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METEOROLOGICAL AND ATMOSPHERIC SCIENCES Italian Research Activity (1991-1994) report to IAMAP

INTRODUCTION

This is a summary of the the research activity carried out in Italian Universities and Research Laboratories during the period 1991-1994.

For each theme the publications are listed in alphabetical order. Minor contributions, internal reports or in general not refereed publications are not included in the list. This report does not necessarily reflects all the activities and this may be due either to some communication problem or to the fact that some publications reached the reviewer a bit too late. The inclusion of the publications in one particular area may look somewhat arbitrary because there could be some overlap.

Material for this review was received from the following institutions:

Dipartimento di Fisica, Gruppo Dinamica Atmosferica, Università di Bologna;

Dipartimento di Fisica, Università degli Studi, L'Aquila;

Dipartimento di Fisica, Gruppo di Fisica dell'Atmosfera, Università di Roma;

Istituto di Cosmogeofisica del CNR, Torino;

Istituto di Fisica dell'Atmosfera del CNR, IFA Roma;

Istituto di Fisica Generale, Università di Torino;

Istituto di Ricerca delle Onde Elettromagnetiche del CNR, IROE, Firenze;

Servizio Meteorologico dell'Aeronautica, Roma.

METEOROLOGY

The *Servizio Meteorologico dell'Aeronautica Militare* between 1990 and 1994 has defined some guidelines for development in a number of activities. This means an improvement in the conventional meteorological stations with the acquisition of 50 new Data Collection Platforms (DCP), which utilize the METEOSAT satellite as transponder. The acquisition has been completed by 7 digital meteorological radars. A new method has been introduced for storage and dissemination of data, together with the new computing center. These improvements should represent a net gain for the national users.

On the international side, particular attention has been paid to the cooperation with the European Communities for the support of the COST Initiative. For what concerns WMO, support

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has been assured for the Italian participation to the most important scientific and organizative meetings. Satellite meteorology has received considerable new support with the approval of the programs in the EUMETSAT framework (MOP and EPS). The national meteorological and scientific community has exploited the new products made available through the European Center for Medium Range Weather Forecast (ECMWF), like EPS (Ensemble Prediction System), the quantitative precipitation forecast and so on.

The *Gruppo di Dinamica Atmosferica del Dipartimento di Fisica dell'Università di Bologna (ADGB)* is a comparatively small research group staffed by the Department of Physics of Bologna University and it is widely recognized as a centre of excellence of Italian academic research in meteorology, climatology and related modelling. The ADGB staff has a wide research experience in a variety of dynamic meteorology and climatology areas, including atmospheric low-frequency variability, blocking, orographic cyclogenesis and their numerical modelling using limited area models, atmospheric predictability and weather regimes, extended-range weather forecasting, statistical data analysis techniques, including empirical orthogonal functions and cluster analysis (see references in enclosed list).

Some staff members of ADGB are involved in teaching a number of courses for the University Degree in Environmental Sciences within the Science Faculty. Furthermore, strong ties have developed with the Regional Weather Service of the Emilia-Romagna region.

The *Gruppo di Fisica dell'Atmosfera* at the University of L'Aquila has developed during the last few years a capability in the use of Limited Area Model both for the Meteorological Forecast and regional climate studies. This group has participated to CE Programs, to the MECCA consortium and has developed cooperation with the National Electric Power Agency (ENEL) and the previous mentioned research group in Bologna.

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BOUNDARY LAYER METEOROLOGY

The *Geophysics Group at the University of Torino (GEOFIT)* has worked on new parametrization scheme for the ABL to be included in 2D and 3D model of local circulation.

The same group has carried out studies on the interaction of barotropic and baroclinic flows with obstacles. These studies have been compared with existing theories of baroclinic development.

In the field of remote sensing a RASS (Radioacoustic Sounding System) adapted to severe weather conditions has been installed at the Plateau Rosa laboratory (West Alps, 3500 m a.s.l.) and has started measuring vertical temperature profiles during the winter of 1994-1995. In cooperation with ENEL-CRAM (Milan), a study of atmospheric CO₂ concentration fluctuations correlated to synoptic air trajectories and to particular atmospheric circulation patterns allowed to establish a sort of selection scheme to establish in which conditions Plateau Rosa could be considered a good background station.

The *boundary layer group at CNR, IFA in Frascati* has developed a new sodar system operated at normal and higher frequency to improve vertical resolution. The catabatic winds at the French station of Dumont D'Urville yielded data that are being used to obtain information on the energy fluxes. Again, in the Antarctica, sodar data have been obtained along the Reeves glacier and are being studied.

A coordinated campaign has been conducted in the area around Rome using many sodars operating in the same area. This data are being used mainly to define the atmospheric circulation responsible for transport and diffusion of pollutants. Similar data obtained also with a RASS instrument are related to long lived man made pollutants (e.g. CFC), which were chemically sampled.

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CLIMATE RECORDS

The *Geophysics Group at the University of Torino* (GEOFIT) has reconstructed the climatic conditions of the last millennia on the basis of measurements of climatic indexes like CaCO_3 , thermoluminescence, C in coastal sediments of Mediterranean Sea and through tephroanalysis of Tyrrhenean sediments near Naples.

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STRATOSPHERIC CHEMISTRY AND PHYSICS

This sector has produced a considerable amount of work and is really concentrated in only few institutions like the Departments of Physics at the Universities of Rome and L'Aquila, and the IFA-CNR section in Frascati. International cooperation has made possible to carry out lidar measurements at both poles correlated with dustsonde and ozonesonde data. The modelling activity on both the chemistry and the microphysics has produced noticeable results with the participational to international assessment.

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