schanot@ncar.ucar.edu
NOAA AOC	James McFadden	P.O.Box 6829 USA-33608-0829 MacDill AFB, FL	+1-813-830 3310 3076	Jim.D.McFadden@ noaa.gov
NOAA Science Center, Room 207	Fedor Mesinger	5200 Auth Road USA-20746-4304 Camp Springs, MD	+1-301-763 8000 7249	fedor.mesinger@ noaa.gov
NOAA, Nat. Weather Serv., W/IA	John J. Kelly, Director	1325 East-West Highway USA-20910 Silver Spring, MD	+1-301-713-0645	John.Kelly@ NOAA.gov
NOAA/National Severe Storms Laboratory University of Washington	Bradley Smull	Box 354235 USA-98195 Seattle, WA	+1-206-685-3767	smull@ atmos.washington.edu
NSF, Div. of Atm. Science	Stephan P. Nelson	4201 Wilson Blvd., Rm. 775 USA-22230 Arlington, VA	+1-703-306-1526	snelson@ nsf.gov
Observatory of Neuchatel	Valentin Mitev	rue de l'observatoire 58 CH-2000 Neuchatel	+41-32-889 88 13	valentin.mitev@ on.unine.ch
Osservatorio Geofisico Università degli studi di Modena	Paolo Frontero	Via Campi 213a I-41100 Modena	+39-059-37 07 03	paolof@ rainbow.unimo.it
Pacific Northwest National Laboratory	Charles D. Whiteman	P.O. Box 999 USA-99352 Richland, WA	+1-509-372 6147	Dave.Whiteman@ pnl.gov
Paul Scherrer Institut	Markus Furger	CH-5232 Villigen PSI	+41-56-310 29 91	Markus.Furger@psi.ch
Physics Departement University of L'Aquila	Rossella Ferretti	Via Vetoio I-67010 Coppito -L'Aquila	+39-0862-433-076	ferretti@aquila.infn.it
Politecnico di Milano Dipartimento di Ingegneria Idraulica	Marco Mancini	Piazza L. da Vinci 32 I-20133 Milano	+39-02-23996 295	mmancini@ idra1.iar.polimi.it
President Hungarian Meteorological Service	Ivan Mersich	P.O. Box 38 H-1525 Budapest	+36-1-212 26 99	intrel@met.hu
Recherche en Prévision Numérique Environnement Canada	Robert Benoit	2121 Trans-Canada N., Suite 564 CAN-H9P-1J3 Dorval, Quebec	+1-514 421-4762	Robert.Benoit@ec.gc.ca
Regione Piemonte, Settore Meteoidrografico c/o CSI Piemonte	Renata Pelosini	C.so Unione Sovietica, 216 I-10134 Torino	+39-011-3168702	renata.pelosini@csi.it

TABLE 1-2. List of institutions participating in MAP with contact addresses.

institution	contact	address	phone	e-mail
School of Meteorology University of Oklahoma	Joshua Wurmann	100 East Boyd, Run 1422 USA-73019 Norman, Oklahoma	+1-405 325 0589	jwurman@ou.edu;
Schweizerische Meteorologische Anstalt	Peter Binder	Krähbühlstrasse 58 CH-8044 Zürich	+41-1-256 93 67	pbi@sma.ch
	Thomas Gutermann, Director	Krähbühlstrasse 58 CH-8044 Zürich	+41-1-256 93 51	tgu@sma.ch
Scripps Institution of Oceanography UCSD/Pord DIV	Laurence Armi	8605 La Jolla Shores Dr, NH232 USA-92037 La Jolla, CA	+1-619-534 6843	larmi@ucsd.edu
Service d'Aeronomie CNRS/ UPMC	Jacques Pelon	4 Place Jussieu F-75252 Paris Cedex	+33-1-44 27 37 79	jacques.pelon@ aero.jussieu.fr
Servizio Idrografico e Mareografico Nazionale	Mauro Bencivenga	Via Monzambano 10 I-00185 Roma	+39-06-495 77 46	
SLF, Swiss Federal Institute for Snow and Avalanche Research	Michael Lehning	Flüelastrasse 11 CH-7260 Davos	+41-81-417 01 58	lehning@slf.ch
Slovak Hydrometeorological Institute	Stephan Skulec	Jeséniova 17 SK-833 15 Bratislava 37	+421-7-54 77 12 47	skulec@ shmuvax.shmu.sk
U.K. Meteorological Office	Adrian Broad	London Road UK-RG12 2SY Bracknell, Berkshire	+441-344-85 64 27	asbroad@meto.gov.uk
U.K. Meteorological Office Building Y46	N. M. Price	RAE Farnborough UK-GU14 6TD Hants	+441-1252-39 5400/ 5503	nmprice@meto.gov.uk
UCAR NCAR	Richard Dirks	P.O. Box 3000 USA-80307-3000 Boulder, CO	+1-303-497 89 87	dirks2@ ucar.edu
	Joachim Kuettner		+1-303-497-86 56	kuettner@ ncar.ucar.edu
Ufficio Generale per la Meteorologia Aeroporto F. Baracca - Centocelle	Roberto Sorani	Via Papiria 365 I-00175 Roma	+39-06-2429 2728	r.sorani@ ecmwf.int,r.sorani@tiscalinet.it
Ufficio Idrografico di Bolzano	Alexander Toniazzo	Via Mendola 33 I-39100 Bolzano/Bozen	+39-0471-414753	alexander.toniazzo@ provinz.bz.it
Universiät für Bodenkultur Institut für Meteorologie und Physik	Petra Seibert	Türkenschanzstrasse 18 A-1180 Wien	+43-1-4705820-20	seibert@ mail.boku.ac.at
Università di Brescia Dip. di Ingegneria Civile	Baldassare Bacchi	Via Branze 38/40 I-25123 Brescia	+39-030-371 55 20	bacchi@ bsing.ing.unibs.it
University Ljubljana Department of Physics	Joze Rakovec	Jadranska ul. 19 SI-1000 Ljubljana	+386-61-1769 xxx	joze.rakovec@ uni-lj.si
WMO-Director Atm. Research and Environment Programme Dept.	Frederic Delsol	7 bis, Avenue de la Paix CH-1211 Genève 2	+41-22-730 82 12	delsol@wmo.ch
Zentralanstalt für Meteorologie und Geodynamik	Peter Steinhauser	Hohe Warte 28 A-1190 Wien	+43-1-36 026 2001	peter.steinhauser@ zamg.ac.at

1.2 Presentation of the main MAP entities

as of 20 May 1999

The field activities are concentrated in three target areas and one additional mission area (see Fig. 1-1). The Lago Maggiore target area will be the main focus of projects P1 and P3 (so-called "Wet MAP"), as well as part of P8. It is complemented by the north-east Italian/ Slovenian mission area, which will be a preferred flight mission area in case of no precipitation on the former one. The Brenner Pass target area will be the focus for Project P4, and the Rhine Valley target area will be the focus for Project P5, and part of P8. The remaining projects (P2, P6, and P7) are not linked to specific geographical areas, as they rely mainly on aircraft measurements.

The MAP Operations Centre (MOC), hosted by Austrocontrol and ZAMG on Innsbruck Airport, will be the main centre of decision, and the main concentration point of MAP scientists during the field phase. It will coordinate most aircraft activities and the activities of the Brenner Pass target area. The NCAR Electra, NOAA P-3, and UK C-130 aircraft will be based at the MOC.

The activities of the Lago Maggiore target area will be coordinated at the Project Operation Centre Radar (POC), hosted by the Italian Meteorological Service in the Centro Meteorologico Regionale building, at Milano-Linate military airport.

The French Merlin IV and Fokker 27 aircraft will be based at the POC. The data of all radars on the southern side of the Alps will be concentrated at the POC to construct in real time a 3D composite of the rain areas on the southern slopes of the Alps, which will allow to guide the MAP aircraft towards areas of greatest interest. The hydrological model for Project P3 will be run at the POC.

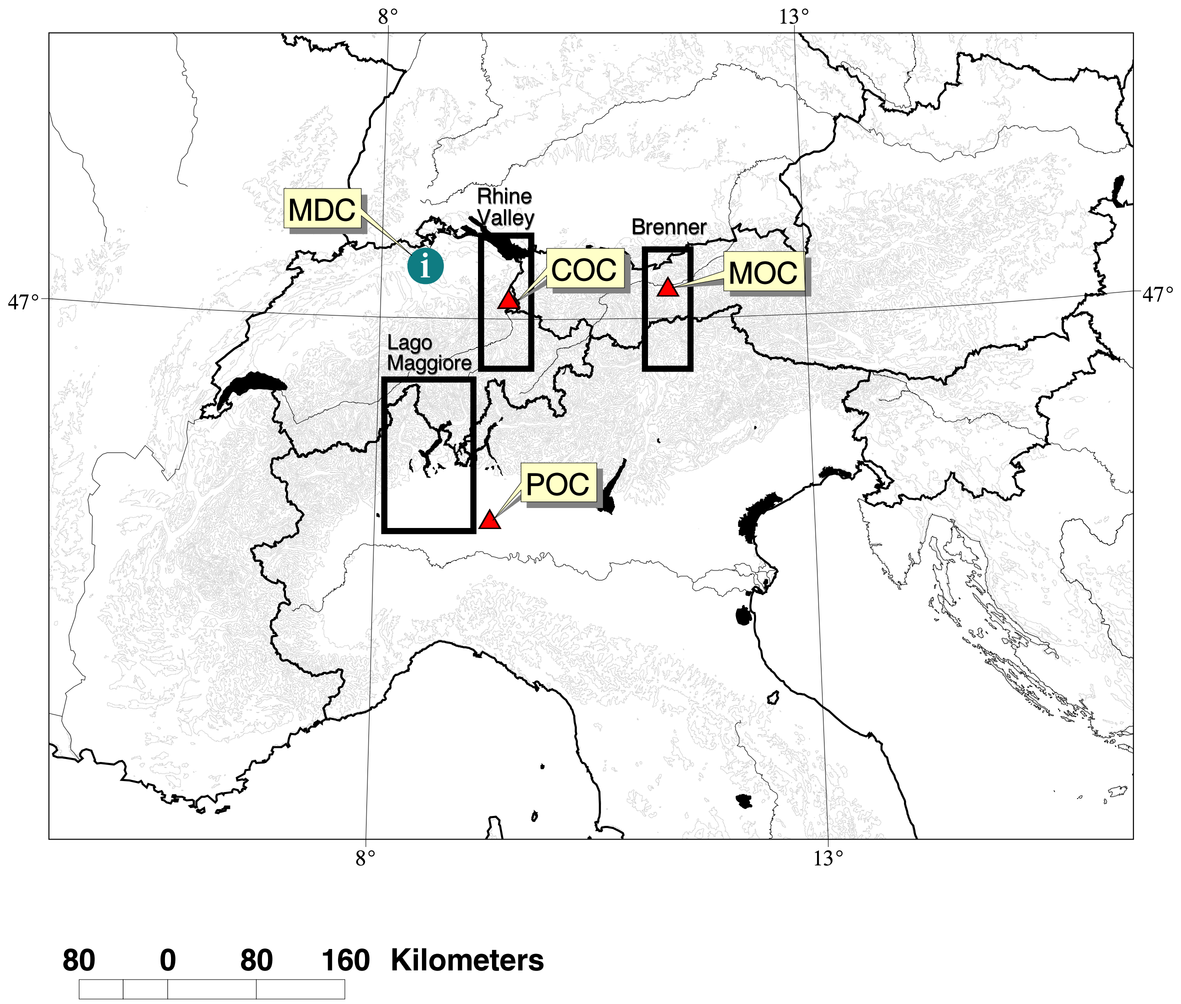

FIGURE 1-1. Key features in MAP: Three target areas (frames do not indicate "hard" boundaries); MOC: MAP Operation Centre in Innsbruck; POC: Project Operation Centre Radar in MIlano-Linate; COC: Coordination Centre Rhine Valley in Bad Ragaz; MDC: MAP Data Centre in Zurich.

The activities of the Rhine valley target area will be coordinated from the Coordination Centre Rhine Valley (COC), located in Bad Ragaz.

The three Operation Centres will remain in close connection via phone, internet, and fax during the whole field experiment. The coordination process is described in Chapter 2 below.

1.3 Strawman scenario for MAP-SOP events

as of 30 April 1999

1.3.1 Introduction

This strawman scenario is based on an evaluation of the MAP-seasons 1989–1998. The evaluation was carried out with the aid of the daily weather map of the University of Berlin (Berliner Wetterkarte, 1989-1998), which contains an excellent overview of the large-scale weather situation, the central European weather situation including the Alpine region, and an extensive overview of local observations focusing on extreme events.

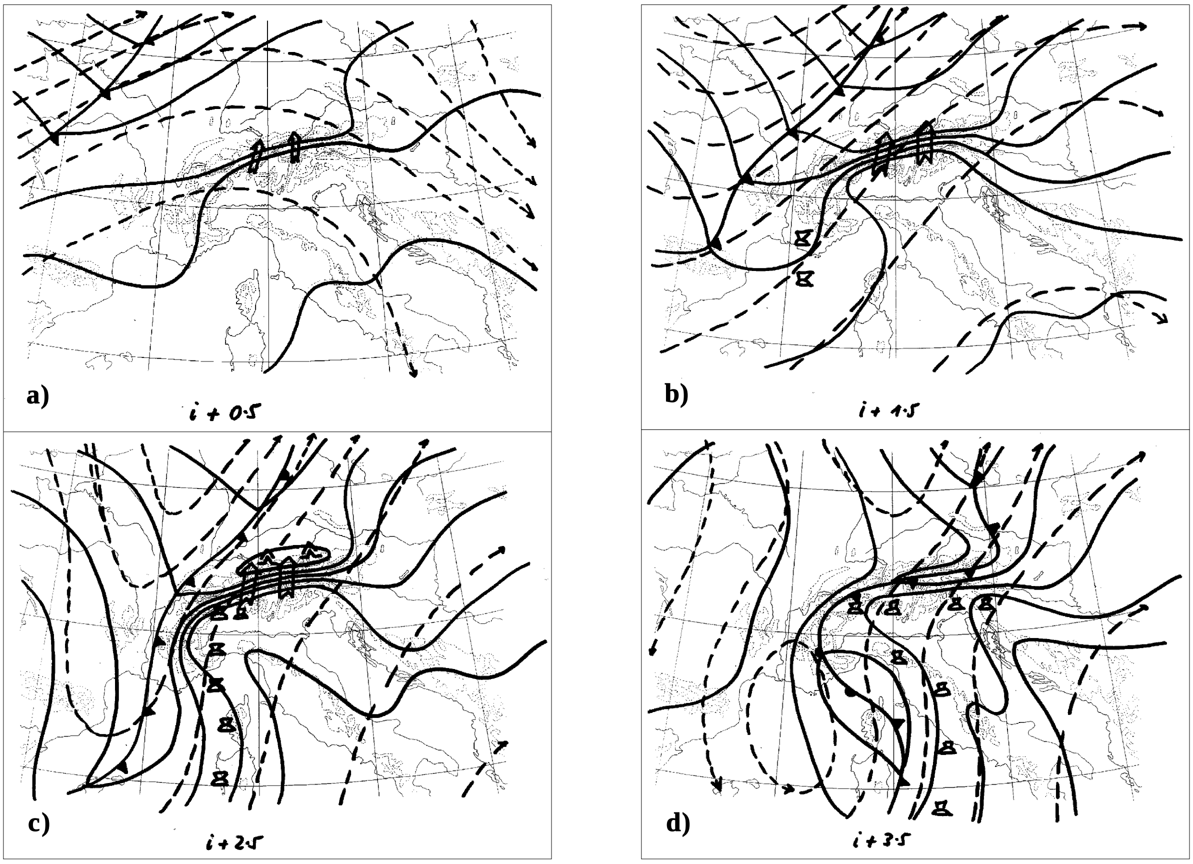

FIGURE 1-2. Schematic depiction of the time sequence of a major MAP event. Continuous lines are surface isobars with say 4 hPa spacing, dashed are 500 hPa contour lines with say 40 gpm interval. Thick arrows indicate Foehn flow in the Rhine valley and gap flow over the Brenner pass, other symbols are conventional. It should be noted that with slowly moving, intensifying troughs the surface front may very often consist of more than one line which may modulate the Foehn flow considerably. Panel a) denotes day i + 0.5 (onset of shallow Foehn in the Wipp valley), panel b) approaching trough over France, panel c) onset of heavy precipitation in the SW-part, and panel d) end of Foehn in the Wipp valley, onset of precipitation in SE-part.

day	event	event type
i-3	pre alert	
i-2	pre alert confirmed	
i-1	alert	
i	onset of shallow foehn in the Rhine valley	FOR
i+0,5	onset of shallow foehn in the Wipp valley	FOR,GAP
i+1	intensifying/deepening foehn in the Rhine and Wipp valley	FOR, GAP
i+1,5	approaching trough over France	FOR,GAP,ULF
i+2	vorticity banners and wave breaking north of Alps	FOR,GAP,ULF,PVB,GWB
i+2,5	onset of heavy precipitation in the SW-part	FOR,GAP,PVB,GWB,ORP
i+3	end of foehn in the Rhine valley	GAP,PVB,GWB,ORP
i+3,5	end of foehn in the Wipp valley, onset precip. in SE	ORP
i+4,5	possibly north foehn	

TABLE 1-3. Major event strawman scenario. See text and Fig. 1-2 for a more detailed description.

The evaluation covered MAP-relevant weather situations leading to Foehn events in the Rhine valley and in the Wipp valley over the Brenner-pass (gap flow), to heavy precipitation events in the southwestern part of the Alps (especially in the western Po valley and Ticino area) and in the southeastern part of the Alps (especially in the Friuli and Julian Alps region) and to pronounced deep southerly or northerly flows over the Alps, favourable to potential vorticity banner generation and to gravity wave breaking. South Foehn events were selected if a significant (roughly 5 hPa or more at sea level) cross-Alpine pressure difference was present in the high-resolution weather map, without (shallow Foehn) or with (deep Foehn) a pronounced southerly flow at crest height and above. Heavy precipitation events were selected if at least one station in the relevant regions reported a 12-hourly precipitation of roughly 30 mm or more, associated with a southerly low-level flow component impinging on the Alps. If a heavy precipitation event was obviously associated with a pronounced upper-level trough (indicating high upper tropospheric potential vorticity) approaching the Alps via France, it was selected as ‘upper-level feature’ event. The lack of upper level PV-maps for the present evaluation may have considerably underestimated such events. This should be kept in mind when interpreting the statistics. Both potential vorticity banner and gravity wave breaking events were pragmatically declared to take place when a southerly or northerly flow across the Alps with approximately 30 knots or more at crest height was present. It has to be considered that very often this criterion is fulfilled only over part of the Alpine crest. In principle, gravity wave breaking is also possible with an arbitrary flow direction, e.g. a westerly flow over the Alps. Due to the lack of experience on that matter and to avoid confusion, no such cases have been selected.

1.3.2 Statistics of the SOP periods of the last ten years

MAP events that occurred during the SOP period of the last ten years have been singled out and displayed in Table 1-5. Some statistics on these events is presented in Table 1-4

1.3.3 Conclusion

The very positive result is that during each of the MAP seasons from the most recent 10 years all of the MAP-relevant phenomena occurred at least once within the period September 7 to November 15. Even if we count major events, i.e. time windows of a few days where several (three or more) of the MAP-relevant phenomena occur, at least one such event was present in each of the 10 years. The duration of a major event may vary between 2 and 7 days with a mean of 3.5 days. A typical major event has a temporal characteristic as displayed in Fig. 1-2 and in Table 1-3 (major event strawman scenario).

phenomenon	mean number of days (/SOP)	mean number of events	mean duration of events (days)	distribution ratio (%)	mean maximum interval (days)
ULF	3.3	3.3	1.0	71:29	41
FOR	16.4	9.0	1.8	71:29	22
GAP	18.0	9.7	1.9	73:27	18
ORP	14.5	5.2	2.8	75:25	30
ORP (W)	10.2	3.9			
ORP (E)	4.3	1.3			
GWB/PVB	11.2	4.3	2.6	67:33	27
GWB/PVB(N)	5.9	2.5	2.4	85:15	40
GWB/PVB(S)	5.3	1.8	2.9	94:6	48
one or more phenomena	25.6	12.1	2.1	68:32	14
two or more phenomena	19.0	9.8	1.9 (2.4)		
three or more phenomena	5.9	4.4	1.3 (3.5)		

TABLE 1-4. A ten-years statistics of MAP events in the SOP period (see Table 1-5). The table headings are explained in the following: **phenomena**: according to the MAP Science Plan, 1998; **mean number of days**: number of 24 hour periods, not necessarily calendar days; **mean number of events**: an event is a continuous period of the occurrence of one or more MAP-related phenomena; **mean duration of events**: ratio between mean number of days and mean number of events; the number in brackets are based on the total number of days of a two- or multi-phenomenon event irrespective of a simultaneous occurrence of phenomena; **distribution ratio**: indicates the ratio between the mean maximum number of events within an arbitrary five week period and the mean number of events within the rest of the MAP season (the total length of SOP is exactly 10 weeks); **mean maximum interval**: mean value for the ten years 1989 to 1998 of the maximum observed interval between two successive occurrence of a phenomenon within the SOP period; **ULF**: Upper level feature event; **FOR**: Foehn event in the Rhine valley; **GAP**: Gap flow (Foehn) event in the Wipp valley (Brenner pass); **ORP**: Orographic precipitation event (W: In the western section, E: in the eastern section only); **GWB**: Gravity wave breaking event (N: north of the Alps with a southerly flow, S: south of the Alps with a northerly flow); **PVB**: potential vorticity banner event (N: north of the Alps with a southerly flow, S: south of the Alps with a southerly flow).

The less positive result is that there is a strong tendency for repeated major events within a short period and hence quite an unbalanced distribution of expected actions within the MAP SOP. The median of the interval between the onset of two events is 8 days, with a modal value of only 5 days. The distribution ratio tells us that we have to expect two thirds or more of all events within one half of SOP. Looking at special phenomena, the distribution becomes even more unbalanced. For orographic precipitation events we must expect three quarters of the events within one half of SOP and even much worse, nearly all pronounced northerly or southerly flow regimes leading to gravity wave breaking and vorticity banners have to be expected in one half of SOP. This may be explained by the persistence of the large-scale flow regimes over the Alpine region.

Minor events (only one or two phenomena occurring simultaneously or overlapping) usually either concern periods with only shallow Foehn (westerly upper level flow) or with potential vorticity banner generation and wave breaking south of the Alps with a deep and pronounced northerly flow. The latter sometimes occurs after a major event, i.e. after the passage of the upper- level trough.
In most of the 10 most recent MAP seasons long periods (14 days mean maximum interval) without any of MAP relevant phenomena occurred. This is usually caused by a stationary/blocking high pressure cell over or close to Central Europe, a phenomenon called “Altweibersommer” in German (corresponding to the American “Indian summer”). For some of the phenomena the maximum period without an event may be as long as 4 to 5 weeks for gravity wave breaking, potential vorticity banners or oro-

	Station	September (7–30)	October (1–31)	November (1–15)	N	NN
	ULF			X X X	2	3
1	FOR	X X	X XX XX X X XX X	X X X X X X X	7	19
9	GAP		X X X XX XX X X XX X	X X X X	5	16
8	ORP			X X X X	2	4
9	GWB		S S	N N	2	4
	PVB		S S	N N	2	4
	ULF		X X X X X		3	5
1	FOR	X X	X X X X X X X X XX XX XX X X XX XX XX XX X X	X	9	29
9	GAP	X X	X X X X X X X XX XX XX X X XX XX XX XX XX X X X	X X X	11	33
9	ORP		X X X X X X X XX		3	9
0	GWB		N N		1	2
	PVB		N N		1	2
	ULF	X X X X X	X X X	X X	6	10
1	FOR	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X	X X X X X X X	12	33
9	GAP	X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X X X X X	X X X X X X X	12	43
9	ORP	X X X X X X X	X X X X	X X X	6	14
1	GWB	N N N N N	S S	N N	4	9
	PVB	N N N N N	S S	N N	4	9
	ULF	X X X X	X X X X X		4	9
1	FOR	X X X X X X X X X X X X	X X X X X X X X X	X X X X X X X X	9	30
9	GAP	X X X X X X X X X X X	X X X X X X X X X X	X X X X X X X X	10	30
9	ORP	X X X X X	E E E E E E E E E		5	14
2	GWB	N N N	S S	S	3	6
	PVB	N N N	S S	S	3	6
	ULF	X X X X X X X X	X X X X X X X X	X X	8	18
1	FOR	X XX XX X X XX XX X X XX XX XX XX X X X X X X X	X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X	11	56
9	GAP	X XX XX X X XX XX X X XX XX XX X X X X X X X X X	X X X X X X X X X X X X X X X	X X X X X X X X X X X X X	11	57
9	ORP	X X X X X X X X X E E E X X X X X X X E	X X X X X X X X X X X E E E E E E E	X X	9	41
3	GWB	N N N N N N N N N N N	N N N N	S	6	15
	PVB	N N N N N N N N N N N	N N N N	S	6	15
	ULF	X X X X	X X	X X	4	8
1	FOR	X X X X X XX XX XX XX X	X XX XX XX XX XX X X X X X X X X	X X X X X X X X X X	9	43
9	GAP	X X X X X X X XX XX XX XX X	X XX XX XX XX XX X X X X X X X X X X X	X X X X X X X X X X	10	48
9	ORP	X X X X X X X X	X X X E X X	X X X X X E	9	20
4	GWB	S S S N N N N	N N N N	N N N N N	5	16
	PVB	S S S N N N N	N N N N	N N N N N	5	16
	ULF	X X X X	X X		3	6
1	FOR	X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X	X X X X X X X X X	11	39
9	GAP	X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X	X X X X X X X X	12	40
9	ORP	X X X X X	X	E E	4	8
5	GWB	N N N	N N	S S S S S S S S S S S N N N N	5	20
	PVB	N N N	N N	S S S S S S S S S S S N N N N	5	20
	ULF	X X		X X	2	4
1	FOR	X X X X X X X X X X X X	X X X X X X X X	X X X X X X X X X X X X X X	8	34
9	GAP	X X X X X X X X X X X X X	X X X X X X X X X	X X X X X X X X X X X X X X X X	7	38
9	ORP	X E	X E X X E	X X X X	6	11
6	GWB	S S S S S S S S S N N N	N N S S S S S	N N	8	21
	PVB	S S S S S S S S S N N N	N N S S S S S	N N	8	21
	ULF			X X X	1	3
1	FOR		X X X X X X X X X X X X X	X X X X X X X X X X X X X	6	27
9	GAP	X X	X X X X X X X X X X X X X X	X X X X X X X X X X X X X	6	29
9	ORP	E	X E E	X X X E E X X X X E E	6	15
7	GWB		S S S S	N N N N	4	8
	PVB		S S S S	N N N N	4	8
	ULF	X X			1	2
1	FOR	X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X		9	31
9	GAP	X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X X X X X	X X X X X	14	38
9	ORP	X X E E E E E	E E E E E E		4	13
8	GWB	S S S S S S S N N	S S N N S S	S S	7	17
	PVB	S S S S S S S N N	S S N N S S	S S	7	17

TABLE 1-5. Statistics of MAP events. For explanation of acronyms see legend of Table 1-4.

graphic precipitation and even 6 weeks for upper-level features. Also for the more frequent Foehn events (FOR and GAP) a period of roughly 3 weeks has to be expected without any occurrence.

References:
Berliner Wetterkarte, 1989-1998: FU Berlin
MAP Science Plan, 1998: Zurich

1.4 Definition of an Intensive Observing Period (IOP)

as of 20 May 1999

The various meteorological phenomena related to the scientific objectives will be studied by different sets of observational platforms, in different geographical regions and possibly as a sequence in time. Therefore, not all observational systems will necessarily be active simultaneously.

The start of a MAP-IOP is defined by the time, when the first extra measurements are initiated. The operational sounding systems will increase their frequency to 4 ascents per day. The IOP ends when extra measurement activity is stopped. During IOPs a substantial fraction of the major observing systems, such as research aircraft and research radars, will be activated and coordinated actions will take place.

In the standard case, the decision for an IOP is taken around noon by the MST. In this case the earliest extra measurements should start at 00 UTC the next day. Since most operational sounding stations have a routine ascent at 00 UTC, the first additional sounding is launched at 06 UTC.

Exceptionally, specific subsystems of the MAP observing system can be operated during a certain period without significant interaction with other parts of the overall observational set-up. Such a period is called an “Active Period” of the respective section.

The start and duration of an IOP is defined by the MST. However, the Operations Director may stop an IOP at any time in consultation with the MST for urgent reasons or to save resources. Based on available resources we anticipate about 25 days of IOPs.

1.5 Notification scheme

as of 20 May 1999

The general notification framework is proposed to be as follows:

- PRE-ALERT 60h
- ALERT 36h
- NOTIFICATION 12h

1.5.1 PRE-ALERT (-60h)

- Based on the 72h to 96h forecasts. Even if the forecast will be reasonably accurate, there is still an uncertainty and the event is still hypothetic.
- The pre-alert is very useful for the planning the rest cycles of the aircraft and radar crews in view of their involvement in the IOP.
- Calibration of the instrumentation, warm-up and repairs find also their right time during these 60h.

1.5.2 ALERT (-36h)

- Based on the 48h to 72h forecast. The previous alert has been confirmed and the event is going to happen. The meteorological system did not disappear or change its path.
- The groups continue their approach procedure to measuring.
- PBL groups in the Lago Maggiore target area and Riviera Valley experiment start measuring the "undisturbed" structure of the atmosphere prior to the IOP.

1.5.3 NOTIFICATION (-12h)

- Final decision for an IOP and its timing, based on the 24h to 48h forecast.
- The groups start their final approach to measuring.
- 12h after the notification the special measurements start, delimiting the initial time of the IOP.

Different phenomena will in principle be controlled by different notification schemes, which are then experiment-specific. For example aircraft have a totally different notification need than PBL teams that start well in advance of the IOP.

The alerts and notifications need to be made available on

- the MAP Field Catalogue so that the groups can get them at any time;
- the MOC message phone;
- by special arrangement, fax or telephone calls can be made to investigators.

Both media will be regularly updated at fixed hours.

1.5.4 Summary of notification requirements

as of 1 September 1999

Here a summary is given of the notification requirements for aircraft (Table 1-6), and surface based observing systems for the Lago Maggiore (Table 1-7), Rhine Valley (Table 1-8), and Brenner Pass (Table 1-9) target areas. Groups/instruments not needing a notification are not listed. .

TABLE 1-6. Notification summary for the MAP aircraft (see Section 5.4. for details).

aircraft	aircraft facility manager	home base	min. notifi-cation time	min. crew rest period be-tween flights	contact
NOAA P-3 (see section 5.4.3)	J. McFadden	Innsbruck	12-24h	15h	
NCAR Electra (see section 5.4.2)	A. Schanot	Innsbruck	12-24h	15h	
UK C-130 (see section 5.4.6)	N. Price	Innsbruck	12h	12h	
DLR Falcon (see section 5.4.1)	H. Finkenzeller	Oberpfaffenhofen		10-14h	DLR-IPA: Fax +49-8153 28 1841 DLR-FA: Fax +49-8153-28 1347
DLR Dornier 228 (see section 5.4.8)	H. Finkenzeller	Oberpfaffenhofen			
CNRM Merlin IV (see section 5.4.5)	J. Pelon	Milano-Linate	12h	8h	
Fokker 27 (see section 5.4.4)	C. Allet	Milano-Linate	12h	16h	
MetAir Dimona (see section 5.4.7)	B. Neininger	Bern-Belp Magadino Altenrhien			
Zodiac (see section 5.4.9)	D. Zardi				

TABLE 1-7. Notification summary for the ground based observing systems of the Lago Maggiore target area. Groups/instruments not needing a notification are not listed.

responsible person	instrument	min. notification time	SOP tel	SOP fax	SOP email
A. Marzorati	tethered balloon: AIR TMT	24h	+39-02-72248711	+39-02-72248749	MARZORATI@cram.enel.it,pellegrini@cram.enel.it
B. Neininger	hydrology: precipitation	unknown	unknown	unknown	unknown
C. Capsoni	radar	24h	+3902-23993572	+3902-23993413	capsoni@elet.polimi.it
D. Sacchetti	raso	24h	+39-010-3536478	+39-02-72248749	marzorati@cram.enel.it
E. Barthazy	Formvar	15h	number not yet known	no fax	eszter@atmos.umnw.ethz.ch, goeke@atmos.umnw.ethz.ch
E. Barthazy	Optical instrument	15h	number not yet known	no fax	eszter@atmos.umnw.ethz.ch, goeke@atmos.umnw.ethz.ch
E. Barthazy	disdrometer	2h	number not yet known	no fax	eszter@atmos.umnw.ethz.ch, goeke@atmos.umnw.ethz.ch
E. Barthazy	vert. radar (X) on van	2h	number not yet known	no fax	eszter@atmos.umnw.ethz.ch, goeke@atmos.umnw.ethz.ch
F. Congeduti	lidar	48h	+39-06-4993-4335/4339 (Institute Rome), +39-06-7027273 (home Rome), +39-0323-518321 (CNR Pallanza, measurement site)	+39-06-20660291, +39-0323-556513 (CNR Pallanza, measurement site)	no email (worst)
G. Bonino	RASS	24h	+39-011-670-7453	+39-011-658444	bonino@ph.unito.it
G. Graziani R. Vogt	sodar	unknown	unknown	unknown	unknown
G. Scialom	Ronsard Doppler radar	6-12h	at radar or hotel or cellular phone	no fax	at radar site
G. Scialom	disdrometer	unknown	unknown	unknown	unknown
G. Toller	TDR reflectometer	6h	no phone	+39-0461-650956	toller@ismaa.it, eccel@ismaa.it
J. Gurtz	TDR reflectometer	unknown	unknown	unknown	unknown
J. Wilson	S-Pol radar	12h	probably cell phone	no fax	no email
M. Mancini	Soil measurements probes (TDR)	unknown	unknown	unknown	unknown
M. Menziani	TRASE system with multiplexer and probes (TDR techniques)	unknown	unknown	unknown	unknown
M. Rotach	Aircraft DIMONA	48h, after pre-alert 12-24h	mobile 079-340 77 33	+41-41-755 38 04 (will be forwarded)	no email
M. Rotach	raso	48h	+41-91-8806020, +41-79-2775535 (mobile)	+41 1 362 5197 (ETHZ)	rotach@geo.umnw.ethz.ch
M. Rotach	scintillometer	48h	phone	no fax (ETHZ)	no email
M. Steiner, B. Smull	DOW-Doppler radar on wheels (X)	3-6h	no phone	no fax	no email

TABLE 1-7. Notification summary for the ground based observing systems of the Lago Maggiore target area. Groups/instruments not needing a notification are not listed.

responsible person	instrument	min. notification time	SOP tel	SOP fax	SOP email
P. Trivero	sodar	24h	+39 0131 283856 (or +39 11 6707407)	+39 0131 254410	cassardo@al.unipmn.it
R. Cavalli	radar Monte Lema	1h	+41-91-756 23 11	+41-91-756 23 10	jjo@sma.ch, cav@sma.ch, gga@sma.ch, uge@sma.ch, mbc@sma.ch
R. Houze	UW radar	unknown	unknown	unknown	unknown
R. Ranzi	gravimetric soil moisture measurement	24h	+39-030-3715520	+39-030-3715503	ranzi@bsing.ing.unibs.it
R. Ranzi	soil moisture measurement	unknown	unknown	unknown	unknown
R. Richiardone	sodar	unknown	unknown	unknown	unknown
R. Richiardone	sonic anemometers	yes (24h)	+39-011-670-7444	+39-011-658444	richiardone@ph.unito.it
R. Vogt	12 m tower	unknown	unknown	unknown	unknown
R. Vogt	energy balance station	unknown	unknown	unknown	unknown
R. Vogt	radiation	unknown	unknown	unknown	unknown
R. Vogt	scintillometry	unknown	unknown	unknown	unknown
R. Vogt	soil heat flux	unknown	unknown	unknown	unknown
S. Chauzy	Field mill for surface electric field	6-12h	no phone, CB	no fax	chas@aero.obs-mip.fr
S. Chauzy	balloon soundings for thunderstorm electric field	6-12h	no phone, CB	no fax	chas@aero.obs-mip.fr
S. Chauzy	disdrometer	6-12h	no phone, CB	no fax	chas@aero.obs-mip.fr
S. Chauzy	inducting ring	6-12h	no phone, CB	no fax	chas@aero.obs-mip.fr
S. Chauzy	sensor for electric current in precipitation	6-12h	no phone, CB	no fax	chas@aero.obs-mip.fr
S. Paloscia	Airborne Microwave Radiometers (C and L bands) + Thermal Infrared	24h-36h	+39-055-4235220	+39 055 4235 290	paloscia@iroe.fi.cnr.it
U. Giostra	infrared soil temperature sensor	unknown	unknown	unknown	u.giostra@isiata.le.cnr.it
V. Klaus	UHF	12h	no phone	no fax	klaus@meteo.fr
V. Klaus	VHF and RASS	12h	no phone	no fax	klaus@meteo.fr

TABLE 1-8. Notification summary for the ground based observing systems of the Rhine Valley target area. Groups/instruments not needing a notification are not listed.

responsible person	instrument	notification	SOP tel	SOP fax	SOP email
B. Benech, H. Berger	CLB tracking station	24-36h	+41-79-300 43 05 (mobile), +41-26-662 62 11 (SMI)	no fax	benb@aero.obs-mip.fr, hbe@sma.ch, hbe@bluewin.ch
B. Benech, H. Berger	CLB, mobile	24-36h	+41-79-300 43 05 (mobile), +41-26-662 62 11 (SMI)	no fax	benb@aero.obs-mip.fr, hbe@sma.ch, hbe@bluewin.ch
C. Haeberli	raso P760	6h	+41-81-302 35 34 (24h/d from 8 Sep)	to be communicated	no email
C. Haeberli	raso P763 +surfce station	unknown	unknown	unknown	unknown

TABLE 1-8. Notification summary for the ground based observing systems of the Rhine Valley target area. Groups/instruments not needing a notification are not listed.

responsible person	instrument	notification	SOP tel	SOP fax	SOP email
D. Ruffieux	UHF WP	12h	+41-77-341232 (mobile)	no fax	dcr@sma.ch, hbe@sma.ch, hbe@bluewin.ch
D. Ruffieux, H. Berger	10m tower (wind), 2m station	12h	+41-77-341232 (mobile)	no fax	dcr@sma.ch, hbe@sma.ch, hbe@bluewin.ch
D. Ruffieux, H. Berger	sodar	12h	+41-77-341232 (mobile)	no fax	dcr@sma.ch, hbe@sma.ch, hbe@bluewin.ch
H. Berger, B. Benech	CLB tracking station	24-36h	+41-79-300 43 05 (mobile), +41-26-662 62 11 (SMI)	no fax	hbe@sma.ch, hbe@bluewin.ch, benb@aero.obs-mip.fr
H. Berger, D. Ruffieux	sodar	12h	+41-79-300 43 05 (mobile), +41-26-662 62 11 (SMI)	no fax	hbe@sma.ch, hbe@bluewin.ch, dcr@sma.ch
H. Richner	raso	unknown	unknown	unknown	unknown
M. Dorninger	4 foto cameras	unknown	unknown	unknown	unknown
M. Dorninger	5 Microbarographs combined with mesonet stations	unknown	unknown	unknown	unknown
M. Dorninger	instrumented car	unknown	unknown	unknown	unknown
M. Piringer	Air tethersonde meteorological tower captive balloon	24h	M. Piringer +43-1-36026-2402; U. Pechinger +43-1-36026-2401; K. Baumann +43-1-36026-2405, F. Traher +43-1-36026-2418; E. Polreich +43-1-36026-2417	+43-1-3602674	piringer@zamg.ac,at, pechinger@zamg.ac.at, baumann@zamg.ac.at, traher@zamg.ac.at, polreich@zamg.ac.at
M. Piringer	Doppler sodar	unknown	unknown	unknown	unknown
M. Piringer	Ozone and meteorological sonde at cable car	unknown	no phone	no fax	no email
M. Piringer	surface station	unknown	no phone	no fax	no email
M. Piringer	ultra sonic anemometer with surface station	unknown	no phone	no fax	no email
Markus Furger	scintillometer	YES (24H)	phone for the SOP	fax	Markus.Furger@psi.ch
Pierre H. Flamant	Transportable wind lidar	unknown	no phone	no fax	flamant@lmd.polytechnique.fr
R. Steinacker	Doppler sodar	unknown	unknown	unknown	unknown
R. Steinacker, C. Haeberli	BASORA 1700 TDF raso	12h	+43-1-368-11-37/1 (Steinacker), 5 (Dorninger), celluar phone number not yet known	+43-1-369-81-27/1	Reinhold.Steinacker@univie.ac.at, Manfred.Dorninger@univie.ac.at
Reinhold Steinacker	equipments for PILOT balloons	12h	+43-1-368-11-37/1 (Steinacker), 5 (Dorninger), celluar phone number not yet known	+43-1-369-81-27/1	Reinhold.Steinacker@univie.ac.at, Manfred.Dorninger@univie.ac.at
Reinhold Steinacker	weather monitor	12h	+43-1-368-11-37/1 (Steinacker), 5 (Dorninger), celluar phone number not yet known	+43-1-369-81-27/1	Reinhold.Steinacker@univie.ac.at, Manfred.Dorninger@univie.ac.at
S. Gubser	pilot balloons	unknown	unknown	unknown	unknown
S. Gubser	sodar	unknown	unknown	unknown	unknown

TABLE 1-8. Notification summary for the ground based observing systems of the Rhine Valley target area. Groups/instruments not needing a notification are not listed.

responsible person	instrument	notification	SOP tel	SOP fax	SOP email
S. Vogt	Wind Temperature radar WTR (UHF WP and RASS)	unknown	unknown	unknown	unknown
SMI	ANETZ+additional parameter	unknown	H. Richner, SLF	no fax	no email
SMI	ENET station	unknown	H. Richner, SLF	no fax	no email
SMI	ENET station / Thygan+baro.	unknown	H. Richner, SLF	no fax	no email
Schmidt	Video camera	unknown	unknown	unknown	unknown
V. Mitev	backscatter lidar	unknown	unknown	unknown	unknown

TABLE 1-9. Notification summary for the ground based observing systems of the Brenner Pass target area. Groups/instruments not needing a notification are not listed.

responsible person	instrument	minimum notification time	SOP tel	SOP fax	SOP email
D. Sacchetti	raso	unknown	unknown	unknown	unknown
G. Mayr	instrumented car	unknown	will have a cell phone for the SOP	no fax	georg.mayr@uibk.ac.at
J. Vergeiner	raso Vaisala mobile radiosounding system	24h	will have a cell phone for the SOP	no fax	johannes.vergeiner@uibk.ac.at
K. Baumann	Remtec Doppler sodar	12h	will have a cell phone for the SOP	no fax	johannes.vergeiner@uibk.ac.at
M. Hardesty, D. Durran, R. Smith	GLASS raso	12h	will have a cell phone for the field phase	no fax	alexander.gohm@uibk.ac.at
M. Hardesty, D. Durran, R. Smith	lidar	12h	will have a cell phone for the field phase	no fax	alexander.gohm@uibk.ac.at
M. Hardesty, D. Durran, R. Smith	surface station	12h	will have a cell phone for the field phase	no fax	alexander.gohm@uibk.ac.at
R. Santangelo	minisodar	12h	will have a cell phone for the SOP	no fax	johannes.vergeiner@uibk.ac.at
R. Santangelo	raso	24h	no phone	no fax	paolo.frontero@rainbow.unimo.it, sergio.teggi@unimo.it
Roger Smith	surface station	24h	will have a cell phone for the field phase	no fax	alexander.gohm@uibk.ac.at

1.6 MAP resources

as of 15 July 1999

TABLE 1-10. Summary of extra ground-based resources for the SOP.

observing system	Lago Maggiore	Rhine Valley	Brenner Pass	others	total	remarks
enhanced operational radio soundings (cf. Table 3-1)					17	
additional radio sounding stations	2	7	4	0	13	
CWINDE-99 wind profiler					15-20	
additional wind profiler	2	2		5	9	

TABLE 1-10. Summary of extra ground-based resources for the SOP.

observing system	**Lago Maggiore**	**Rhine Valley**	**Brenner Pass**	**others**	**total**	**remarks**
radars (S, C, X)	8			5	13	
lidars	1	2	2		5	
RASS	6	1		1	8	
surface energy and water balance observations	27			1	28	
near- surface turbulence observations (towers, anemometers)	10	2	3	1	16	
higher PBL observations (sodars, tethered balloons, cameras)	13	7	2	1	23	

TABLE 1-11. Aircraft resources for the SOP (cf. apportionment of flight hours in Table 5-1).

aircraft	**contact**	**availability**	**total flight hours**	**Remarks**
NCAR Electra	R. Dirks	15.9.-15.11.	150h	50% wet, 50% dry x dropsondes (x+y=225)
NOAA P-3	D. Jorgensen	20.9.-15.11.	125h	55% wet, 45% dry y dropsondes (x+y=225)
DLR Falcon	H. Volkert	20.9.-15.11.	76h	~50 dropsondes (DLR), more desirable
UK C-130	A. Broad	1.11.-15.11.	25h	for P6 only 150 dropsondes
Merlin IV	P. Bougeault	15.9.-15.11.	60h	-
Fokker 27	E. Richard	15.9.-15.11.	68h	-
Dimona	M. Rotach H. Richner	26.7.-8.8. (Riviera), 1.9.-31.10. (Riviera and Rhine Valley)	70h	-
Zodiac	P. Pampaloni S. Paloscia	SOP	~15h	Planned by CNR-IROE
Dornier 228	G. Mayr			

1.7 Schedule and duration

as of 15 July 1999

The timelines in Fig. 1-3 to Fig. 1-5 illustrate the operational availability of the various devices of MAP during the SOP.

- Forecaster shifts will run from the 5 September onwards. All forecasters had a training session at the MOC-FO in early July 1999.
- The first Daily Planning Meeting will be held on 7 September 1999.
- In principle, 8 September can be the first IOP day.
- First flight operation day of the NCAR Electra, Merlin IV and Fokker 27 is 15 September 1999.
- First flight operation day of the NOAA P-3 and the DLR Falcon is 20 September 1999.
- First flight operation day of the UK C-130 is 1 November 1999.
- Enhanced operational soundings can be requested for the first IOP day. In any case, a test will be initiated prior to the first flight operations early in the SOP, even in a weak case.

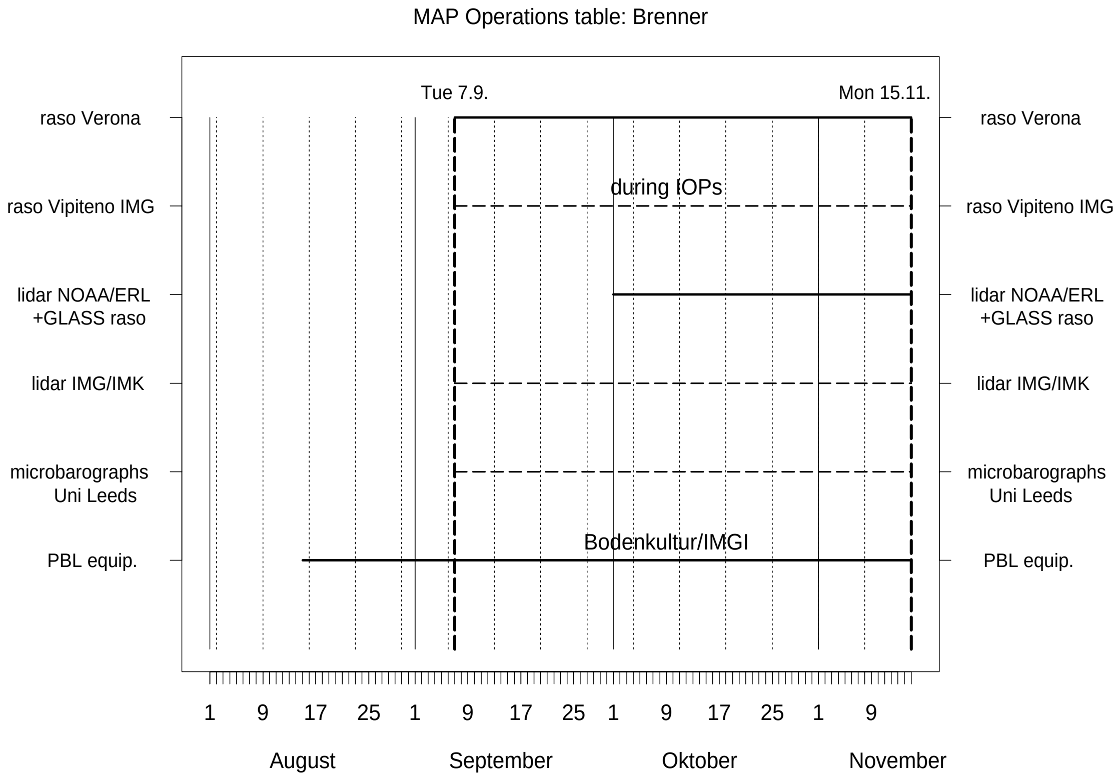

FIGURE 1-5. Observing systems in the Brenner area.

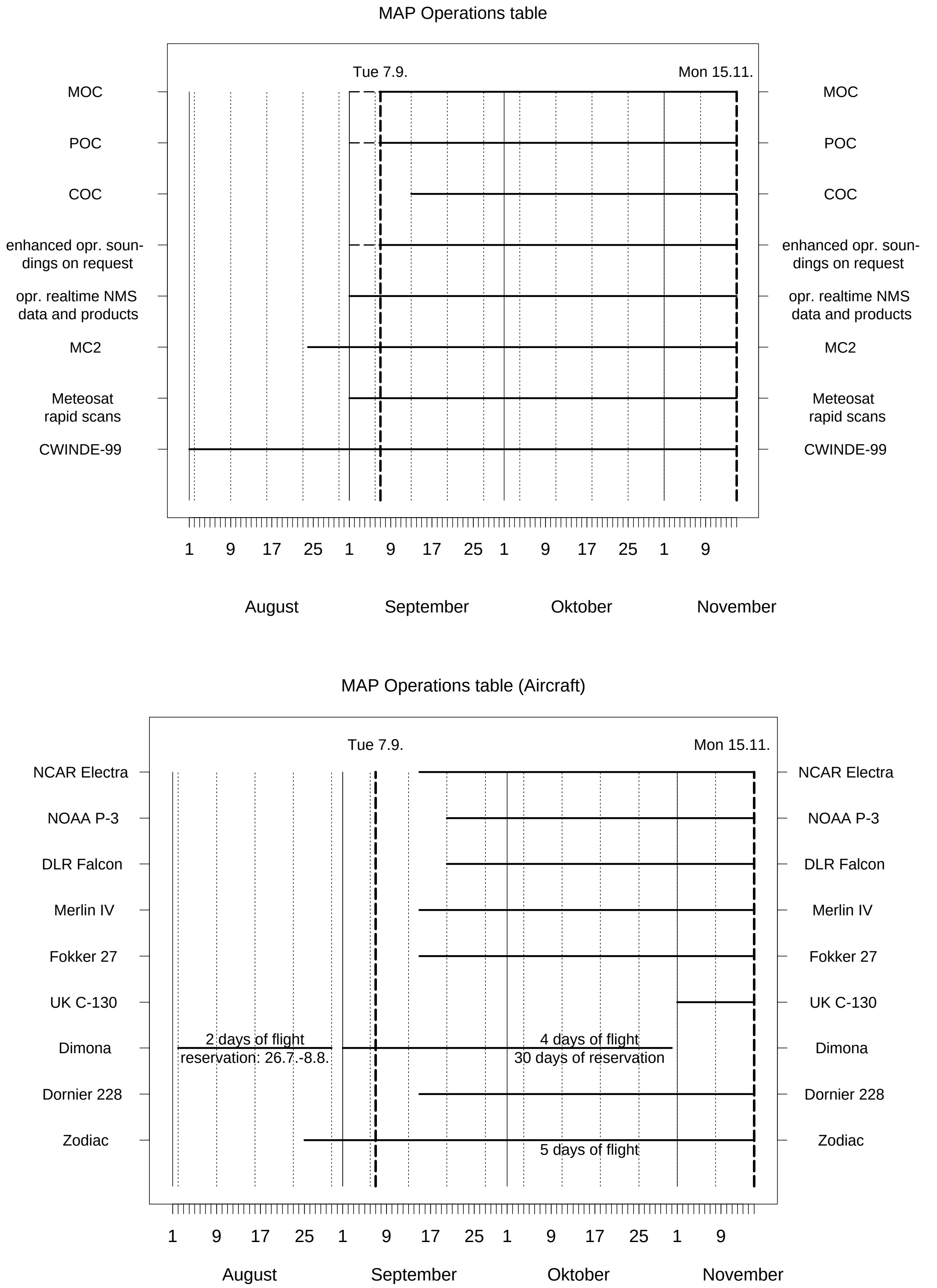

FIGURE 1-3. Allocation of major MAP facilities and observing platforms (upper panel) and aircraft (lower panel).

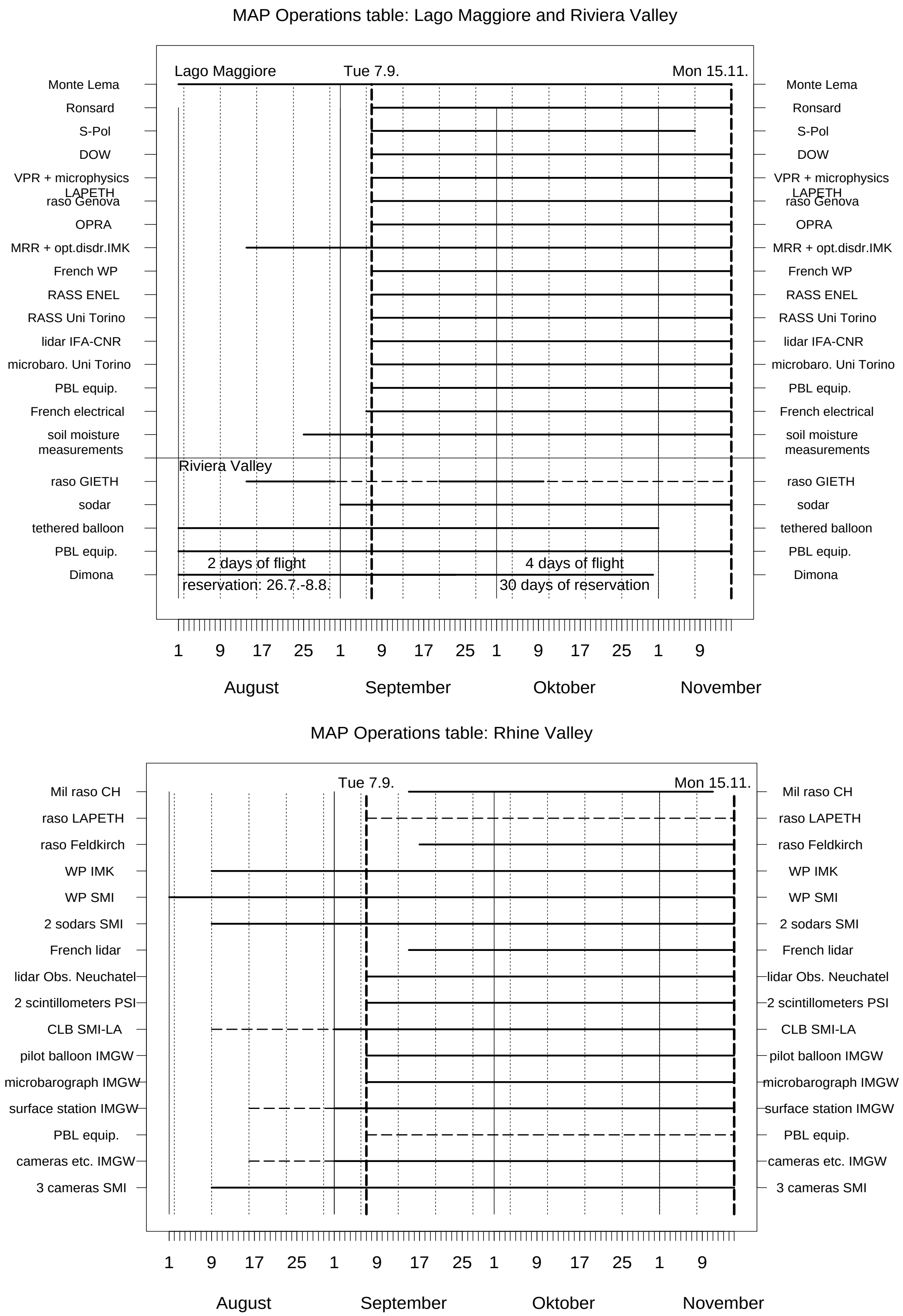

FIGURE 1-4. Observing systems in the Lago Maggiore area (upper panel) and in the Rhine Valley (lower panel).