

THE NATIONAL INSTITUTE OF METEOROLOGY AND GEOPHYSICS
ACTUAL SITUATION AND DEVELOPMENT PERSPECTIVES

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Abstract

A historical review of the INSTITUTO NACIONAL DE METEOROLOGIA E GEOFÍSICA of PORTUGAL (Formerly Serviço Meteorológico Nacional) is presented and some relevant aspects concerning the research activities on the upper atmosphere are emphasized. In addition future new prospects concerning those matters will be open aiming to use new technological development in weather forecasts direct towards the improvement of the impact of meteorology and geophysics in social and economical activities.

1. Introduction

The National Institute of Meteorology and Geophysics (INMG) is the portuguese institution that covers all the scientific areas related to the main environmental geophysical subjects. Under the transformation of an old service (National Meteorological Service) it was possible to establish a complet organization devoted not only to satisfy the users of meteorological and geophysical services but also to improve the scientific research necessary for the correct follow-up of the various activities of the institution. The structure of the Institute was created taking in account the new perspectives of the modern society in Portugal and considering in high level the participation of all people in the development of the different tasks involved in short, medium and long term programs. It was considered that in various directions, mainly aviation, fishing, agriculture, civil protection, which might be faced

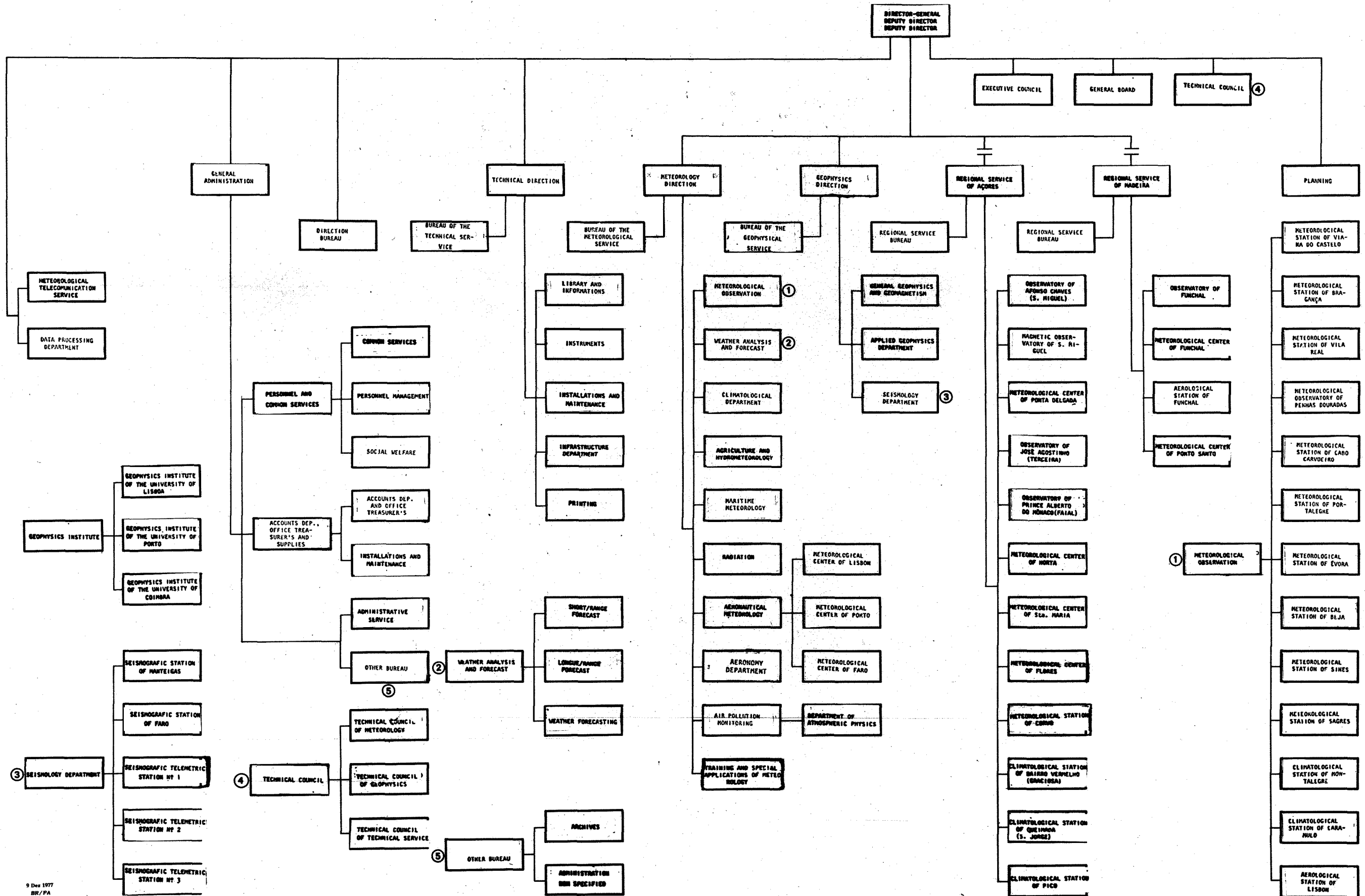
in a different way and with much more intensive and important means, the INMG would be the adequate institution.

2. Historical review

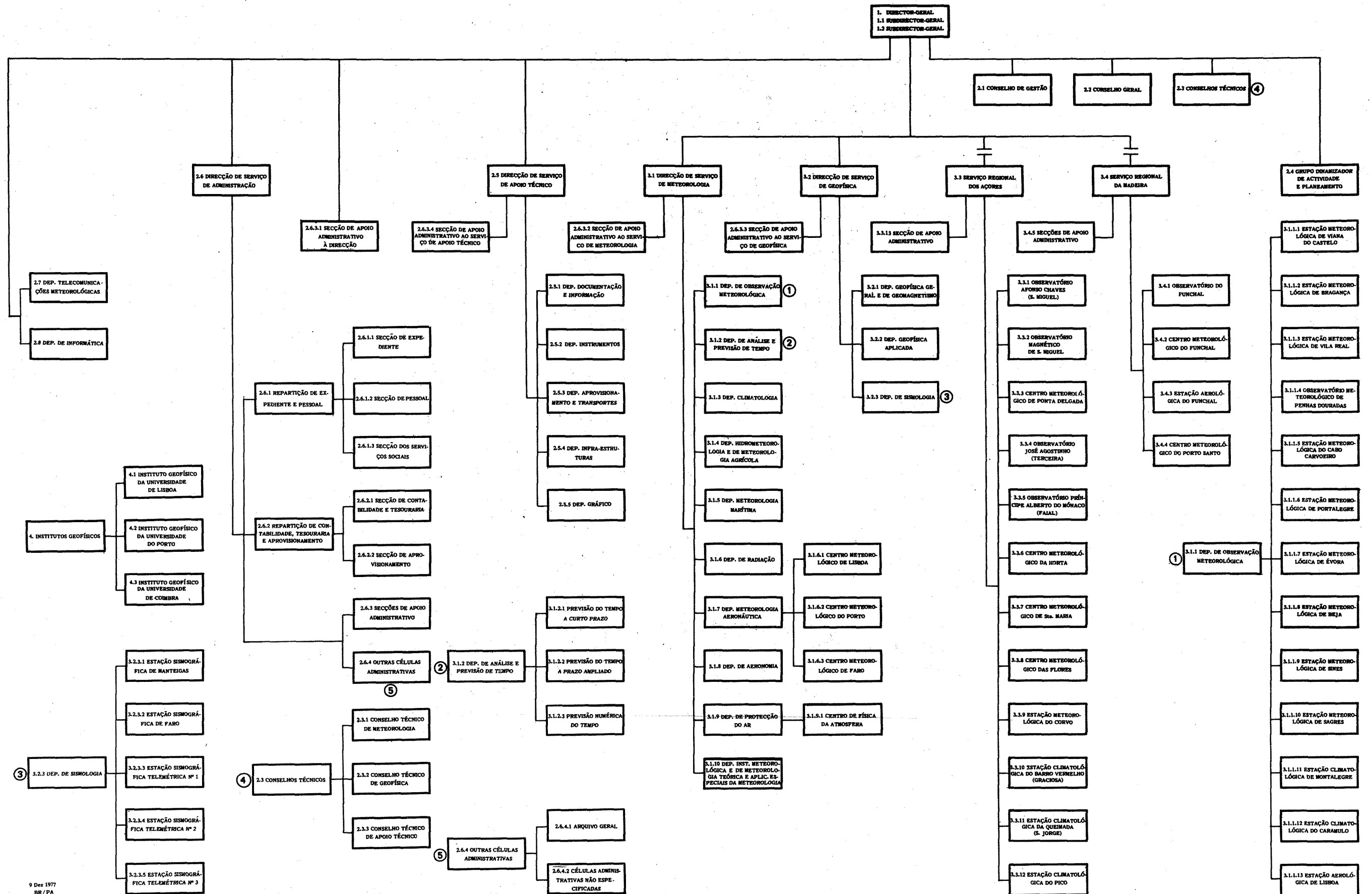
Meteorology is the science that take care about all the physical phenomena of the terrestrial atmosphere and those occurring at the surface of the planet related to those one. There is a correspondance technique which starting from the knowledge of the past and present situation of the weather allows to predict the probable evolution for one more or less long period, the conditions that manage the climate of a region, the development of the physical phenomena above mentioned.

The economical importance of the meteorology was first understood about the XIX Century when the publication of the "Charts of the winds and currents" shortened the duration of the more important trade sail displacements. About that time in Portugal was created in the Escola Politécnica de Lisboa, in 1854, the "Observatório do Infante D. Luiz" which some years after would be the first Meteorological Service in Portugal coordinating all the observations and works concerning the land and sea surface of the portuguese territory. The meteorological observations started in 1854, the geomagnetic in July 1857. After that the University of Coimbra created the "Instituto Geofísico" in 1864. The seismographic observations started after the Benavente earthquake of 1909 (23rd April). In the beginnig of the century the dispersion of observations undertaken by different ministries

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was not very favourable to obtain the machinery that the geophysical science implies, and for that purpose in 1946 it was created the "Serviço Meteorológico Nacional" in order to coordinate and develop all the meteorological and geophysical matters and to satisfy the needs of country and the international responsibilities.

The World Meteorological Organization (WMO) increases its importance and fixes the rules of different subjects concerning the various meteorological problems; the permanent representative of Portugal for the WMO was the Director-General of the SMN. The portuguese service was an institution with responsibilities distributed between the research and the service of forecasts for different applications, outstation guidance, radio and press, shipping or international exchange.

However, the development of Portugal was not corrected followed by this Service which techniques and methods were dramatically obsolete. The international cooperation, very important in the fields of meteorology and geophysics when the frontier concept doesn't exist, might be improved.

3. The present situation

The situation of the country was promptly modified by the action of the new INMG.



Fig. 1 - The new INMG headquarters

Different ambitious programs have been approved and really executed: the acquisition of the equipment for the reception of meteorological satell-

tes, the automation of data processing; the connection to the European Center for Medium Range Weather Forecast; the studies for the implementation of a meteorological radar network, the seismological studies which enable the definition of a new network of seismographic stations, the acquisition of modern equipment for geomagnetic observation, and the reinforcement of the cooperation specially with France and Spain, the implementation of instrument development, and some geophysical projects such as the Aeromagnetic Map of Portugal.

We have now in operation more than 150 meteorological stations and more than 600 points where there exists measurement of the precipitation. For synoptic purposes there are 25 stations, with observations each 3 hours.

The surface and upper-air analysis and forecasts are made and prepared at the Central Forecasting Center, this work is disseminated by eight Secondary Centers, spread through all country including Açores and Madeira regions.

The development implies new specializations on the different directions related to the activity of the Institute, and for that purpose the cooperation with the more technological advanced countries is very important: United States of America, United Kingdom, France, Germany for instance have provided many stages very adequate under the perspective of development pursued.

The major modification introduced by the creation of the INMG was the spirit of cooperation that must be spread over the whole structure; some results have been obtained and there is a strong intention to reinforce this methodology.

The INMG is a Government Department of the Ministry of Transportation, directed by a Director-General and two vice-director-general, composed by four different Services which one directed by a specific director, the main activities are controlled by one Executive Committee.

The Meteorological Service comprises departments as follows:

- a) Meteorological observation devoted mainly to define the policy on observations including standards and procedures, control of observatories, upper-air stations and auxiliary points of observation;

- b) Weather analysis and forecast, which responsibilities have been described above, and prepare the daily weather report;
- c) Climatology, treats the land surface and upper-air climatology, the quality control of climatological and upper-air data, synoptic and statistical analysis of climate;
- d) Agriculture and hidrometeorology dealing especially with the meteorological requirements for agriculture, horticulture, forestry and the studies of hidrometeorology with special emphasis to the applications of radar meteorology;
- e) Marine meteorology, manages the coastal stations and sea stations mainly devoted to the studies of sea waves, oceanographic studies controlling the observations of the voluntary observing fleet, advice on service for shipping, marine climatology, and the control of the port meteorological office;
- f) Radiation and aeronomy, dealing with studies related to the solar radiation and theoretical study of the high atmosphere, application of observation from satellites; research on the physics and the chemistry of the air;
- g) Aeronautical, operating all the stations directly interested on civil aviation at aerodromes and producing services to civil aviation;
- h) Air pollution monitoring, concerned by the air pollution and transportation of pollutants, representation of turbulent eddy transports, research on the structure and properties of the atmospheric boundary layer, including diffusion of constituents and aerosols within and preparing advisory work on atmospheric pollution, ozone sounds, spectrophotometers and solar atmospheric radioactivity;
- i) Professional training and special applications of meteorology, dealing with all aspects of professional training, research in dynamical and synoptic meteorology, especially relating to short-medium range forecasting including meso-scale phenomena, special meteorological problems.

The Service of Geophysics comprises the following departments:

- a) General geophysics and geomagnetism including now the applied geophysics department, which has the responsibility for different studies of basic geophysics in all the aspects and the geomagnetic observatories, surveys and controls the secular geomagnetic variation over the territory, producing maps of magnetic and gravity anomalies, directly related to the mineral and geothermal exploration;
- b) Seismology, which manages the national seismographic network and conducts seismological studies especially experimental field work; elaboration of risk seismic map, and related research; automatic determination of hypocentres earthquakes and focal mechanism.

The Technical Service has the responsibility of the services of library, publications and equipment, and manages the print office (Fig. 2), services to the public directly and through television, radio and press, instrument development, maintenance, production, installation and control of equipment (Fig. 3) and support technical departments for general purposes.

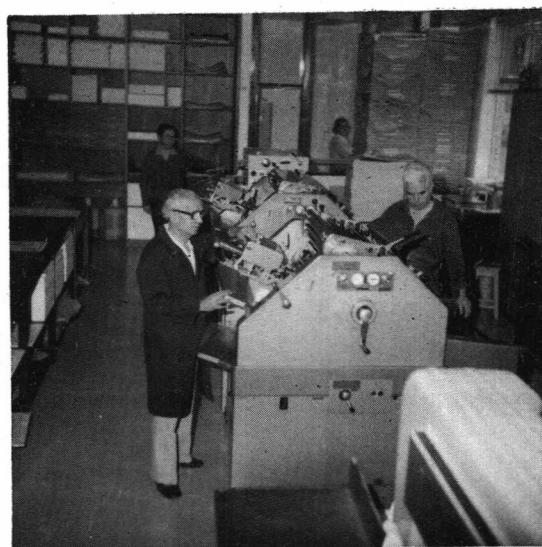


Fig. 2 - Printing office

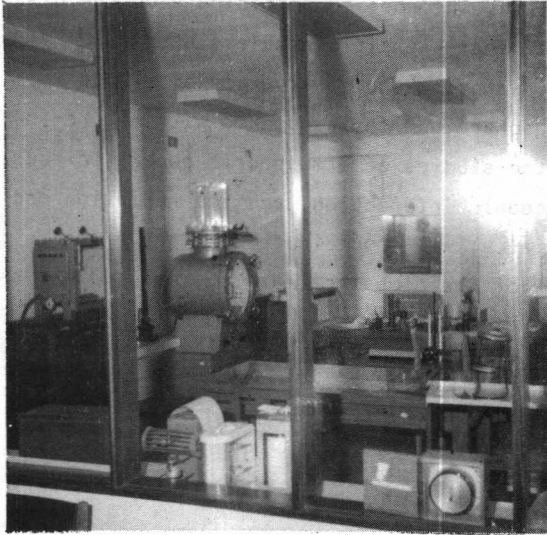


Fig. 3 - Calibration Laboratory

The data processing department is essentially a meteorological computing laboratory where the data preparation (Fig. 4) occupies a very important place, with a modern system of transcription of the data and a meteorological data bank is available for advanced computer and data-processing techniques, it provides also some advice on computers exploitation of data by the professional services.



Fig. 4 - Data Transcription Room

The Meteorological Telecommunications department has the charge of planning and provide the telecommunication facilities (Fig. 5) and services to meet national and international requirements. It develops and exploits new telecommunication techniques and systems; the electronic laboratory associated has the charge of new designs and techniques applied to the meteorology and geophysics.

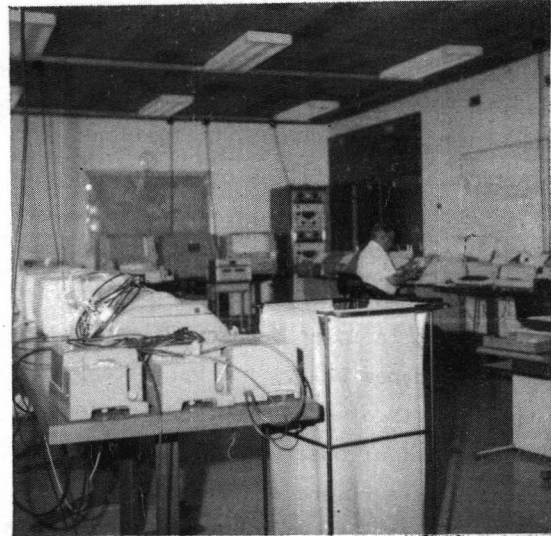


Fig. 5 - Telecommunication Room

The General Administration Service has the charge of all questions related to the personnel management, accounting and budget problems, it provides also the secretariat for the services and departments mentioned above.

There is a special working group for general international matters including WMO and planning studies for short, medium and long-term development affecting the whole institution, and preparing some research of human biometeorology, specially human reactions to physical environmental phenomena and bioclimatology.

4. New projects for meteorological research

The INMG got the basic structure for develop many up-to-date studies related to the environment evolution. Many of the large-scale and long-term processes associated with climate fluctua-

tions are not understood. The general circulation and climate models do not take into account all physical processes. As satellite and new ocean observation fill the data voids, considerable advances in evaluating and understanding climate fluctuations are expected. The INMG is receiving informations from meteorological satellites and very soon more information from the ocean around the coast and Açores, from anchored and drifting buoys. It is necessary a certain period of records to implement the climate models, after empirical and statistical treatment of various climate parameters. The behaviour of the major circulation systems determines major climate fluctuations, and should be watched by satellites observations. Imagery from satellites permit better monitoring of the jet stream, the polar vortex (the major feature of the middle and tropospheric flow in winter), the blocking (not yet been explained dynamically or thermodynamically) the variations in tracks and intensity of storms and anticyclones. This new techniques of observations open a very large field of research and applications for the young meteorologists in the world. The departments of Atmospheric, physics, radiation and aeronomy continues to study the solar heating of the stratosphere relating the observation of solar radiation with ozone measurements, as we know that changes in stratospheric flux and the ozone distribution can have significant effects in the troposphere owing to the couple, radiative and dynamic, between stratosphere and troposphere. Some theoretical research on the chemical reactivities processes have been emphasized, and will continue in short-term plan. The INMG try to contribute in a major effort for the global interpretation of the large scale atmospheric processes under the scope of WMO programs and will improve the direct methods of observation of the upper atmosphere by new radiosounding technique, introducing a complete automatic procedure in processing the data. Recently the measurement of solar ultraviolet radiation started in Lisbon; we intend to contribute to the problem of the absorption of this radiation by ozone, which is primarily responsible for the stable stratification of the atmosphere above the minimum temperature at the tropopause. The participation of meteorologists of the INMG in

stratospheric workshops and conferences will continue in future, in order to participate on the discussions of the scientific problems associated with the prediction and observation of trends in the stratosphere, which associated with the results of the studies of atmospheric general circulation, oceanic interaction, and the radiation and energy balance, will contribute to improve the knowledge of the global climate system.