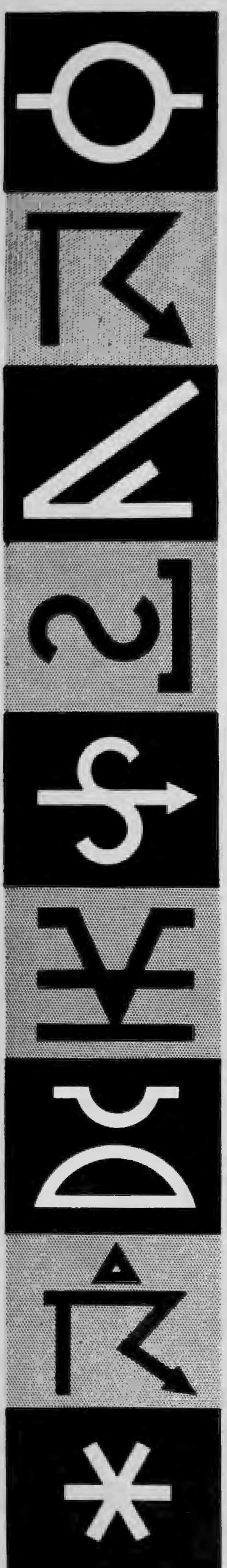

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WMO/IAMAP SYMPOSIUM ON EDUCATION AND TRAINING IN METEOROLOGY AND METEOROLOGICAL ASPECTS OF ENVIRONMENTAL PROBLEMS

More than 100 participants and observers attended the WMO/IAMAP Symposium on meteorological education and training, held in Caracas, Venezuela, February 17-22, 1975. As the lengthy "official title" of the Symposium indicates, participants discussed not only the traditional education of weather forecasters but also the specialized training required for meteorological applications over a very wide array of environmental fields. This latter demand seems to be growing exponentially.

Dr. A. Nyberg of Sweden, Director of the Symposium, described the role of WMO in the field of meteorological education and training. He and many subsequent lecturers spoke of the important achievements of WMO in standardizing curriculae, in preparing syllabi and in providing support for meteorological training facilities in the developing world. In Africa, for example, a relatively large number of students have graduated from WMO-supported regional institutes in Algeria, Egypt, Kenya and Nigeria.

The sessions on environmental training for meteorologists were lively. Professor Van Mieghem captured the spirit of the discussions in his written comments, which are reprinted here in their original French.

> "Le nombre de services requis de la météorologie croit exponentiellement dans le temps et la diversité des domaines d'application ne cesse d'augmenter: transport par terre, par mer et par air, agriculture, santé publique, protection d'environnement et des réserves d'eau. Il incombe aux services météorologique de rendre tous ces services à la communauté, mais il ne peut être question de former des météorologistes chefs d'orchestre connaissant par coeur toutes les partitions. Le météorologiste est un geophysicien. En sciences il n'ya pas de chef d'orchestre: il y a seulement des virtuoses et c'est fort bien ainsi. Pour accomplir toutes les tâches que la communauté exige d'un Service météorologique, celui-ci doit utiliser un personnel météorologique ayant acquis certain notions dans les divers domaines d'application de la météorologie et faire appel à des experts ad hoc ayant reçu quelques éléments de météorologie".

The Canadian contingent consisted of C.M. Penner, R.E. Munn and R. List. Mr. Penner gave a paper on "training for applications of meteorology to environmental problems", in which he reviewed the AES continuing program of refresher courses. He also was a session chairman and a rapporteur. Dr. Munn gave a paper on training in air pollution meteorology while Professor List spoke on education and training in the field of weather modification.

COLLOQUE SUR LES ÉTUDES ET LA FORMATION EN MÉTÉOROLOGIE ET LES ASPECTS MÉTÉOROLOGIQUES DES PROBLÈMES DE L'ENVIRONNEMENT, ORGANISÉ

par l'OMM/IAMP

Plus de 100 participants et observateurs ont pris part au colloque organisé par l'OMM/IAMP portant sur les études et la formation en météorologie, qui s'est tenu à Caracas, au Vénézuela, du 17 au 22 février 1975. Comme l'indique le très long titre officiel du colloque, les participants ont examiné non seulement les études traditionnelles des prévisionnistes, mais encore la formation spécialisée qu'exigent les applications de la météorologie à une très vaste gamme de discipline de l'environnement. La demande semble s'accroître à un rythme accéléré dans ce dernier domaine.

M. A. Nyberg de Suède, directeur du colloque, a décrit le rôle de l'OMM dans le domaine des études et de la formation en météorologie. Lui et bien d'autres conférenciers ont parlé des importantes réalisations de l'OMM en matière de normalisation des cours, de préparation des programmes et de soutien aux installations permettant la formation en météorologie dans les pays en voie de développement. En Afrique, par exemple, les instituts régionaux subventionnés par l'OMM ont remis des diplômes à un nombre relativement important d'étudiants en Algérie, en Egypte, au Kenya et au Nigéria.

Au cours de sessions animées, on a abordé la formation des météorologistes en matière d'environnement. Les remarques écrites qu'a formulées, en français, le professeur Van Mieghem et que nous reproduisons textuellement ci-dessous, traduisent bien l'esprit de ces discussions.

"Le nombre de services requis de la météorologie croît exponentiellement dans le temps et la diversité des domaines d'applications ne cesse d'augmenter: transport par terre, par mer et par air, agriculture, santé publique, protection d'environnement et des réserves d'eau. Il incombe aux services météorologiques de rendre tous ces services à la communauté, mais il ne peut être question de former des météorologistes chefs d'orchestre connaissant par coeur toutes les partitions. Le météorologiste est un géophysicien. En sciences il n'y a pas de chef d'orchestre: il y a seulement des virtuoses et c'est fort bien ainsi. Pour accomplir toutes les tâches que la communauté exige d'un Service météorologique, celui-ci doit utiliser un personnel météorologique ayant acquis certaines notions dans les divers domaines d'applications de la météorologie et faire appel à des experts ad hoc ayant reçu quelques éléments de météorologie".

La délégation canadienne comprenait MM. C.M. Penner, R.E. Munn et R. List. Dans sa conférence intitulée "formation en vue des applications de la météorologie aux problèmes de l'environnement", M. Penner a examiné le programme permanent de cours de révision du SEA. Il a également présidé une session et fait office de rapporteur. M. Munn a parlé de la formation en météorologie de la pollution atmosphérique et le professeur List a traité des études et de la formation dans le domaine de la modification du temps.

TRAINING FOR APPLICATIONS OF METEOROLOGY TO ENVIRONMENTAL PROBLEMS*

by C.M. Penner

Introduction

A very rapid growth of meteorological services took place in the "forties" spurred on by the demands of military and civil aviation. The major impetus came from the demands and requirements for forecasting services. Those of us who participated in this growth of meteorology are keenly aware of the role and importance of meteorology to aviation and the role that aviation has played and continues to play in fostering advances in meteorology. These roles still exist and are still of great importance. However, the trend of the "seventies" is that aviation is no longer our first or even our most important customer. Other uses of forecasting services and many other applications of meteorology to environmental problems are coming to the forefront and are requiring major efforts on the part of National Meteorological Services.

Once (more or less adequate) observational networks were established, and data processing communications and forecasting had been automated, at least partially, the Meteorological Services had a very valuable product to sell. Although consumers were not hard to identify, they had to be sought out. If the potential user does not know what information is available, if he does not know how to use and interpret the available information, if he has no appreciation of meteorology – then he cannot make any use of it. The non-meteorological user of a meteorological service is not in a position to get his information from scientific meteorological journals or from research specialists. He must usually obtain his information in an operational or day-by-day setting.

Organization for the Provision of Scientific Meteorological Services

The operational weather forecaster (Class I or Class II meteorologist) is fully occupied with the daily tasks of forecast production and distribution and is not in a position to provide a wide spectrum of services, advice and consultation, data-processing, statistics and investigations to a wide variety of users in other scientific disciplines, or to cater to the specialized needs of agriculture, forestry, industry, resource development, etc.

To provide scientific meteorological services (other than weather forecasting services) to such varied users, we have set up Scientific Support Services Units in each of the six major regions in Canada. These units are staffed by qualified Class I meteorologists and by qualified technical staff at the Class II and III levels. Their task is to provide meteorological, climatological weather services to local users of various types either scientific or laymen.

Examples of Types of Services Provided

There are many examples of the type of work performed and the problems encountered by the meteorologists working as Scientific Service Officers. It should be stressed again that these are not research meteorologists although they do carry out local scientific investigations. The basic research and the major research projects are carried out by the research teams of the headquarters meteorological research establishment or the research is performed in the universities or by other research institutes or groups. The scientific services meteorologist is an operational meteorologist concerned with the solution of immediate or local problems for the most part. He provides advice and consultation on meteorological problems encountered by the user and provides meteorological advice and assistance on interdisciplinary environmental research projects. The main research project, for example, may be a forestry research project, but meteorological advice is needed by the forestry scientists.

Training Requirements

The basic training requirements for operational meteorologists who are to work in these areas are those of a Class I meteorologist followed by experience as a forecaster or sometimes by experience in research or other specialized areas.

The wide variety of problems encountered by the scientific services meteorologists will clearly require a broadly-based meteorological knowledge, both theoretical and practical, obtained through training and experience. He will need a thorough knowledge of the data base in meteorology and of the structure and behaviour of atmospheric weather systems. A research scientist trained in a narrow research specialty who knows little about the structure of atmospheric weather systems will not be able to deal effectively with the problems encountered at the user interface. The trend in university-based meteorological education is to have more and more specialization and pay less and less attention to the atmospheric engine as a total system – in other words – to the study of dynamic-synoptic meteorology as applied to atmospheric circulation and weather patterns. Such specialization is not likely to produce the meteorologist-generalist needed to work in environmental problems.

I would like to quote here from Dr. Edward S. Epstein[+] –

> "It is hard for me to visualize an effective meteorologist at any level . . . who does not have some understanding and appreciation of weather, and to me, this is what Synoptic Meteorology is all about."

Later, in the same article he continues,

> "Truly applied meteorology will require two sorts of specialists: meteorologists with an appreciation of the areas to which application is to be made, and a good knowledge of the methodology for applying this knowledge; and specialists in the area of application who also have a good understanding of how applications are made and an appreciation of meteorology."

In other words, environmental problems will need to be solved by a team approach – an interdisciplinary team approach – and this is the role, on the operational side, of the Scientific Services Meteorologist. Clearly, similar roles will be found among scientists in research teams.

An individual who can be an expert in two scientific disciplines say, meteorology and agriculture, occasionally exists but is such a rare bird that he should never be considered as a real possibility in the planning of meteorological services or projects. Of course, he would be welcomed with open arms if he should turn up.

Therefore, we look basically to training meteorologists and developing in them an appreciation of the problems in the other disciplines and how meteorology can be applied in other disciplines.

Training Needs for Applications to Environmental Problems

Firstly, then, our meteorologist must have a sound understanding of weather systems on all scales solidly based on physical theory and an appreciation of the fields in which meteorological science is to be applied. He must be sensitive to the problems in another area of science. He must be able to apply his knowledge and understanding to these problems and develop skill in identifying and formulating the meteorological problems for the non-meteorological user. He must be able to work with and interpret meteorology to the user.

After his training in professional meteorology which should include certainly a survey of a wide range of applications and perhaps a more detailed study of one area as a subject for a research thesis for example, he needs to acquire further competence in the fields of applications with particular reference to the user requirements. In addition, he needs to develop knowledge of physical modelling and computer simulation. He needs to develop skills in communications and public relations.

*Extracted from a paper prepared for the WMO/IAMAP Conference at Caracas, Venezuela, February 1975.

+1972– AMS/UCAR Symposium on Manpower and Education Needs in the Atmospheric Sciences. Bull. Amer. Met. Soc. 53, p 599.

RETIREMENT: "MAX" WARREN

Mr. S.M. "Max" Warren retired from his position at the Gander Weather Office on December 30, 1974 after thirty-seven years of faithful and conscientious Government service.

He was born at Heart's Content on September 25, 1915 and began his career with the Department of Education, Government of Newfoundland, as a teacher on September 1, 1937.

In October 1941 he came to Gander as a Meteorological Assistant, following in the footsteps of his brother Charles.

From this beginning Max progressed to instructor/climatologist, acting administrative assistant and supervisor EG-ESS 4 in Gander. Max then attended ASTS in Ottawa during 1967 where he successfully completed a course in advanced meteorology. Upon returning to Gander he was promoted to operations technician EG-ESS 5.

To these positions Max brought a sense of duty and dedication which won him the respect of his co-workers at Gander and throughout the Service.

Max is active in the community life of Gander. He is a devoted member of the Anglican Church congregation and takes keen interest in civic and social projects.

Max is married to the former Naomi North of Bay Roberts, Newfoundland. They have three children; two sons, Robert and Calvin, both reside in Gander and are employed with Eastern Provincial Airways, and a young daughter, Barbara, at home.

Left to Right. Mrs. C.C. Jeans, Barbara Warren (daughter), Mrs. Max Warren, Max Warren, Mr. Robert Warren (son), and Mrs. Robert Warren.

PROGRAMMED INSTRUCTION IN ELEMENTARY METEOROLOGY

by Len C. Oddy

Introduction

By 1969, the Canadian Weather Service, now the Atmospheric Environment Service had been training meteorological technicians at a centralized location for nearly a decade. This was the Air Services Training School in Ottawa. This experience permitted the identification of several different training requirements in the field of elementary meteorology theory. Among these were the need to provide:

1) an individualized approach to permit differing rates of learning
2) remedial training for weak students
3) enrichment for bright students
4) refresher training of experienced observers prior to advanced courses.

It was realized that the self-instruction method could meet these needs. At the time, the meteorological training staff, although widely experienced in meteorology and in instructional methods, was relatively inexperienced in the writing of such programmed texts. For this reason it was decided to contract the writing of the program to a commercial programming company, under the technical and editorial control of meteorological staff of the school. A contract was finally awarded to INTEXT. Inc. of Montreal, a subsidiary of International Correspondence Schools, to produce a programmed text, in both English and French, to meet specific training objectives in Elementary Meteorology.

Development

After over a year of writing, testing and revision the program was ready in its first English edition early in 1970. About six months later the French edition was also available. One-to-one and small group tests had been carried out by Intext during the writing of the program, and large group tests were conducted by the meteorological staff of the school, before acceptance, to ensure that the program would give the results guaranteed for it by the designers. Criterion examinations produced "80/80" or better on each part of the program, i.e. at least 80% of the group achieved scores of 80% or more, when tested soon after completion of each module.

The program is made up of seven books or modules and for the most part is written in a linear format. It therefore provides small instructional steps and immediate confirmation of the correct answer to the student. It is designed for a student population having no prior meteorological training. A junior matriculation background is assumed.

The modules vary in length and complexity and are designed to have a minimum of dependence on one another. It is therefore feasible to tailor the application of the program to different training requirements by the exclusion of some of the modules, totally or in part.

After about a year of use with large groups the entire text, in both English and French, was converted to a computerized system of entry – editing – photocomposition and typesetting known as "Alpha-text". The major advantage of this system is the speed and ease with which changes in text, type or format can be made without the need for extensive proof-reading.

Application

It is important to realize that such programmed texts do not replace the instructor. Satisfactory results cannot be obtained if the student is expected to work through the material without help or guidance. The program is simply another resource open to the teacher who must, however, continue to be concerned with individual differences in ability and motivation. The instructor's role becomes one of providing encouragement, direction, introductions; of leading discussions; of formal lecturing on especially difficult concepts. The successful attainment of training goals remains the responsibility of the instructor.

In application to field training, correspondence-type courses, it is vital that a schedule of progress be set up for the student and that he receive constant feedback and remedial advice from the instructor.

Since 1970, this programmed text or adaptations of it, have been used in the following training areas:

A. In-house Ab-initio Courses
   - Meteorological Technician
   - Radio Operator
   - Air Traffic Controller

B. Field Training (Correspondence) Courses
   - Advanced Meteorology Review
   - Radio Operator Introduction
   - Radio Operator Weather Briefer
   - Forest Fire Meteorology

C. Other
   - Air Pollution Meteorology
   - Private Pilot Licensing

In use, the original programmed text has been adapted to the unique requirements of these courses in several ways. In some cases the subject matter of certain modules was irrelevant and the entire module was omitted, as for example, Module 6 in a non-aviation course. Condensed versions of the modules have been used in some situations where review or remedial emphasis was required rather than initial exposure. In other cases, the criterion examinations were modified to stress the achievement of only some of the learning objectives rather than all of them. Sometimes the criterion examinations, which follow each module, were replaced by one or two consolidated examinations in situations requiring a higher level of recall than normal. Finally, due to its modular design, this text is open-ended in the sense that additional modules may be added from time to time where *specific applications* of the general theory warrant it.

Content

The following is a summary of the content of each module of the program:

MODULE 1 – The Atmosphere – a short introduction to the properties and characteristics of the atmosphere and the fundamentals of radiation balance.

MODULE 2 – Weather Determinants – a major section covering temperature distribution, moisture, adiabatic processes, and stability. The last part of this module provides enrichment material in the form of basic tephigram procedures and calculations.

MODULE 3 – Pressure and Wind – this is a non-mathematical treatment of horizontal and vertical pressure variation and wind theory. Some enrichment work is also provided in a treatment of thermal wind and the hodograph.

MODULE 4 – Weather Phenomena – is of fundamental importance, covering cloud formation and recognition, elementary precipitation physics, and the basic theory of formation of fog, thunderstorms, turbulence, and standing waves. The significance of these to applied fields such as aviation is *not* included here.

MODULE 5 – Air Masses and Fronts – the nomenclature in operational use in Canada is employed in the treatment of air mass properties and modification, and in frontal structure and frontal weather. Upper fronts are briefly included.

MODULE 6 – Aviation Weather Problems – deals with the specific aspects of meteorology theory developed in earlier modules as applied in aviation operations. Separate sections cover turbulence, thunderstorms, standing waves, visibility, icing, altimetry and frontal weather.

MODULE 7 – Flight Planning Information – availability, form, and content of Canadian charts, reports and forecasts for aviation use is treated in this module. Although dealing only with those reports and forecasts designed for aviation consumers, this module is a valuable source of information for any group requiring more detail than that normally available in plain language messages.

A more detailed appreciation of what this programmed text will accomplish may be had through a study of the specific behavioral learning objectives designed into it. Appendix I provides this as a statement of what the student will be able to do on completion of each module. A criterion examination is available for each module to measure the achievement of the learning objectives of each one separately. Mid-term and final examinations also exist for the determination of over-all competency.

LE RAYONNEMENT SOLAIRE ET L'ATMOSPHÈRE

par Guy Bergeron

Feuillet météorologique
Ministère des Richesses naturelles, février 1975

Dans l'esprit des gens habitant un pays comme le nôtre, les mots "rayonnement solaire" évoquent le souvenir de la lumière et de la chaleur moelleuse qui nous baignent tout au long du mois de juillet . . . Venons-en tout de même à des pensées plus scientifiques et imaginons quelles mesures pourrait effectuer un satellite artificiel chargé d'instruments sensibles aux radiations électromagnétiques. Tout d'abord, il émane du soleil à un taux quasi-constant des radiations visibles et infrarouges principalement, des radiations ultra-violettes en quantité moindre, et aussi des ondes radio. Il appert ensuite que notre planète réfléchit dans l'espace environ 30 pour cent du rayonnement incident et absorbe le reste et enfin que la terre émet des radiations infrarouges sur toute sa surface. C'est ainsi que l'atmosphère renvoie dans l'espace l'énergie qu'elle avait retenue un certains temps.

Une étude, portant sur une période d'un an, montrerait que l'énergie reçue par voie de rayonnement est maximale près de l'équateur et minimale aux pôles, alors que les pertes en ondes infrarouges se répartissent assez également sur toute la surface du globe. D'énormes transferts d'énergie doivent donc se produire des régions équatoriales vers les régions polaires. C'est en grande partie ce qui pousse les courants marins à circuler, qui produit la circulation générale de l'atmosphère, les vents, les tempêtes et les ouragans qui transportent de l'énergie des régions équatoriales vers les pôles.

Tous ces mécanismes tentent de répartir également l'énergie solaire autour du globe; heureusement car s'ils ne fonctionnaient pas, des températures passablement plus bases règneraient sur nos régions en hiver.

Il s'agit maintenant d'examiner en détail les facteurs atmosphériques pouvant agir sur le rayonnement solaire avant et après que ce dernier ait atteint la surface du globe.

L'albédo est la fraction du rayonnement incident que l'atmosphère réfléchit dans l'espace (nous l'avons évalué à 30 pour cent tout à l'heure). Une baisse de l'albédo signifierait donc une plus grande quantité d'énergie disponible pour faire circuler l'atmosphère et pour la réchauffer, donc climat globalement plus chaud. L'albédo provient de la réflexion des radiations sur les nuages, les surfaces glacées et enneigées, les océans, les particules atmosphériques et le sol lui-même. Les recherches actuelles dans le domaine portent sur la réflectivité des nuages, des continents et de la mer, pour chacune des bandes importantes du spectre solaire, suivant les saisons, l'élévation du soleil dans le ciel et la composition de l'atmosphère. Les chercheurs comptent utiliser de plus en plus les satellites artificiels et les avions pour effectuer des mesures quantitatives de l'albédo.

Les nuages de leur côté, formés de gouttelettes et de cristaux de glace, absorbent et surtout réfléchissent dans l'espace une partie appréciable du rayonnement solaire. Ils empêchent la radiation infrarouge (c.-à-d. la chaleur) émise par le sol et l'atmosphère de s'échapper dans l'espace. Et enfin, ils émettent eux-mêmes de l'infrarouge selon leur température. Durant le jour, les nuages diminuent l'ensoleillement disponible au sol, entravant ainsi le réchauffement de l'atmosphère (sauf dans des locaux de nuages à développement vertical élevé). La nuit, ils empêchent l'air de se refroidir trop en diminuant les pertes de chaleur par rayonnement. Toutefois, leur contribution au climat global et à la circulation générale reste en partie à déterminer à cause de l'insuffisance de nos connaissances sur la distribution, la quantité et le type de nuages couvrant le globe à chaque moment du jour ou de l'année. Des observations par satellite s'avèrent là aussi d'une nécessité cruciale.

Certains chercheurs étudient maintenant la structure interne des nuages ainsi que les processus thermiques qui s'y déroulent afin de mieux comprendre leur rôle dans l'évolution des conditions atmosphériques. On a aussi remarqué que la pollution de l'atmosphère par l'activité humaine peut "salir" les nuages et en augmenter l'absorptivité. Cependant, nul n'en connaît encore toutes les répercussions possibles sur le climat.

Parlons maintenant de l'anhydride ou gaz carbonique (CO_2) et de la vapeur d'eau. On appelle ces gaz les "éléments chauffants" de l'atmosphère. En effet, ils absorbent le proche infrarouge provenant du soleil ainsi que celui irradié par le sol et les océans, qui ont été chauffés par la lumière visible de ce dernier, et réchauffent l'air en lui communiquant cette énergie. Ils augmentent de cette façon le temps de séjour de l'infrarouge (de la chaleur) dans l'atmosphère en minimisant les pertes par rayonnement dans l'espace. Cela maintient les températures à des valeurs passablement plus élevées qu'elles le seraient dans une atmosphère d'oxygène, d'azote et de gaz inertes seuls. On nomme ce phénomène dû au CO_2 et à la vapeur d'eau: l'effet de serre. L'importance de cet effet s'avère le plus critique durant la nuit lorsque le soleil ne peut compenser les pertes de chaleur par rayonnement.

Dans le passé, plusieurs se sont demandé si le CO_2 et la vapeur d'eau, libérés en quantités industrielles par les usines et les villes modernes, ne pourraient pas contribuer à un réchauffement notable du climat. Cette théorie s'appuie sur le fait que la température moyenne autour du globe, ainsi que la concentration en CO_2 et en vapeur d'eau, ont suivi une courbe ascendante parallèle du milieu du XIXe siècle jusqu'aux années 40. A cela, on peut répondre que depuis ce temps, le climat terrestre s'est refroidi alors que la concentration de CO_2 atmosphérique n'a cessé de s'accroître. De plus, nous sommes en droit de croire qu'une augmentation de la quantité de vapeur d'eau provoquera une croissance du voile nuageux, réduisant ainsi l'ensoleillement et la température globale, au lieu d'améliorer l'efficacité de l'effet de serre. De toute façon, de tels raisonnements doivent s'étendre à bien des processus atmosphériques, et une solution globale de ces systèmes de causes et d'effets devra être envisagée.

Parmi les facteurs influençant le bilan radiatif terrestre, un autre élément à considérer est l'ensemble des particules solides ou liquides (hormis celles des nuages) formées de poussières, grains, molécules de toutes tailles et produits chimiques provenant des continents, mers, volcans, combustions diverses ainsi que de l'activité humaine. Nous nommerons ces particules: aérosols. Ces derniers peuvent diffuser une partie de la lumière solaire dans toutes les directions (par conséquent en retourner une fraction dans l'espace) et en absorber une autre qu'ils réémettront par après selon leur température. A moyen ou à long terme, l'effet sur le climat de la présence des aérosols constitue l'un des points obscurs des connaissances actuelles; en effet, leur distribution dans le temps et l'espace varie considérablement et leur effet sur la radiation incidente et celle irradiée dans l'espace reste difficile à déterminer.

Cependant, nous savons que les aérosols contribuent à épaissir le voile atmosphérique et à réduire l'ensoleillement global. Une augmentation de leur concentration aurait donc pour effet immédiat d'abaisser les températures; mais cela produirait par la suite une chaîne de rétroactions, dont les conséquences climatiques ne peuvent à priori être déterminées. Les recherches actuelles dans ce domaine comportent un grand nombre d'échantillonnages à toutes les altitudes, au-dessus des villes comme des régions inhabitées, en vue de déterminer la distribution et le temps de séjour dans l'atmosphère des aérosols. Cela permettra de se rendre compte de l'étendue et du degré de permanence de la pollution atmosphérique et d'inclure ce facteur dans les modèles visant à une compréhension globale du bilan radiatif.

Il ne s'agit pas seulement d'isoler les facteurs influençant le bilan radiatif afin de les examiner de plus près; il importe aussi de comprendre qu'une modification au niveau de l'un de ceux-ci se répercutera sur l'ensemble des autres processus par un jeu complexe d'interactions. Par exemple, un accroissement de la concentration de vapeur d'eau atmosphérique augmentera l'ennuagement et ainsi l'albédo; cela causera une baisse de température qui réduira l'évaporation et de cette façon la quantité de vapeur d'eau atmosphérique; de plus, la baisse de l'ensoleillement agira sur les vents; et les variations de températures sur le couvert de neige donc sur l'albédo; cela affectera aussi les précipitations et l'humidité et ainsi de suite. Et ces interactions se poursuivront jusqu'à ce qu'un équilibre soit atteint.

De cette façon, le climat que nous subissons est une résultante des facteurs tendant à absorber, conserver et répartir l'énergie reçue du soleil, et de ceux cherchant à la réfléchir ou la réémettre dans l'espace. Les températures, de leur côté, dépendent de la fraction du rayonnement incident pénétrant dans l'atmosphère, et de la durée de son séjour dans celle-ci; encore là une résultante de facteurs antagonistes.

Enfin, les modèles que les chercheurs mettent au point en vue de décrire le comportement du système atmosphérique, tentent de plus en plus d'étudier les réactions de ce système à une variation d'un ou plusieurs paramètres. Par exemple, on recherche quelle conséquence aura sur le climat global une variation du rayonnement solaire ou de la pollution atmosphérique. Cela permettra d'évaluer entre autres choses la stabilité à long terme du climat en regard des perturbations induites par les activités industrielles et urbaines.

Terminons en disant qu'une meilleure compréhension du bilan radiatif terrestre ne pourra qu'aider à utiliser et respecter ce géant fragile que constitue notre environnement.

AUTOGRAPHIC PRECIPITATION NETWORK CITY OF EDMONTON

The Water and Sanitation Department of the City of Edmonton has identified a need for real-time precipitation data from various locations within the City. The data, both rate-of-fall and amount, are required for preliminary planning, detailed sewer design and possible future operational control.

The Department, in cooperation with the Western Region AES, has installed a network of seven tipping-bucket rain gauges around the City. The gauges are located on City-owned property or on top of buildings to reduce vandalism. One gauge is located on top of the 336 foot Edmonton Centre in the downtown area.

The gauges are connected by dedicated telephone lines to an electronic interrogator located in the Water and Sanitation Department engineering office. The interrogator, which was designed and constructed by a local electronics firm, simultaneously, collects and stores the precipitation data from the seven gauges. Once each minute, the accumulated data is transferred to a twelve-channel recorder. The data recorded on the chart then gives the special and temporal distribution of the precipitation.

Future plans include enlarging the network to nine rain gauges and 15 flow monitors and employing computers for data reduction. The accumulated data could then be utilized in computer models to establish planning and design criteria.

The average density of the rain gauges would be in the order of 1 gauge for an area of between 8 and 9 square miles.

METEOROLOGICAL INSPECTOR'S SEMINAR – 1975

A seminar for Surface Meteorological Inspector's was held at A.E.S. Headquarters, January 7-24, 1975, under the guidance and direction of Technical Training Division, Training Branch. The inspectors participating represented all A.E.S. regions.

The three-week seminar was divided into two workshops. The first workshop, of two-weeks duration, dealt with surface meteorological instruments, and was presented by the staff of the Installation and Maintenance Division, Instruments Branch. The primary objective of this workshop was to provide the surface inspector with the broad knowledge and skill required in the inspection, installation and maintenance of surface meteorological instrumentation.

The second workshop, during the last week of the seminar, dealt with general inspection services and administration. The general objectives of this session were threefold:

1. To provide the inspector with a broad knowledge of meteorological station management concepts and their applications in the A.E.S.

2. To assist the surface meteorological inspector in identifying and using the resources at his disposal, and

3. To identify those areas where additional support for surface meteorological inspectors is required.

To achieve these objectives, discussions were held on topics such as: observer assessments, quality control and monitoring systems, station programs and information systems management, staff relations and other personnel office functions, alcohol and drug addictions, safety and legal responsibilities related to vehicle operations, as well as a general discussion on inspector responsibilities and philosophy. Staff from various divisions within Field Services and Central Services Directorates and Administration Division participated as discussion leaders.

The session on safety and legal responsibilities related to vehicle operations was introduced as a result of suggestions solicited from the inspectors, and was one of the highlights of the seminar. Further suggestions will be sought to improve future seminars.

Seated left to right – F. Brunning, (Head, System Controls Unit, F.S.D.); W. Stewart, (Head, Systems Management Section, O.S.D.); G. Pincock, (Director, Field Meteorological Systems Branch, F.S.D.); H. Kruger, (Chief, Observational Systems Division, F.S.D.); T. White, (Seminar Director, Training Branch). Standing left to right – R. Stark, (Head, Planning and Documentation Section, C.S.D.); C. Brown, (Tech. Officer, Inspection. O.S.D.); W. Halina, (Supv. Inspector, Installation and Maintenance, Ontario); Inspectors: A. Purves, (Ont.); L. Murton, (Wes.); D. Law, (Ont.); A. Copp, (Atl.); C. Robinson, (Cen.); D. Blanchard, (Que.); S. Delude, (Que.); B. Zollen, (Pac.); G. Leal, (Wes.); T. Thompson, (Wes.); C. Blackwood, (Atl.); C. Coade, (Tech. Office, Stn. Programs, O.S.D.)

Photo Courtesy of Norman Steinhaur

CHIEF OF ICE RECONNAISSANCE TAKES WRONG TURN, LOSES WAY, STOPS IN DISNEYLAND TO ASK FRIEND DIRECTIONS BACK TO ARCTIC ICE FIELDS

Mr. Tom Kilpatrick is fortunate to have good friends in California. Tigger, who lives in Disneyland, was quite happy to tell him how to find Cousin Polar Bear. The photograph was taken during a recent trip which Mr. Kilpatrick made to the Lockheed Aerospace Corporation in Burbank, California to discuss visual observing stations on ice reconnaissance aircraft. Lockheed had proposed alternatives to the present specially designed bubble located on the top side of the fuselage of the ice recco Electra aircraft.

ISO has many back copies of Zephyr from the last few years. Anyone wishing a specific issue should write to:

ISO
AES HQ
Downsview, Ontario
M3H 5T4

PERSONNEL

The following have accepted positions as a result of competition:

74-DOE-TOR-CC-417	MT 9 Section Head Project Planning & Development AES Headquarters L. Berntsen
74-DOE-WPNA-10-970-4254	CS 2 System Analyst Western Region F.J. Calvert
75-DOE-TOR-INV-912-7600	EG-ESS 7 DOE-912-7600 ARD, AES Hqts. W.J. Clark
73-DOE-TOR-CC-107	Captain CFWO Baden – DMetOc E.T. Hudson
74-DOE-WPNA-CC-124	EG-ESS 6 Dewline Inspector Western Region W. Laidlaw
74-DOE-WPNA-CC-146	MT 7 Supervisor ODIT Unit Western Unit R. Lee
74-DOE-WPNA-CC-134	EG-ESS 4 Officer in Charge Western Region J.R. Teshier

The following transfers took place:

L.D.F. Chu	From: Arctic Weather Central To: Vancouver W.O.
D. Fournier	From: Alert, Ellesmere Island To: Resolute Bay, N.W.T.

M.H. Hacksley	From:	Regina W.O.
	To:	Winnipeg W.O.
R.D. Holdham	From:	C.F.B. Edmonton
	To:	Edmonton International Airport W.O.
E.T. Hudson	From:	Arctic Weather Central
	To:	Department of National Defence
D.S. McGeary	From:	Prairie Weather Central, Winnipeg
	To:	FSD, AES HQ.

The following are on Project Assignments:

E.E. Wilson (Ms.)	From:	Toronto W.O.
	To:	ARD, AES HQ.

Temporary Duty:

G. Fenech	From:	Toronto W.O.
	To:	AES HQ.
E.J.G. Guimond	From:	Maritimes W.O.
	To:	Frobisher Bay
H.J. Routledge (Mrs.)	From:	Regina W.O.
	To:	Churchill

TRIVIA

If a person jumps to conclusions, he might come to a jarring landing.

The very cheapest way to visit with a distant friend is with an eight-cent postage stamp.

Busy people use the popular credit card as a "buy pass" for cash.

How old you really are depends on how many birthdays you're still looking forward to.

LITTER!

You shouldn't litter
Because it's bitter
Now bitter is sour
And sour spoils the ground
It's mushy and flushy and stuffy

Litter is smashing and trashing
I don't know why
But its annoying
Not enjoying

If we did not have garbage pails
It would be a pesky, dirty world
Unpleasant trash in the world

Now that you know
I'm going to go.

Do Not Litter.

by Linda
Grade 3

Expression	Signification ou équivalent
Se serrer les coudes	S'aider davantage les uns les autres
Une soie	Une personne très aimable
Faire un petit velours à	Faire plaisir à
Ça vient de s'éteindre	C'est sans espoir
Se paqueter la fraise	Prendre une cuite – se saouler
Un paquet de troubles	Un tas d'ennuis
Pousse, mais pousse égal	Exagère, mais pas trop
Croire son affaire chocolat	Croire l'affaire dans le sac
Magasiner	Faire des emplettes
Il y a du monde à la messe	Il y a beaucoup de monde