

**INTERNATIONAL ASSOCIATION OF
METEOROLOGY AND ATMOSPHERIC PHYSICS**

**INTERNATIONAL UNION
OF GEODESY AND GEOPHYSICS**

REPORT OF PROCEEDINGS

XVI GENERAL ASSEMBLY

GRENOBLE

AUGUST — SEPTEMBER 1975

IAMAP PUBLICATION No. 16

TORONTO 1976

**INTERNATIONAL ASSOCIATION OF
METEOROLOGY AND ATMOSPHERIC PHYSICS**

**INTERNATIONAL UNION
OF GEODESY AND GEOPHYSICS**

REPORT OF PROCEEDINGS

XVI GENERAL ASSEMBLY

GRENOBLE

AUGUST – SEPTEMBER 1975

IAMAP PUBLICATION No. 16

TORONTO 1976

FOREWORD

Although the outgoing Bureau is responsible for these IAMAP proceedings covering the period since the Moscow General Assembly in 1971 as well as the Grenoble Meeting in August/September 1975 it has become the custom for the incoming president to write the foreword. I am grateful for this opportunity to make a few remarks.

The major part of the proceedings is devoted to the reports of the activities of the various bodies of the association. These reports including those at the Grenoble Assembly speak for themselves. It is perhaps interesting to note that the volume of activities of the various commissions and other bodies differs considerably. This certainly reflects to some degree the different rate of progress in the respective fields. Considering the rapid progress in most fields and the international character of the Association it would appear that in some cases the level of activity does not seem to be quite adequate.

Important for future scientific activities are the various resolutions passed in Grenoble by IAMAP and by the Union. In the latter case the proceedings contain only those resolutions which are relevant to IAMAP. The proceedings also contain the revisions of IAMAP-statutes.

We would like to draw particular attention to the presidential address at the Grenoble Assembly which was devoted to an exceptional and important topic – the IAMAP/IAGA rivalry. In this address Dr. Fritz gives a valuable survey of the development of the present deplorable situation and points out ways to solve or reduce these difficulties. An IAMAP/IAGA ad hoc Committee was formed which considered this problem. One essential result is the decision to have a Joint IAMAP/IAGA Assembly in Seattle in 1977. It is the hope of all concerned that this occasion will have positive repercussions on future development.

The outline of the scientific program at the Grenoble Assembly contains both the program and the abstracts for those sessions where IAMAP was the primary organizer. For those symposia where IAMAP was not the primary organizer no abstracts are given. Only papers actually presented were considered.

A total of 34 interdisciplinary symposia arranged by more than one association were held at Grenoble. IAMAP was the primary organizer of 8 of these symposia and was involved in an additional 10. Of these 18 symposia IAMAP cooperated on 8 with IAGA, on 7 with IAPSO and on 5 with IAHS. Considering the large number of additional meetings of working groups, business meetings and related activities, it was a comprehensive program unavoidably resulting in many parallel sessions. The situation was further complicated by the fact that three of the eight associations (IAGA, and IAPSO) arranged internal symposia, the total number of which surpassed 30. In view of this situation it seems desirable for future IUGG assemblies that all associations adhere strictly to the ruling that only interdisciplinary symposia are to be arranged.

C. Junge,
President, IAMAP

IAMAP EXECUTIVE COMMITTEE

President:

Prof. Dr. Chr. Junge, Director,
Max-Planck-Institut für Chemie,
D-6500 Mainz,
Saarstrasse 23,
Postfach 3060,
Federal Republic of Germany.

Vice-Presidents:

Prof. P.R. Pisharoty,
Physical Research Laboratory,
Navrangpura,
Ahmedabad-9,
India.

Dr. W.L. Godson,
Atmospheric Environment Service,
4905 Dufferin Street,
Downsview, Ontario,
Canada M3H 5T4

Secretary

Mr. S. Ruttenberg,
National Center for Atmospheric Research,
P.O. Box 3000,
Boulder, Colorado 80303,
U.S.A.

Members

Dr. A.J. Dyer,
Division of Meteorological Physics,
CSIRO,
Box 77, Mordialloc,
Victoria 3195,
Australia.

Dr. E. Hesstvedt,
Institut for Geofysikk,
Universitetet 1 Oslo,
P.O. Box 1022, Blindern,
Oslo 3,
Norway.

Dr. J.T. Houghton,
Clarendon Laboratory,
Oxford, OX1 3PU,
U.K.

Prof. K. Isono,
Water Research Laboratory,
Nagoya University,
Furo-Cho-Chikusa-Ku,
Nagoya,
Japan.

Dr. V.E. Zuev,
IDA CO AN SSR,
Tomsk 29,
Gertsen St. 8,
USSR

CONTENTS

	Page
IAMAP PROCEEDINGS	
Foreword – Prof Dr. C. Junge	iii
1. Executive Committee and Bureau	
1.1 Bureau Report	1
1.2 Grenoble Report	1
2. Commissions and Committees of the Association; Symposia	
2.1 Bureau Report	2
2.2 Grenoble Report	3
3. Commission on Atmospheric Radiation	
3.1 Commission Report	4
3.2 Grenoble Report	10
4. Commission on Atmospheric Ozone	
4.1 Commission Report	12
4.2 Grenoble Report	15
5. Commission on Atmospheric Chemistry and Global Pollution	
5.1 Commission Report	17
5.2 Grenoble Report	18
6. Commission on Meteorology of the Upper Atmosphere	
6.1 Commission Report	20
6.2 Grenoble Report	21
7. Commission on Dynamic Meteorology	
7.1 Commission Report	22
7.2 Grenoble Report	23
8. Commission on Polar Meteorology	
8.1 Commission Report	24
8.2 Grenoble Report	25
9. Commission on Cloud Physics	
9.1 Commission Report	27
9.2 Grenoble Report	30
10. Commission on Atmospheric Electricity	
10.1 Commission Report	31
10.2 Grenoble Report	36

CONTENTS (Cont'd)

	Page
11. IAMAP/IAPSO Joint Committee on Air-Sea Interaction	
11.1 Commission Report	39
12. Inter-Union Commission on Radio Meteorology	
12.1 Commission Report	39
12.2 Grenoble Report	41
13. Liaison with the World Meteorological Organization (WMO)	
13.1 Report of the IUGG Liaison Officer with WMO	42
13.2 Grenoble Report	43
14. Publications	
14.1 Bureau Report	44
14.2 Grenoble Report	44
15. Financial State of the Association	
15.1 Bureau Report	44
15.2 Grenoble Report	46
16. Supplementary Report on Plenary Meetings	
16.1 First Plenary	47
16.2 Second Plenary	54
16.3 IAMAP Resolutions	55
16.4 IUGG Resolutions	62
16.5 Presidential Address	69
17. Statutes of the International Association of Meteorology and Atmospheric Physics	75
18. Scientific Symposia	
18.1 Meteorological and Hydrological Aspects of Continental Drought	85
18.2 Snow and Ice Crystals	91
18.3 GARP First Objective: Weather Predictability	101
18.4 GARP Second Objective: Climate Change	117
18.5 Marine Meteorological Aspects of Pollution	123
18.6 Stratosphere-Mesosphere Relations	128
18.7 High Atmosphere and Space Problems in Atmospheric Electricity	144
18.8 Artificial Weather Modification	153
18.9 Joint Symposia Programmes (IAMAP Secondary sponsor – Titles only)	162
19. Grenoble Assembly Registrants (IAMAP only)	181

1.1 BUREAU REPORT

The following members, elected at the Moscow General Assembly 1971, were in office throughout the quadrennial period:

President:	Dr. S. Fritz, USA
Vice Presidents:	Dr. C.H.B. Priestley, Australia Dr. P.R. Pisharoty, India
Secretary:	Dr. W.L. Godson, Canada
Executive Members:	Dr. R.K. Berggren, Sweden Prof. A. Khrgian, USSR Prof. G. Yamamoto, Japan

Dr. R.E. Munn, Canada, served as Assistant Secretary on selection by the IAMAP Executive Committee. In addition to Dr. Godson and Dr. Munn, the Bureau Secretariat consisted of Ms. N. Derco, who served as unofficial Executive Secretary-Treasurer and Ms. E. Stoyko, Secretary (1973-75). The IAMAP Executive wishes to express its gratitude and appreciation to the Atmospheric Environment Service, and in particular to the Assistant Deputy Minister, Mr. J.R.H. Noble, for permitting the participation in the Bureau Secretariat of the four individuals listed above and for providing the extensive ancillary services so that the true Secretariat expenses to the Association were almost nil.

Individual Commission and Committee reports follow in the next section of the Proceedings. It should be noted however that subsequent to the SCOR General Meeting in December 1974, SCOR withdrew from their involvement in the activities of the Air-Sea Interaction group.

The Executive Committee met at the Melbourne Assembly to discuss plans and proposals for IAMAP Executive and Commission activities. In the interim periods formal business was conducted by correspondence.

1.2 GRENOBLE REPORT

Executive Committee meetings were held during the Grenoble Assembly and were chaired by the President, Dr. S. Fritz. Decisions made by the Executive Committee may be found in these Proceedings under the appropriate agenda items.

The Nominations Committee proposed the following nominations for the new Executive Committee:

President:	Prof. Dr. C. Junge (FRG)
Vice Presidents:	Dr. P.R. Pisharoty (India) Dr. W.L. Godson (Canada)
Secretary:	Mr. S. Ruttenberg (USA)
Executive Members:	Dr. A.J. Dyer (Australia) Dr. E. Hesstvedt (Norway) Dr. J.T. Houghton (USA) Prof. K. Isono (Japan) Dr. V.E. Zuev (USSR)

The above nominations were approved unanimously.

2. COMMISSIONS AND THE JOINT COMMITTEE OF THE ASSOCIATION: SYMPOSIA

2.1 BUREAU REPORT 1971-1975

IAMAP Commissions and the Joint Committee reports are included in the Proceedings in Sections 3-12. However, for a more concise view of Symposia during the four-year period, it is customary to provide a list of symposia, intercomparisons, etc., which were sponsored or cosponsored by IAMAP Commissions and the Joint Committee. A detailed account of the Symposia at the Melbourne First Special Assembly is given in the Proceedings of that Assembly (published 1974). In particular, one major conference, the International Conference on Structure, Composition and General Circulation of the Upper and Lower Atmospheres and Possible Anthropogenic Perturbations, was held at Melbourne and several IAMAP Commissions (IRC, IOC, ICMUA, ICDM, ICACGP) cooperated in the organization of it. In addition, the general symposia held during the four-year period are as follows (by Commission):

Radiation Commission (IRC)

International Radiation Conference, Japan, 1972

Symposium on Clouds and Radiation, Australia, 1974

Ozone Commission (IOC)

Symposium on Atmospheric Ozone and General Circulation, Switzerland, 1972

Commission on Atmospheric Chemistry and Global Pollution (ICACGP)

Symposium on Atmospheric Trace Gases, FRG, 1973

Commission on Meteorology of Upper Atmosphere (ICMUA)

General Sessions – Melbourne Assembly, Australia, 1974

Commission on Dynamic Meteorology (ICDM)

Symposium on Dynamics of Meso-Scale Representation and Fine Mesh Modelling, England, 1973. Cosponsored sessions at Melbourne Assembly, Australia, 1974

Commission on Polar Meteorology (ICPM)

Meteorology of the Polar Regions, Australia, 1974

Commission on Cloud Physics (ICCP)

International Conference on Cloud Physics, U.K., 1972

International Conference on Nucleation, USSR, 1973

International Conference on Weather Modification, USSR, 1973

Nuclei Workshop, USA, 1975

General Sessions – Melbourne Assembly, Australia, 1975

Commission on Atmospheric Electricity (ICAE)

Conference on Long-Range Geographic Estimation of Lightning Sources, USA, 1972

Meeting on Atmospheric Electric Measurement with Aircraft and Radiosondes, etc., USA, 1972

Fifth International Conference on Atmospheric Electricity, FRG, 1974

Joint Committee on Air Sea Interaction

Air-Sea Interaction Symposium, Australia, 1974

Inter-Union Commission on Radio Meteorology (IUCRM)

The Fine Scale Structure of Precipitation and Electromagnetic Propagation, France, 1973

Colloquium on Probing of Atmospheric Constituents, U.K., 1975

In addition, IAMAP cosponsored,
the WMO Symposium on Education and Training in Meteorology and Meteorological
Aspects of Environmental Problems, Venezuela, 1975.

WMO Symposium on Long-Term Climatic Fluctuations, U.K., 1975.

2.2 GRENOBLE REPORT

The symposia, cosponsored by IAMAP Commissions, during the Grenoble Assembly, are listed, with programs and abstracts, in Section 18 (Scientific Meetings) of this Proceedings. Symposia planned for 1976 and early 1977 are listed below:

- (1) 4-10 April 1976, Exeter (U.K.) JOC Study Conference on the Development of Numerical Models for the Tropics.
- (2) April/May 1976, Yugoslavia. JOC/IAMAP Study Conference on Proposed GARP Sub-program on Airflow over Mountains (ICDM).
- (3) 9-18 June 1976, Philadelphia (USA). COSPAR Assembly, including at the beginning a four-day WMO/IAMAP/COSPAR Symposium on Meteorological Observations from Space.
- (4) 26-30 July 1976, Boulder (USA). IAMAP/WMO International Cloud Physics Conference (ICCP).
- (5) 2-6 August 1976, Boulder (USA) WMO/IAMAP Scientific Conference on Weather Modification (ICCP).
- (6) 9-17 August 1976, Ros Dresden (GDR). IAMAP/WMO Symposium on Atmospheric Ozone and related topics (IOC and ICACGP).
- (7) 19-28 August 1976, Garmisch-Partenkirchen (FRG). IAMAP/WMO Symposium on Radiation in the Atmosphere, with special emphasis on structure and radiation properties of particles and clouds (including remote sensing and satellite measurements) (IRC and ICACGP).
- (8) 30 August-3 September 1976, Geneva. UNESCO/WMO Symposium on Problems Related to Solar Energy Utilization.
- (9) 4-8 October 1976, Warsaw. WMO Symposium on interpretation of large-scale NWP products in terms of weather for local forecasting purposes.
- (10) A number of Symposia are planned for 1977 in addition to the IAMAP Assembly (22 August-3 September 1977, Seattle, USA), but usefully definite information on them is not yet available.

Some discussion took place at Grenoble concerning the "Second IAMAP Special Assembly" scheduled for 22 August-3 September 1977, in Seattle, Washington, USA. IAGA's Assembly will also be held at this time and there will be opportunities for several joint symposia.

3. COMMISSION ON ATMOSPHERIC RADIATION

3.1 COMMISSION REPORT 1971-74

This Report covers the principal activities of the Radiation Commission for the period from the Moscow Report (1971) as published in IAMAP Publication No. 15 till the end of 1974.

3.1.1 MEMBERSHIP 1971-1975

J. London (USA) – President
H.-J. Bolle (FRG) – Secretary
A. Ångström (Sweden) – Honorary Member
F. Möller (FRG) – Honorary Member
W. Mörikofer (Switzerland) – Honorary Member
M.I. Budyko (USSR)
R. Dogniaux (Belgium)
H. Hinzpeter (FRG)
J.T. Houghton (United Kingdom)
K.Ya. Kondratyev (USSR)
Jacqueline Lenoble (France)
Anna M. Mani (India)
G.V. Rosenberg (USSR)
Z. Sekera (USA) (deceased 1973)
K. Sekihara (Japan)
D. Spänkuch (German DR)
D. Wark (USA)
F. Yamamoto (Japan)
V.E. Zuev (USSR)

3.1.2 FINANCIAL STATEMENT

Receipts

IAMAP Allocations	\$ 2,852.00
Others	7,457.15
Cash on Hand and in Banks 1. Jan. 1971	
1. Jan. 1971	<u>1,698.84</u>
Total	\$ 12,007.99

Expenditures

Administration	\$ 530.75
Publications	1,000.00
Assemblies	2,455.30
Symposia	69.94
Scientific Meetings	157.51
Contracts	<u>6,430.00</u>
Total	\$ 10,643.50

Cash on Hand and in Banks

31 Dec. 1974	\$ 1,364.49
--------------	-------------

3.1.3 BUSINESS AND ADMINISTRATIVE MEETINGS

Business meetings were always held in connection with scientific meetings. There have been three sets of business meetings; during the IUGG Assembly in Moscow, 1971; the Radiation Symposium in Sendai, 1972; and the IAMAP First Special Assembly in Melbourne, 1974.

There was one administrative meeting between the President and the Secretary in Arosa at the time of the Ozone Symposium for the planning of the Symposium on Clouds and Radiation in Melbourne, 1974, and the coordination of the work of the ad hoc groups (see section 3.1.7).

3.1.3.1 MOSCOW, XV IAMAP GENERAL ASSEMBLY, JULY – AUGUST 1971

The Radiation Commission approved the programme of the Symposium on Radiation planned for Sendai. It discussed the results of the radiometersonde intercomparisons, and the role of radiation within GARP. New members and officers of the Commission were elected. J. London succeeded K. Ya. Kondratyev as President, and H.-J. Bolle was elected as Secretary.

3.1.3.2 RADIATION SYMPOSIUM SENDAI, 26, MAY – 2, JUNE 1972

Two Business Meetings were held in Sendai on 27 and 31 of May. Major items of the discussions were the following.

- a) The Radiation Commission received a report about recent activities of the COSPAR W/G. 6 which presented a study on “Application of Space Techniques to Some Environmental Problems” to the United Nations Conference on the Environment. The Radiation Commission welcomed this initiative and supported the basic content of the COSPAR report in a letter to the United Nations Special Committee on Problems of the Environment (SCOPE). The Radiation Commission noted that severe problems of calibration are involved in the application of space techniques to measure climate parameters which should be analysed in depth by a special ad hoc group.
- b) A report of the ad hoc group on Radiometersonde Intercomparison and Calibration presented by J. Gille was very well received, and the Radiation Commission proposed that JOC for GARP be asked to accept further co-responsibility for the group.
- c) The President reported on a meeting of the Inter Union Commission on Solar Terrestrial Physics (IUCSTP) and introduced the problem of very accurate measurements of the solar flux and its spectral distribution into the discussion.
- d) The Radiation Commission responded to a statement of J. Kuettner, the Director of the ISMG for GATE, about the development of a radiation subprogram in GATE by offering its advisory capacity for the definition of such a program. A resolution concerning the calibration of radiation instruments used in international programs was drawn up.
- e) The Radiation Commission received several proposals for work which needs to be done. Some of these proposals led to the institution of ad hoc working groups (see section 3.1.7).

3.1.3.3 MELBOURNE, IAMAP FIRST SPECIAL ASSEMBLY, 14.-25. JANUARY 1974

The discussions in Melbourne centered around the work of the different ad hoc Working Groups which had been set up since autumn 1972. The Radiation Commission heard the progress reports of the W/G's, gave advice for the direction of future work, and redefined the terms of reference where it became necessary.

On behalf of JOC, R.W. Stewart informed the Radiation Commission about the planning for GATE and the status of the Radiation Sub-Programme. Other Sub-Programmes of GARP were reviewed in order to evaluate the contribution made by radiation groups and to radiation research. Such Sub-Programmes of interest are CAENEX, AMTEX, and MOONEX. B.R. Döös drew attention to the subject of calibration and intercomparison of geostationary meteorological satellite measurements and their usefulness with respect to the determination of radiation balance components. The Radiation Commission proposed a follow up to this problem within their W/G's.

The Radiation Commission noted its interest in several sessions during the IUGG Assembly in Grenoble, 1975. The Commission accepted the invitation of the Federal Republic of Germany for the next Radiation Symposium (1976).

3.1.4 SCIENTIFIC SYMPOSIA

The Radiation Commission sponsored or participated in sessions or symposia at four major Conferences during the period covered by this report.

3.1.4.1 MOSCOW, 1971

The Radiation Commission participated actively in the Symposium on Energetics and Dynamics of the Mesosphere and Lower Thermosphere, which was jointly sponsored by IAMAP and IAGA. Seven papers concerned with radiation problems were presented.

3.1.4.2 SENDAI, 1972

The Radiation Symposium held from 26. May to 2. June 1972 in Sendai was co-sponsored by WMO, COSPAR (ICSU), the American Meteorological Society, the Meteorological Society of Japan, and was strongly supported by the Japan Meteorological Agency. It was attended by 106 participants from 14 countries. Six invited and 74 contributed papers were presented. 58 papers could only be read by title but their extended abstracts are contained in the proceedings (see section 3.1.5).

3.1.4.3 BAKU, 1973

At the XXIV IAF Congress in Baku, 8.-14. October 1973, the Radiation Commission co-sponsored sessions with the following topics: (1) Meteorology, Hydrology, and Oceanography; (2) Atmosphere and Sea Pollution; (3) Biosphere; (4) Geology and Geomorphology, (5) Test Sites and Combined Sub-Satellite Experiments; (6) Automatic Techniques of Data Processing. At this meeting, an informal discussion about "Standard Radiation Atmospheres for Flux Calculations and Standard Procedures to Compute Atmospheric Radiative Transfer in a Scattering Atmosphere" also took place, with 17 scientists participating.

3.1.4.4 MELBOURNE, 1974

During the IAMAP First Special Assembly in Melbourne, 14.-25. January 1974, the Radiation Commission was involved in the Conference on Structure, Composition and General Circulation of the Upper and Lower Atmospheres, and Possible Anthropogenic Perturbations, and organized jointly with the Commission on Cloud Physics a Symposium

on Clouds and Radiation. 17 papers were presented at two sessions dealing with the structure of clouds, their optical properties, and their effects on the earth heat budget.

3.1.5 PUBLICATIONS

Proceedings of the International Radiation Symposium, Sendai, Japan, May 26 -- June 2, 1972. 565 pages.

Standard Procedures to Compute Atmospheric Radiative Transfer in a Scattering Atmosphere. Volume I: Generalities and Review of Methods for a Plane-Parallel, Horizontally Homogeneous Atmosphere. Volume II: List of References for Volume I. Editor: Jacqueline Lenoble, Laboratoire d'Optique Atmosphérique, U.E.R. de Physique Fondamentale, Université des Sciences et Techniques de Lille, France. The distribution of these two reports is limited, but it is intended to publish a revised version 1976.

3.1.6 PLANNED SYMPOSIA

The Radiation Commission will take an active part in the Symposium on Meteorological Observations from Space: Their Contributions to the First GARP Global Experiment, which is to be held in conjunction with the XIXth Plenary Meeting of the Committee on Space Research in Philadelphia, USA, 7.-10. June 1976. The Symposium is cosponsored by IAMAP. H.-J. Bolle has been appointed IAMAP representative at the Scientific Organizing Committee.

The Radiation Commission and the Commission on Atmospheric Chemistry and Global Pollution will organize a Symposium on Radiation in the Atmosphere with special emphasis on the structure and radiation properties of aerosols and clouds including remote sensing and satellite measurements in Garmisch-Partenkirchen, F.R. of Germany, 19.-28. August 1976.

The Radiation Commission proposes the following topics for the Second Special Assembly of IAMAP and IAGA to be held in Seattle, 20. August -3. September 1977,:

- Line parameter and spectroscopic observations of trace gases in the troposphere and stratosphere (jointly with IAGA).
- Inversion methods in atmospheric research.
- Radiation flux computations in climatological and dynamical models.
- Cloud fields and radiation (jointly with Commission on Cloud Physics)
- Surface, airborne and satellite measurements of the aerosol concentration and size distribution.

3.1.7 SCIENTIFIC ACTIVITIES

3.1.7.1 Radiometersonde Intercomparison Program

The Radiometersonde Intercomparison Program which was initiated in Bergen, 1968, was concluded with a Report by J.C. Gille and P.M. Kuhn: The International Radiometersonde Intercomparison Program (1970-1971). The Report was submitted to the JOC of GARP. It summarizes the experiments in six recommendations for the future use of these sondes. The program was supported by WMO.

3.1.7.2 AD HOC WORKING GROUPS

3.1.7.2.1 Introduction

Noting the existence of problems in the general field of atmospheric radiation which need international cooperation in order to be solved, the Radiation Commission decided to institute ad hoc Working Groups according to proposals submitted to the Commission by individual scientists or scientific groups. These W/G.'s are set up to advise other bodies or to clarify positions and to prepare material on which the R.C. could base its recommendations. The following W/G.'s have been instituted during autumn 1972.

3.1.7.2.2 Ad hoc W/G on the Definition of the Radiation Sub Programme for GARP (Chairman T.H. Vonder Haar).

During the Sendai Meeting the advisory capacity of the Radiation Commission for the GATE Radiation Sub-Programme was called upon and after further considerations with JOC and ISMG a small review group was set up in Nov. 1972 to assist JOC, and in particular ISMG in establishing a radiation sub programme for GATE. The group met twice before the GATE field phase, 19.-24. Feb. 1973 in Leningrad, USSR, and 4.-8. March 1974 in Fort Collins, USA, and advised the ISMG in three primary areas:

- a) Preparation of the detailed plan for the GATE RSP (GRSP).
- b) Special radiation instrument intercomparisons needed before, during and after GATE.
- c) Exchange of information between radiation scientists participating in GATE and related programmes.

The results of this task were summarized by H. Kraus (ISMG) in GATE Report No. 4, "The Radiation Sub Programme for the GARP Atlantic Tropical Experiment", WMO, Geneva 1974, and in the "Final Report of the Second Informal Planning Meeting for the GRSP", WMO, Geneva, April 1974. It is planned that the group should meet again after GATE to review and discuss the scientific results of the RSP and to advise on the data validation process.

3.1.7.2.3 Ad hoc W/G on Standard Procedures to Compute Atmospheric Radiative Transfer in a Scattering Turbid Atmosphere (Chairman J. Lenoble).

After a number of powerful computation methods have been fully developed, it becomes necessary to check on the accuracy of the different methods and to find out the most economical procedures for different future applications. The group had a number of meetings with leading scientists in this field, and studied the involved problems thoroughly. A comprehensive report on a number of aspects of the work was submitted to the Radiation Commission and is now being prepared for publication. A final report can be expected in 1976 (see section 3.1.5).

3.1.7.2.4 Ad hoc W/G on Transmission Functions for use in Inversion Procedures (Chairman D. Wark).

According to a resolution adopted by the Radiation Commission a group of experts was asked to examine the problems of transmittances to be used in indirect soundings from satellite measurements of spectral radiances and to recommend standard transmission functions to be employed during the FGGE. The group reviewed the basic problem involved in the use of absorption parameters and computation methods to derive transmittances from them, as well as the results of special experimental investigations. First proposals for an action to standardize transmittances for use during FGGE have been presented. The group will continue its work.

3.1.7.2.5 Joint ad hoc COSPAR/IUGG W/G on Calibration and Intercomparison of Rocket and Satellite Radiation Instruments (Chairman J. Houghton).

In view of the needs of the Global Atmospheric Research Programme, the WWW and future space activities including the use of Spacelab and the monitoring of climate parameters from different observation platforms, IUGG and COSPAR joined in the study of the compatibility and absolute calibration of experiments on board the various space systems and at ground based observations platforms. In order to elaborate on the background and necessary steps to be taken to solve this problem, an ad hoc group was jointly set up by the two primary groups, COSPAR W/G. 6 and the IAMAP Radiation Commission in order to:

- review current calibration methods of radiation sensors with respect to accuracy and long term stability,
- investigate the necessity and feasibility of new inflight calibration standards,
- develop methods of intercomparison for experiments on board different spacecraft, e.g. over certain reference areas,
- look into the problem to what extent groundbased (or aircraft – or balloonborne) measurements will be needed and available to obtain more accurate calibration and more detailed information about the atmosphere and of climate parameters.

The group started its work and had first informatory meetings. It organized a special session on this topic during the Grenoble Assembly in cooperation with IAGA.

3.1.7.2.6 Ad hoc W/G on a "Standard Radiation Atmosphere" (Chairman: R.A. McClatchey).

A pressing problem, not only for GARP, is the determination of the accuracy of radiation computations in the atmosphere. An evaluation and comparison of existing methods is presently very much impeded due to the inhomogeneity and incompleteness of the input parameters used by different authors. It is therefore necessary to (i) recommend model atmospheres covering the variability of the atmosphere with respect to seasons and latitude, which can be used in comparative calculations (ii) to establish an underlying basis for molecular absorption calculations and (iii) to propose computation methods for atmospheric emission and absorption in different applications. The working group started its work by correspondence, had a meeting in Baku (see section 3.1.4.3) and is continuing its work.

3.1.7.2.7 Ad hoc W/G on Units and Terminology (Chairman J. Howard).

The introduction of the new SI – System as well as some evolutionary tendencies in the notation of radiation quantities made it very desirable to clarify the new situation, and to recommend units and the related terminology for general use. In order to provide the Radiation Commission with the necessary background information a W/G was set up, which has submitted a status report and is continuing its work.

3.1.7.3 OTHER SCIENTIFIC ACTIVITIES

The Radiation Commission received a number of other proposals for fields in which advice, guidance or organization of the scientific work seems to be desirable. Though the Radiation Commission was so far not in the position to take appropriate actions on these topics the problems listed below will be followed up carefully with the aim of possibly instituting appropriate working groups in the future.

- a) Determination of the solar constant and the solar spectral irradiance at 1 A.U.
- b) Standardization of inversion techniques
- c) Global monitoring of aerosol
- d) Future Radiation aspects of GARP and the experimental verification of radiation computation techniques.

3.1.8 Deceased former members of the Radiation Commission
 Andrew J. Drummond, 5 Sept 1917 -- 26 August 1972.
 Rudolf Schulze, 13 May 1906 -- 16 July 1974.

3.2 GRENOBLE REPORT, 1975

3.2.1 Business Meeting

The Radiation Commission held its Business Meeting on Friday, 29. August. According to the practise introduced in Melbourne, the meeting was open to guests, except for the last two items (membership).

Participation

Members: J. London, President

H.-J. Bolle (FRG)

R. Dogniaux (Belgium)

J. Houghton (U.K.)

J. Lenoble (France)

F. Möller (FRG)

D. Spänkuch (DDR)

D. Wark (USA)

G. Yamamoto (Japan)

V.E. Zuev (USSR)

Chairman of ad hoc groups, guests:

K.L. Coulson (USA)

A.L. Fymat (USA)

I. Galindo (Mexico)

J.C. Gille (USA)

D.F. Heath (USA)

L.D. Kaplan (USA)

F. Kasten (FRG)

P. Kuettner (WMO)

J. Plassard (Libya)

W.L. Smith (USA)

T.H. Vonder Haar (USA)

H.W. Yates (USA)

3.2.2 PROGRESS REPORTS OF AD HOC WORKING GROUPS

The Radiation Commission heard the progress reports of the following ad hoc groups.

- a) Units and Terminology (summarized by Bolle). The report consists of two documents which refer to the present status. The chairman, J. Howard, resigned and proposed E. Raschke to continue the work which could not yet be concluded.
- b) Standard Radiation Atmosphere (summarized by Bolle). Due to uncontrollable reasons the chairman, R.A. McClatchey, had to interrupt the work for some time. Agreement in some points have been reached between the members, but no final conclusion has yet been elaborated.
- c) Transmission Functions for Inversion Procedures (Chairman D. Wark). Considerable progress has been made in the definition of standardized transmission functions for temperature and humidity inversion, but the results of some balloon and laboratory experiments which are under way have to be expected before final conclusions can be drawn.
- d) Calibration and Intercomparison of Satellite instruments (Chairman J. Houghton).
A special session at the Grenoble meeting was dedicated to this problem and an ad hoc group meeting took place in Grenoble. The discussion disclosed the complexity of the problem and the ad hoc group could not yet make specific recommendations how to overcome this situation. However, activity was stimulated and will continue.
- e) Standard Computation Procedures (Chairman Jacqueline Lenoble).
The conclusions of this group were summarized in three reports which will be followed by a fourth one in 1976. The report, especially the first two volumes, received most favourable comments. Madame Lenoble, however,

noted that the last part of the work suffered from inadequate support from the scientific community. This part deals with intercomparisons of computer computations for a standard set of input parameters, and so far not many groups communicated back their results.

- f) GATE Radiation Sub Program (Chairman T.H. Vonder Haar). The field phase of the GATE RSP could successfully be concluded. The chairman reported that the group met again in June, 1975, in Leningrad, to discuss with the scientists of the GATE Radiation Center the evaluation and validation of the data sets. There has been and is still a close cooperation between all participating parties which makes it desirable that the group is not immediately dissolved.

The Commission noted that the group cooperated extremely well with ISMG and that the work was very successful.

The Commission thanked the ad hoc groups for their work and after detailed discussion specified the expected results of the future work for each group.

3.2.3 **WORKING GROUP ON INVERSION TECHNIQUES**

Following a proposal of Dr. Fymat the Commission concluded it to be time now to set up an ad hoc group to look at the inversion techniques and first to identify the inherent problems on the way towards a standardization of the methods.

3.2.4 **SOLAR CONSTANT AND SOLAR SPECTRAL IRRADIANCE**

The Commission heard short reports of Dr. Heath and Dr. Kaplan about a meeting in the USA at NASA and NCAR in which the question of the measurement of the solar constant and its spectral distribution were discussed.

The Commission concluded that it is presently not in the position to recommend a solar constant value within 1% accuracy but strongly recommended further efforts to continue with measurements and to improve their accuracy.

3.2.5 **GLOBAL ATMOSPHERIC AEROSOL RADIATION EXPERIMENT**

The Radiation Commission received a detailed proposal from K. Ya. Kondratyev to initiate a global experiment to investigate the concentration and radiation properties of the aerosol. The Commission endorsed the principal aims of the proposal. It noted, however, that the proposal was extremely broad and it was not clear where the resources could come from to set up appropriate logistics which would certainly be required in order to carry out the experiment. It was recommended that an appropriate committee be asked to review the proposal for JOC and to discuss further recommendations with JOC.

3.2.6 **GARP**

The Commission heard a short report about AMTEX from Prof. Yamamoto and considered further discussions with JOC about the radiation objectives within FGGE and the climate objective within GARP.

3.2.7 **MEMBERSHIP**

The Radiation Commission recommended new members to IAMAP and reelected J. London as President and H.-J. Bolle as secretary. A list of the proposed members follows:

Honorary Members:

A. Angstrom

Sweden

F. Möller

F.R. Germany