

U. G. Straitline boring machine from the Canadian Longyear Co. will be used. The structure of the upper parts of the frozen firn will also be carefully examined in open shafts. Besides these more specific investigations, the amounts and different kinds of accumulation material (direct precipitation and snow drift) will be determined, as well as the ablation quantity (melting, evaporation, and wind corrosion).

The wintering party will have one full summer, two springs, and at least one autumn at its disposal for investigating the mountain areas, which will be photographed from the air as soon as possible for comparison with the photos still extant from the German expedition. The most important object of these regional studies is to ascertain whether the recent climatic fluctuation, which has proved of so great importance in the Arctic, also includes the Antarctic or not. Thorough and detailed study would be devoted to the most interesting districts and their local glaciers, surrounded by the open inland ice or its more or less broad arms.

The meteorological program includes not only the usual recordings of temperatures, humidity, and wind at ground level as well as at various heights on a ten meters high mast, but also all determinations of incoming and outgoing radiation, necessary for a calculation of the heat economy of the snow and ice surfaces. We attach special value to the daily launching of radiosondes and radar-wind measurements in anticipating suitable cooperation with other stations in the Antarctic and adjacent continents to facilitate the interpretation of the data from our own station.

In addition the Base Stations activities listed above regular observations will be made of earth magnetism, cosmic radiation, the ozone layer, and the aurora borealis.

As already said, Great Britain will be responsible for the geology. No man has yet set foot on the large snow- and ice-bare regions of Queen Maud Land. Judging by the German photographs, widely different kinds of rocks and complicated tectonics must be expected there. Both crystalline and sedimentary rocks obviously occur there, the former including both schists and diabases. It also seems as though these would to a greater extent than the other kinds be associated with a more placid and even topography. What is most startling is the violent acuity of the alpine topography characterizing the mountain massifs in general and especially those in the area enclosed by long. 0° — 10° E and lat. 72° — $72^{\circ} 30'$ S. The highest, acutely pyramidal peak has rightly been called "Matterhorn"; it would perhaps be even better characterized by the name "Kinchinjunga". These mountains accentuate still more the new and essential problems associated with a full appreciation of the Antarctic and the world's Ice Age, which are presented by Queen Maud Land. In any case it is of the greatest importance to a full understanding of the geological, tectonic, and topographical character of the Antarctic and its relations to the general structure of the southern hemisphere that these areas should be examined as extensively as possible by modern methods and from modern points of view.

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Swedish Meteorological Research 1939—1948¹

To a considerable extent the scientific meteorological activities in Sweden during the war suffered from the competition with the practical meteorological work made necessary by the war conditions. Nevertheless a number of investigations of a more general bearing have been carried through and published.

¹ Based on a report to the meeting of U. G. G. I. at Oslo in 1948.

A brief survey of the essentials of these researches will be given below.

Aerology. A detailed examination of a cyclonic disturbance passing over north-western Europe 17—18 October 1935 has been made by A. NYBERG 1942 and E. PALMÉN with due regard to all available upper air data. Among the results may be mentioned that the upper tropical air was moving ahead of

the tropospheric warm front, thus giving rise to a kind of stratospherical cold front. A strong cooling occurred of the warm air ahead of the upper cold front. A deviation of the actual wind of up to about 15° from the geostrophic wind was found.

In a thesis "Synoptic-aerological investigation of weather conditions in Europe 17—24 April 1939", NYBERG 1945 has made an extensive use of all available aerological observations in order to obtain a clear conception of the atmospheric circulation in the cases investigated. Among the results laid forward in the summary, the following may be mentioned. The existence of distinct fronts also at higher air levels is in many cases undeniable, but there is good reason to believe their existence to be neither a necessary nor a sufficient condition for cyclogenesis or the formation of cyclonic rain areas. In a case of a cyclonic disturbance investigated, it was found that no distinct fronts existed at the start, but were kinematically formed in connection with a later development.

In cyclones a transformation of warm air occurs by the occlusion process during the elevation, while in the sub-tropical high-pressure areas transformation in the opposite direction takes place.

MARKUS BÄTH 1946 has made an investigation of three tornadoes which have occurred in Sweden in the years 1939 and 1942. His paper on the subject contains an examination of the synoptic conditions in the three cases and gives a theoretical consideration especially of the question of the energy supply.

Climate. ÅNGSTRÖM 1939 a, b, 1941, 1942 a has carried out a number of investigations on climatic variations of temperature and precipitation. He has emphasized especially the influence of variation in the general circulation of the atmosphere on the temperature variations and has pointed out that from theoretical reasons one ought expect the variations to be much larger at very high than at middle and low latitudes. He has further discussed some fundamental principles which ought to be considered in defining climatic variations. He has drawn attention to the necessity of paying attention to the accidental variation of the meteorological elements in discussing the differences between longer series and in discussing so called climatic changes.

Similar problems have also been treated by G. H. LILJEQUIST 1943 in his investigation of severe winters in Stockholm 1757—1942.

A study by F. BERGSTEN 1945 on methods for determining the influence of wind on the water level of the oceans and their application on computations of the land elevation, deals with a combined meteorological and hydrogeological problem. Bergsten shows that determinations of the land elevation without due regard to the circulation of the atmosphere may give rise to serious misinterpretations.

C. J. ÖSTMAN 1939 has investigated the connection between the ice conditions at the Swedish east coast and the meteorological factors. The paper is illustrated with numerous charts and diagrams, the text being given in Swedish and German language.

A. ÅNGSTRÖM and S. JACOBSON 1940 have investigated the temperature conditions in the lake Vänern and in its outlet, Götaälv, especially with regard to the factors influencing the ice formation. The English summary contains several results of general interest among which may be mentioned a discussion of the marked temperature rise occurring in the water of the lake after a protecting ice layer of sufficient thickness has been formed. The consequence hereof is that the ice often is found to disappear or decrease in the outlet with an increase of the ice cover in the lake.

T. BERGERON 1943 has in the book "Norge" by Hans Ahlmann given a short survey of the climate of Norway. He has investigated, 1944 a, on the basis of synoptic meteorological observations the meteorological conditions for the dissemination of Spores, Pollen etc. A special case is subjected to a detailed treatment.

A. ÅNGSTRÖM 1946 has in a treatise "Sveriges klimat" — the climate of Sweden — given a general survey over the climatic conditions of the country. The work is illustrated by numerous diagrams and maps.

Hydrometeors. H. KÖHLER 1941 has made an experimental investigation on sea water nuclei. He has by means of Millikans method measured mass, radius, density and concentration of droplets produced artificially in driving air through sea water. The masses of the salt particles in the drops have been calculated from the density. The rate of evaporation has also been preliminarily investigated. Among the results may especially be mentioned that

it was shown that droplets and nuclei artificially produced in the way described, were of the same order of size as the particles and nuclei occurring within clouds and fog.

Instrument and methods. NYBERG 1939 has with aid of a resistance bridge of the Kelvin type made measurements of the temperature in the air layers close to a snow surface. A maximum gradient of about 1°C mm was found close to the surface. The turbulence is active down to levels below 1 mm.

NYBERG 1940 has further studied the lag arising in readings by means of the Väisälä sonde. Errors in relative humidity of 30 to 40 per cent are not rare on account of lag effects, to which it is consequently necessary to pay very careful attention.

In another paper NYBERG 1942 b has published some results of comparisons between the air plane meteorograph, the Jaumotte meteorograph and the Väisälä radiosonde.

In consequence of a commission by certain international bodies, N. G. JOHNSON and H. OLSSON 1944 have carried out an investigation resulting in the development of methods for standardization of photoelectric elements by means of solar radiation. They have further studied the relation between radiation records by photoelectric cells and records of the total energy of incident radiation and devised methods by which the one record can be computed from the other one, under various conditions.

NYBERG 1946 has made an investigation of the differences in the readings of the Väisälä radiosonde and the Friez radiosonde as used at Bromma air field in the year 1945. He concludes that the Friez sonde gave values which in general were about $2^{\circ}.5\text{ C}$ lower than those given by the Väisälä type. In extreme cases the difference amounted to 5° C . He expresses the opinion that the difference is due to an error in the Friez sonde.

Other researches. Through a collaboration between the Swedish Meteorological and Hydrological Institute and a committee established by the Royal Swedish Academy of Engineering Sciences, an extensive investigation of thunderstorms as regards the meteorological aspects has been inaugurated. The first results of this collaboration are given in a publication com-

posed by preliminary treatises by LINDHOLM, MODÉN, PERSSON and ÅNGSTRÖM 1945. Further work is in progress especially directed on the problem of forecasting. Special "lability maps" are now drawn at the aerological division connected to the weather service, and on the basis of these maps and of the general analysis, forecasts of thunderstorms are issued.

Warnings for forest fires are sent out by the Swedish Weather Service on the basis of results obtained by ÅNGSTRÖM 1942 b in treating a number of field experiments made in order to establish a relation between inflammability on the one hand and meteorological factors like temperature and humidity on the other.

LINDHOLM 1946 has made a study of the propagation of air waves from the explosion at Oslo on December 19th. 1943. An analysis of the audibility observations in Sweden, combined with the results of available tropospheric data, seems to indicate that in order to explain the location of the abnormal zone one must assume, at the occasion investigated, a temperature distribution within the stratosphere, which is characterized by rather rapid increase with height at comparatively low altitude, namely already at 20—25 km. This agrees well with the results obtained by GUTENBERG from measurements of sound propagation at previous explosions in Europe, but is less compatible with the winter temperature distribution given by DUCKERT.

Among researches, the results of which are not yet published, may be mentioned the comprehensive investigation carried out in connection with the total solar eclipse in northern Sweden July 9, 1945. The Swedish National Committee of Geodesy and Geophysics cooperated in these researches with the Meteorological Institute of Helsingfors. An aerological investigation especially of temperature variations in the upper atmosphere and of radiation errors in the Väisälä radiosonde was made including a series of aerological ascents at Uppsala and at Löfvånger ($64^{\circ} 22\text{ N } 21.24\text{ E. Gr.}$). At the same occasion extensive radiation measurements with aid of actinometers and photoelectric cells were carried out at Löfvånger.

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