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ADVANCES IN INTERNATIONAL METEOROLOGY IN 1936 AND 1937¹

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[Weather Bureau, Washington, December 1937]

INTRODUCTION

The two years 1936 and 1937 undoubtedly constitute a period of greater activity and more far-reaching significance in international meteorology than any other similar period or even considerably longer period in the entire history of meteorological service. A mere recital of the events that have occurred is impressive. First, there was the Lusaka conference of Regional Commission I (Africa) in August 1936, followed by a similar conference of Regional Commission II (Far East) at Hong Kong in January 1937. A highly important conference of the newly formed Commission on Aeronautical Meteorology was held in Paris during June 1937. September was marked by conferences of Regional Commission III (South America) at Lima, Peru, and of the International Meteorological Committee at Salzburg, Austria, the latter being preceded by meetings of Commissions on Agricultural Meteorology, Climatology, Synoptic Weather and Projections for Meteorological Charts, and of two Sub-Commissions on Medical Meteorology and on Sea Swells. Finally, during the present month, December 1937, a conference of directors of meteorological services in the Southwest Pacific has been held at Wellington, New Zealand.

REGIONAL COMMISSIONS

It is of interest to note that all of these conferences, with the exception of most of those at Salzburg, were the direct result of action taken by the international Meteorological Organization at Warsaw in 1935. At that conference representatives of services in tropical countries pointed out that they have special problems, differing from those in temperate latitudes, the solution of which, bringing them into harmony with international standards and practice so far as possible, could be best achieved by holding regional conferences. The proposal was approved and Regional Commissions I and II, the membership to consist chiefly of directors of meteorological services, were authorized for Africa and the Far East. Later, South America was established as Regional Commission III. The adoption of this rather fundamental change in policy on the part of the International Meteorological Organization has been abundantly justified by the accomplishments of the conferences held during the past year and a half. So convincing were these results that action was taken at Salzburg to establish a fourth Regional Commission for North and Central America. This new policy is not to be interpreted as, in any sense, a breaking down of internationalism in meteorological service, but rather as a recognition that different regions have problems of their own which must be locally studied and solved and, to the

greatest possible extent, woven into the international system.

Another action taken at Warsaw in 1935 along this same general line was the designation of regional sub-commissions of the Synoptic Weather Commission, one, for example, for North America, one for South America, one for the Southwest Pacific, and others. That for the Southwest Pacific has, as previously stated, held a conference during the present month at Wellington.

COMMISSION ON AERONAUTICAL METEOROLOGY

Finally, action of far-reaching significance at the Warsaw conference was the appointment of a new Commission on Aeronautical Meteorology which met for the first time at Paris in June 1937. The circumstances leading up to the organization of this commission are set forth in the MONTHLY WEATHER REVIEW, December 1935.

IMPORTANT ACTIONS TAKEN BY INTERNATIONAL METEOROLOGICAL COMMITTEE AT SALZBURG

It would be tedious to attempt to give a detailed account of the proceedings of all of these conferences. For that matter those at Wellington are of course not yet available; and the resolutions passed at Lima with the exception of a few of the most important that were transmitted by cable, were not received at Salzburg in time for consideration. It is my purpose, therefore, to call attention to resolutions adopted by the International Meteorological Committee at Salzburg which appear to be of greatest significance in indicating definite advances in the international aspects of meteorological service. These resolutions are in large part based on action taken by the various commissions and subcommissions.

RADIOMETEOROGRAPHS

During recent years many meteorological services have given special attention to the development of the radiometeorograph, or, as it is frequently called, the "radio-sonde." At Salzburg it was felt that this development had proceeded to a point fully justifying the immediate adoption and use of this method of upper air exploration, and perhaps no more important action was taken by the Committee than the passing of a resolution on this subject, following prolonged discussion as to recent progress. The resolution is as follows:

The development of the radio-sonde has placed at the service of synoptic meteorology a new and powerful instrument for the exploration of the upper atmosphere in all conditions of weather.

¹ Presented at the meeting of the American Meteorological Society, Indianapolis, Ind., December 28, 1937.

Full use of the observations which the instrument provides requires the cooperation of all meteorological services to establish a network of such stations. Only by the provision of a network of stations can the construction of the necessary upper air and particularly stratospheric charts be prepared.

The Committee considers that a network of about 50 stations is necessary for Europe and a corresponding density is desirable for other parts of the temperate zones. A network of stations is equally necessary in the Tropics and polar regions.

The Committee recognizes that the maintenance of these stations and the provision of the personnel required to operate them will involve considerable expense; but it is convinced that further substantial advance in forecasting, and the solution of the problems arising from the extension of flying to great distances and heights, depends on the establishment of an organized system of radio-sonde observations.

The formal resolution was followed by a suggested apportionment of stations among European countries and other regions of the world. Since 50 are recommended for Europe and "a corresponding density for other parts of the temperate zones," the number for North America would amount to something like 125. It was encouraging to note that the representatives of all countries accepted their quotas with enthusiasm and indicated a determination to make every possible effort to carry out their part of the program.

AERONAUTICAL METEOROLOGY

Prior to the Warsaw conference of 1935 there existed much confusion regarding the international development of aeronautical meteorology owing to the lack of coordination in the consideration of the subject by three independent organizations, viz, the Commission on the Application of Meteorology to Aerial Navigation (this being a Commission of the International Meteorological Organization), the International Commission for Air Navigation (C. I. N. A.), and the International Aeronautical Conference (C. A. I.), the last two of which had subcommittees dealing with weather service (see MONTHLY WEATHER REVIEW, December 1935). The new Commission on Aeronautical Meteorology, with Dr. R. Bureau of the French Meteorological Service as president, was created by the I. M. O. at its Warsaw conference for the purpose of coordinating the efforts of these various organizations, and its success in bringing about such coordination can properly be put down as the most important accomplishment of the Paris conference.

The Commission adopted many resolutions, later confirmed by the International Meteorological Committee at Salzburg, among which the following are of special interest and significance:

Meteorological protection for flights on international routes should be provided, in all cases, by official—i. e., Governmental—services in all countries concerned and in accordance with universal rules prepared by the Commission on Aeronautical Meteorology (C. I. M. Aé.). This applies particularly at the present time to the organization of service for transoceanic flying, and a subcommittee was appointed to deal with that subject.

The adoption by all countries of the international code was urged as a fundamental necessity for efficient collection and dissemination of synoptic reports.

All countries are requested to keep the Commission informed of new methods and techniques that they consider useful for the development of international aeronautical meteorology. This includes pamphlets giving instructions, such for example as Circular N of the Weather Bureau.

Synoptic reports should be made at intervals of 3 hours on continents and inland seas and at intervals of 6 hours on the oceans.

The formulation of a uniform code for transmission of forecasts is recommended and will be undertaken.

The great importance of upper air soundings on ships as well as at land stations and reaching into the stratosphere is emphasized.

In view of the lack of ships' reports from certain critical areas in the oceans, recommendation was made that stationary meteorological ships be provided in order to fill these gaps, such ships to take both surface and upper air observations and to be equipped with adequate radio apparatus to enable them to function as collecting and transmitting centers. Already a beginning along this line has been made by the French and German Governments. The great need of more frequent and complete data from ships that are now reporting also was stressed.

Many other resolutions dealing with methods of observation, codes, symbols, meteorological training of pilots and other details were passed, and these will soon be available in published form.

AGRICULTURAL METEOROLOGY

An important action of the Commission on Agricultural Meteorology was the appointment of a subcommittee for the study of hail, including cooperation with the International Committee on Hail Insurance.

Of special interest to American meteorologists was the appointment of J. B. Kincer, of the Weather Bureau, as president of a subcommittee to cooperate with the International Institute of Agriculture at Rome in preparing world maps of precipitation and other meteorological elements for use with similar maps of soils of the world.

CLIMATOLOGY

Among the nine resolutions passed by the Climatological Commission those of chief importance relate to arrangements for intercontinental comparison of standard barometers and to the adoption of Dr. Tor Bergeron's classification and description of hydrometeors. With regard to the latter the committee, in accepting it, specified that appropriate footnotes should be included in the English text, in the case of those terms, such as mist, drizzle, and particularly sleet, the meanings of which are not the same in America and Great Britain.

PROJECTIONS AND SCALES FOR METEOROLOGICAL CHARTS

The resolutions adopted at the Salzburg meeting by the Commission on Projections for Meteorological Charts and by the International Meteorological Committee, relative to projections and scales for meteorological charts, will be discussed in detail in the December MONTHLY WEATHER REVIEW.

SYNOPTIC WEATHER

Over 60 resolutions were passed by the Commission for Synoptic Weather Information and these were later either adopted or approved by the committee. A large number dealt with modifications of resolutions concerning codes, symbols, etc., that had been adopted at previous conferences. Perhaps the most important new one was that regarding the organization of networks of radio-



FIGURE 1.

meteorograph stations, already referred to. Others included the reduction of pressure to levels of 1,000, 1,500, and 2,000 geodynamic meters; provision for "signs of tropical cyclone" in the ww code (No. 92), this being assigned to ww 19 (other significant changes in this code were: ww 17=visibility reduced by smoke; e. g., veldt or forest fires, or industrial smoke or volcanic ashes; and ww 18=duststorm—visibility greater than 1 km); adoption of a new code for mean pressure over the oceans; recommendation that green and brown colors be used respectively for shading to indicate precipitation, and sand or dust storms on synoptic charts; adoption of a special code for use at stations near the Poles to indicate wind direction; adoption of a new code for international exchange of upper-air wind data; inclusion of mountain station reports in collective messages.

MISCELLANEOUS

A subcommission on sea swells of the Commission on Maritime Meteorology decided to institute an international week of observations of swells in the North Atlantic in 1938, with the hope of extending it in later years to all the oceans. Plans for organizing the program for 1938 are now being worked out.

One of the most important resolutions at Lima was the decision to broadcast twice daily from Rio de Janeiro synoptic reports from 84 South American stations. This new service is to begin January 1, 1938.

1941 CONFERENCE IN AMERICA

Of special interest to all American meteorologists is the decision of the International Meteorological Committee

to hold the next general conference on this side of the Atlantic in 1941. This action was taken in response to an invitation issued jointly by the Director of the Canadian Meteorological Service and the Chief of the U. S. Weather Bureau. The plan is that several of the Commissions will meet in Toronto, and these meetings will be followed by the regular six-yearly conference in Washington. This will be the first meeting of this international body in America, and plans already are being worked out to make it one of the most successful ever held anywhere.

CONCLUSION

The onward march of international meteorology is marked by several outstanding accomplishments, among them the preparation and adoption of an International Cloud Atlas, the organization of the Polar Year campaign of 1882-83, and another 50 years later; the establishment of a program of simultaneous upper-air soundings on "International Days;" and the decision to utilize radio in exchanges of reports between continents. Undoubtedly one of the most fruitful of all conferences was that at Copenhagen in 1929, when action of far-reaching significance was taken in standardizing codes and symbols and many other features of international service. The Warsaw conference was notable in putting the finishing touches on much of the fine work so well begun at Copenhagen. But it seems quite certain that the period of a year and a half now coming to a close will take its place as second to none in advancing the high ideals of internationalism in meteorological service, marking as it does a more completely world-wide interest and activity than has any other in the entire history of the International Meteorological Organization.

A CURIOUS PHOTOGRAPHIC CLOUD EFFECT

By W. J. HUMPHREYS

[Weather Bureau, Washington, December 1937]

The correct interpretation of a photograph of a meteorological phenomenon is not always obvious. In many cases this difficulty is owing to unsuspected effects caused by the photographic equipment used, or by the process of development and printing, or both. An excellent example of this sort of puzzling photograph is that of "dark lightning," so called because the positive print shows the streaks as dark lines, and not white as one would expect them to be. This phenomenon does not appear on all pictures of lightning, and when it does occur is more pronounced along the branch discharges than on the main trunk. Of course, despite the testimony of the photographs, the streaks on them are not dark because the lightning itself was black, but for some other reason; and that reason, called the Clayden effect, is a photographic reversal induced by an exceedingly brief, bright image followed by a diffuse fogging illumination. The first light shock renders the plate relatively insensitive at the place or places struck, while the subsequent light darkens the rest of the plate; hence the unexpected reversal in the print. So much for a review of "dark lightning."

The accompanying picture is a fine example of another such puzzle, one which from its analogy to "dark lightning" might be called "black sky." Its explanation is this: Considerably below the level of the cumulus head

there was a thin horizontal sheet of sparse cloud, or dust loaded with more or less condensation; and below that in turn, a much fainter haze, due to dry dust, extending down probably to the ground. Above the thin cloud, or sheet of dense haze, the atmosphere was comparatively free from any particles of light-reflecting size. Under these circumstances the sky seen through the portion of the cloud veil that is shaded by the cumulus above would be, and on this occasion was, a clear deep blue, and the sky outside the shaded area a gray blue. If, then, this combination of sky and cloud were photographed with an equipment that would eliminate the blue and violet while registering the rest of the light, the cumulus would print dark with a white fringe, and the sky black near the cumulus where it "looks" clear blue, and a slightly streaked gray beyond. Just such was the equipment in this case; an Eastman K₂ filter that cuts out the blue and violet while leaving the other colors, and a panchromatic film; exposure $\frac{1}{50}$ second, F/11.

This picture, taken at Rochester, Vt., 2:15 p. m., about August 30, 1937, was kindly supplied by Mr. James Stokley, director, The Fels Planetarium, Franklin Institute, Philadelphia, Pa., with permission by the photographer, Mr. J. W. Sanders, 2216 Rittenhouse Square, Philadelphia, Pa., to publish it.