if the temperature did not vary more than 2° C. from the limits forecast, verification is credited. However, in the case of temperature, if any station shows a disagreement beyond the tolerance allowed the entire forecast is counted as a failure. The basic temperature range as forecast is usually about 7° C., plus 2° C. tolerance for verifying purposes. For example, the forecast for the week July 16–22, 1935, reads "Temperature of the whole period in the limits of 14–7° C."

This constitutes a serious effort to accomplish something definite in the highly difficult task of extending the period of forecasts. It has been in operation too short a time to make possible an appraisal of its dependability and value, but it will be watched with keen interest and with the hope that its continued use will be justified.

### CONCLUSIONS

During the past decade international meteorology has made advances that are without parallel in the previous history of the science. Progress has been marked both in theory and in practical application to human activities, particularly to agriculture, engineering, hydrology, and marine and aerial navigation. Chief contributors to this progress are the standardization of methods of international exchange of continental and marine reports, the development of improved technique in upper-air exploration, and the application of well-established physical laws to forecasting. The increasing dignity, respectability, and efficiency of meteorological service generally are due in no small measure to the inclusion of advanced training courses in this subject in the curricula of leading educational institutions in many countries. With these factors as a ground work, we look forward, with confidence, to the building up of an ever increasingly efficient service, contributing its proper share to progress in the economic, commercial, and social life of the world.

# THE DANZIG MEETINGS OF THE INTERNATIONAL CLIMATOLOGICAL COMMISSION AND THE COMMISSION ON AGRICULTURAL METEOROLOGY

By J. B. KINCER

[Weather Bureau, Washington, December 1935]

At the meetings of the International Climatological Commission and the International Commission on Agricultural Meteorology at Danzig on August 28–31, 1935, a number of important matters relating to international climatology and agricultural meteorology were considered.

Among these may be mentioned definitions of symbols for use in climatological publications; letter symbols for representing the divisions of the day; international exchange by radio of monthly means of pressure, temperature and precipitation; the publication of climatological data by pentad means in addition to monthly means; the best period to be covered for "standard means" or normals, from which to compute departures for individual months and for the year, etc.

With regard to the matter of symbols, Dr. Bergeron, formerly of the Norwegian Meteorological Service, but more recently with the Swedish Service at Stockholm, presented an eleborate series of definitions of hydrometeors with a proposal that the Climatological Commission recommend their adoption by the International Organization. In addition to symbols to represent the various meteorological phenomena, his proposal was to add rather extensive definitions to cover, in many cases, the dynamical processes considered responsible for their development. The British, Canadian, and United States delegates offered opposition to this, especially with regard to the definitions, contending that symbols should merely represent, or stand for, the several phenomena and that no theory as to how they are developed dynamically should be included. Also, in some cases, his scheme was unsatisfactory to the Americans because of a difference in nomenclature: For example, sleet was defined as "precipitation of melting snow, or of snow and rain mixed", whereas in Canada and the United States sleet is an entirely different thing. After much discussion it was evident that no agreement could be had, and a motion was made and carried to refer the entire subject to a joint committee, composed of the Climatological Commission and the Commission on Synoptic Weather, to be held at Warsaw prior to the Directors' meeting. At Warsaw the matter was again considered, with the result that the original proposal was modified in a way that largely sustained the views of the American and the English delegates. Also, a proposal to remove drizzle from the category of rain, distinguishing it as a separate phenomenon, was met by opposition from the English and the American delegates, and was not approved.

Recommendation for a rather important change in thunderstorm symbols was made, the following being adopted: ⌈⟍, thunderstorm, including rain, at station; (⌈⟍), distant thunderstorm (observed from, but not occurring at, the station); and ⟍, distant lightning without audible thunder.

The matter of letter symbols to designate meridian divisions of the day was considered. The designations heretofore used by the Weather Bureau include "a" for before noon; "p", afternoon; "dnp", during the night before midnight; and "dna", during the night after midnight. Several delegates desired to establish definite hours to which the symbols should apply, such as: "np" to represent the period between 9 p. m. and midnight, and "na", between midnight and 3 a. m. The following were finally recommended: "a", before noon; "p", afternoon; "n", nighttime; "np", nighttime before midnight; and "na", nighttime after midnight, without definite time divisions. It may be noted that this conforms to Weather Bureau practice, except in minor details which have been changed to effect entire agreement.

Closely allied to this was the matter of letter symbols to designate the official elevation of meteorological stations and instruments. Some changes were made in the heretofore international designations, with adoption of the following: H, elevation above sea level of the ground at the station, to be considered the official elevation of the station; $H_b$, elevation of barometer cistern above sea level; $h_t$, thermometer above ground; $h_a$, anemometer above ground; $h_d$, wind vane (wind director) above ground; and $h_r$, rain gage above ground. This, in general conforms to present Weather Bureau practice, except that no designation for H has been carried in this country, the official station elevation being that for the barometer above sea level as of the epoch 1900, or the actual barometer elevation for stations established since that time. This requires a change in Weather Bureau practice, and action already has been taken to bring our records into line with the agreement, beginning January 1, 1936.

For many years it has been recognized that there should be some method for expeditious international exchange of current climatological data. The regular monthly reports for many countries are not published until long after the period to which they relate, and, for some time ways and means have been discussed by which an international exchange of data could be accomplished more speedily. This matter was considered at the Danzig meeting, with a proposition that there be, for selected stations, an international exchange by radio as soon as practicable after the close of each month, this to be supplemental to the present exchange of daily synoptic reports. After considerable discussion as to the earliest practicable time for such exchange, the number of stations to be included, and other matters, a resolution was adopted recommending to a joint meeting of the Climatological Commission and the Commission on Synoptic Weather Information at Warsaw that action be taken to accomplish such international exchange. Tentatively, the number of stations to be included in the system was set at one-fifth the total now transmitted daily for synoptic purposes.

At the joint meeting at Warsaw, September 6, the chairman, Col. E. Gold, of England, presented the matter, and called attention to the fact that the Climatological Commission at Wiesbaden in 1934 had suggested that the time limit for distribution of these reports should be the 15th of the following month. After considerable discussion of the Wiesbaden resolution, it was amended to read:

RESOLUTION VIII. The Commission proposes that the transmission of monthly means of pressure, temperature, and precipitation should be accomplished as early as possible, and not later than the 5th of each month. It is understood, too, that these messages, in the case of Sunday, shall be transmitted on the following day.

A joint subcommission on the radio transmission of monthly means was set up, the personnel consisting of Colonel Gold, England; Mr. Gregg, U. S. A.; Dr. Hesselberg, Norway; and Professor Okado, Japan.

A resolution was proposed that the climatological services of the several countries publish data (daily values) by pentad means. This was opposed by the British, Canadian, and United States delegates. It was explained that for Canada and the United States, weekly data are now compiled and published regularly in agricultural meteorological work, and it would be impracticable to publish these on both a weekly and a 5-day basis. Also, it was argued that the week is the standard unit of time in agricultural, business, commercial, and other enterprises, and is therefore the logical period for compilation of weather data, so that they may be comparable. After considerable discussion a resolution was adopted providing for publication by pentads, where convenient, or by weekly units of time in those countries where the 5-day period could not conveniently be adopted. It may be mentioned that in subsequent visits to the Central Meteorological Office in Norway it was found that considerable data have been compiled by 5-day periods for that country and are awaiting publication. It appears also that some other European countries have either published more or less data on this basis, or are preparing to do so.

The fact that temperatures over the world during the present century have trended higher than during preceding years was recognized at the Danzig meeting, and the question as to the establishment of normals, or "standard means", from which to compute departures to correctly represent current conditions received consideration. The 30-year period, 1901–30, was proposed for this purpose. So far as the United States is concerned, it was explained that current standard normals are based on a uniform 50-year period from 1878 to 1927, and, judging by long records in this country, this period gives as good normals as could be obtained at the present time, because it includes both the relatively low records occurring at the beginning of the period and the more recent abnormally high values.

It was voted, however, that in obtaining departures from mean data to represent current conditions, or present century weather, means for the period proposed (1901–30) should be used as a base. The American delegates insisted that in such cases the period covered should be stated definitely and that the departures should be considered, not as normal base residuals, but merely as representing variation from the mean for the period specified.

At a meeting of the International Commission for the Reseau Mondial, the President, Sir George Simpson, Director of the British Meteorological Service, stressed the difficulty in receiving reports from various parts of the world in reasonable time after the expiration of the year. He stated that many station data now have to be asked for by special letter, and for such purpose 196 letters were written during the past 4 years. Records for approximately 470 stations, with the best possible world distribution, are included in the Reseau Mondial.

This publication is now being reproduced by the photographic process, instead of by printing from type, which has reduced the cost by nearly one-half. The last issue is for the year 1927 and the possibility of bringing the publication nearer up to date was considered.

Mr. Wehrlé, Director of the French Meteorological Office, submitted a resolution proposing that each meteorological service publish, within a few days after the close of the month, a summary for selected stations, to be distributed to members of the International Organization; this proposal was offered because of the delay in the appearance of the Reseau Mondial and the fact that many services do not print their monthly reports until long after the period to which they relate. Several members objected on the ground that they could not receive the observations from outlying points in time to comply with the requirements of the resolution, and the President ruled that the opinion of the Commission appeared to be that Mr. Wehrlé's proposal, while very desirable, was not practicable, and that services should not be asked to publish daily values beyond those already issued in regular reports.

In connection with this meeting, Dr. La Cour, Copenhagen, gave a demonstration of presenting climatological data by means of projection films. He showed a series of barogram reproductions, photographs of clouds, and various tables of climatological data. This attracted considerable interest as a possible means of preserving mass climatological data in convenient form, requiring little space; the films for projection purposes were very small.

In concluding the meeting, the President, Sir George Simpson, called attention to the publication of two series of world weather records, compiled by H. H. Clayton, at the expense of a fund provided by Mr. Roebling, and appearing in the Miscellaneous Collections of the Smithsonian Institution, Washington, D. C. He suggested that the conference express to Mr. Clayton its appreciation for the preparation and publication of these reports. The Commission accepted the President's recommendation.

### AGRICULTURAL METEOROLOGY

The first meeting of the International Commission on Agricultural Meteorology was held at Danzig on the afternoon of August 28. It was occupied largely with a consideration and review of different solar radiation instruments suitable for making observations in agricultural meteorological work.

At the second meeting, held on the afternoon of August 29, several reviews of recent investigations and researches in the field of agricultural meteorology were presented and extensively discussed.

Before leaving Washington, Dr. H. C. Taylor, the American representative to the International Institute of Agriculture at Rome, called on Mr. Gregg, Chief of the United States Weather Bureau, and explained that the Institute is now engaged in preliminary work on the preparation of a series of soil maps for the entire world; and, upon their completion, it is proposed to prepare climatic maps of a similar character, to accompany the soil maps. He requested that the matter be presented to the International Commission on Agricultural Meteorology at the Danzig meeting, with a view to obtaining its cooperation in the preparation of the proposed agricultural climatological maps. The matter was presented to the Commission and was favorably received. A joint subcommission was set up to cooperate with the Institute, composed of the chairman, Dr. Schmidt, of Austria, and Messrs. Braak (Netherlands), Knoch (Germany), and Kincer (U. S. A.). The International Institute was requested to appoint a representative to serve on this committee.

## MEXICAN WEST COAST CYCLONES

By DEAN BLAKE

[Weather Bureau, San Diego, Calif., November 1935]

In this paper, two classes of storms that form on the west coast of Mexico are discussed: The first class consists of tropical hurricanes that originate in low latitudes over the Pacific Ocean during summer and fall. Instances are cited in which they have penetrated into southwestern United States. It is shown that they travel with the air masses in which they originate; and that when these move in a northerly direction, the cyclones occasionally penetrate well into the Temperate Zone, and produce rains out of season in the Southwest. Unquestionably, their paths are contingent upon the development of the semipermanent thermal low area over our Southwest, and the position of the attendant upper-level anticyclone.

The second class comprises storms that develop off the coast of Lower California. Frequently during autumn and winter, when an unusually deep high-pressure area is crested over the far western regions of our country, strong easterly winds of föhn nature prevail at the surface in southern California, with a pronounced wind movement aloft from a southerly direction—part of the clockwise circulation aloft around an upper-level anticyclone usually centered somewhere over the Plateau region. Increasing cloudiness and light rains often result in California. It is demonstrated that this current aloft is at times equatorial in its make-up; that its origin may be on either side of Mexico or Central America, in quite low latitudes; that convective instability is realized when it cools sufficiently in its northward journey to permit of penetrative convection, or when it overruns a colder mass below. Where this equatorial current enters the Temperate Zone, extratropical cyclones often form; the hypothesis is advanced that these disturbances sometimes first develop at high levels, and later appear at the surface. Examples are presented of storms formed in this way, notably those of December 6–15, 1934, and February 2–10, 1935, which caused abnormally heavy rains.

The conviction that the waters off the coast of Lower California are a prolific source region for extratropical storms has been growing ever since weather reports became available from stations in Mexico and ships at sea, and aerological observations began to be made regularly at points along the Pacific coast; particularly during the last season, this conviction has become a certainty. In this period disturbances were observed to appear and develop over the Pacific Ocean southwest of southern California, and it now is certain that this must be a region where cyclogenesis frequently takes place.

It has long been known that the ocean west of Mexico and Central America is the breeding place of tropical hurricanes. Hurd (1) places the region of occurrence from the middle section of Lower California at Point Eugenia to latitude 10° N. in longitude 125° to 130° W., and thence eastward to Costa Rica. He states that this is the scene of more than nine-tenths of the Mexican-Pacific group, and that here conditions are ideal for the development of storms of this type.

Like other tropical storms, they form where there are conflicting air currents; in regions where, in the late summer and autumn, the northeast trades encounter the deflected southeast trades. Werenskiold brings this out convincingly in his charts of the mean monthly air transport over the North Pacific (2), which show a marked line of discontinuity over west coast tropical waters that coincides closely with the area where these cyclones make their appearance.

In the reference given above, Hurd discusses at considerable length what he terms "coastwise cyclones", those disturbances that first appear "over and somewhat to the southward of the Gulf of Tehuantepec." He states that this group is the most numerous of all tropical storms found in the eastern Pacific; and, unless short-lived, they usually follow a course to the westward of the entrance to the Gulf of California.

Several in their northwestward journey have actually entered southwestern United States, where, by the unusual and, at the time, unexplainable weather phenomena that attended them, they left an indelible impression. It is true they were no longer of hurricane force, and were in the dying stages of tropical cyclones that pass over land surfaces in the temperate zones, but the attendant high temperatures and unseasonable rains made their incursions long to be remembered.

Three such memorable storms were those of September 24–October 8, 1921; September 10–18, 1929; and September 27–29, 1932. The first originated in the Gulf of Tehuantepec, moved northwestward along the coast of Lower California, and recurved eastward near San Diego. It continued its phenomenal journey over the United States; left the continent in the vicinity of the Gulf of St. Lawrence; and finally disappeared near the British Isles on October 8. At many stations in southern California and Arizona it produced the greatest rainfall ever recorded in September, and, since its arrival was wholly unexpected, caused much damage to crops and drying fruits.