

EVŽEN QUITT

## GENERAL AND DETAILED CLIMATOLOGICAL MAPPING OF CZECHOSLOVAKIA'S TERRITORY

The working team of the Department of Climatology and Hydrology of the Institute of Geography, Czechoslovak Academy of Sciences, in Brno above all deals with two fundamental questions, the elaboration of methods of the climatological mapping and regionalization of Czechoslovakia, and the elaboration of methods and the execution proper of mesoclimatological investigation of small regions.

In the macroclimatological regionalization the climatological material already adapted for the Atlas of the Climate of Czechoslovakia was used. In that Atlas all representative material for the period 1901—1950 and/or 1926—1950 has already been concentrated in 89 maps. From these 14 maps were chosen for the characterization of a certain place for agricultural, technical as well as recreation purposes. These were the maps of numbers of summer, frost and ice days, and of the days with a mean daily temperature  $\geq 10^{\circ}\text{C}$ , the average air temperature in January, April, July and October, the number of days with precipitation of  $\geq 1$  mm, the amount of precipitation in the vegetation and in the winter periods, the number of days with snow cover and the number of days of clear sky and overcast sky. A special method was used in the elaboration of those 14 climatic characteristics.

The territory of the Republic was divided in maps on 1 : 500 000 into squares of 3 × 3 km. The number of the squares, each of them having its own punched card, amounted to about 16 000. In every punched card the 14 climatic characteristics were recorded representing the climatic conditions of the area of 9 sq. km covered by the square. For the whole of Czechoslovakia about 220 000 indications had to be derived. Of this complex of punched cards the cards with equal values of all the 14 climatic characteristics were sorted out. Thus we have got 111 groups in the western part of Czechoslovakia, many of them comprising but several hundred cards, others but several dozen. Some of the groups differed in one or two climatic characteristics. These were grouped into larger units.

The borders of the climatic regions should be placed, in our opinion, in places, where more important changes in several climatic characteristics took place. The indication how many of the 14 climatic characteristics change in transition from one square to the other is to indicate the intensity of the change of climatic conditions. Where a greater number of changes occur, greater changes in the climatic conditions and consequently even more distinct climatic borders can be supposed.

On the basis of those data three fundamental climatic regions have been defined in the western part of Czechoslovakia, i. e. the warm, the moderately warm and the cold, falling into 14 units and subdivided into 111 groups. The units were first defined by means of horizontal and vertical lines. This representation is rather unusual and does not respect the character of the geomorphology of the landscape. The borders were therefore somewhat modified. The climatic regions and units were conjoined in those places where this was justified on the basis of the data of other branches (biogeography, geomorphology). But we purposely did not form regions in places where *there* did not manifest themselves in the squares though they seemed to occur on the basis of geomorphology, biogeography or other foundation maps.

Together with the climatic regionalization of Czechoslovakia we also prepared a proposition of the conception of general and detailed mesoclimatic maps used in the detailed definition of smaller territorial units covering an area of some tens of square kilometres. In the compilation of those maps experience was applied obtained through mesoclimatic field investigations in different regions of Czechoslovakia carried out by the members of the Department of Climatology and Hydrology for several years. According to the scale and contents we distinguish general mesoclimatical maps on a medium scale of 1:100 000 up to 1:200 000 and detailed mesoclimatical maps on 1:50 000, 1:25 000 and 1:10 000.

The necessity of the compilation of general mesoclimatic maps in Czechoslovakia follows from both the natural conditions of the country's territory and present social needs. The general knowledge of mesoclimatic conditions is of decisive importance in the solution of wider macroclimatic, regional-geographical and also theoretical problems. The basic unit of the map contents is the representation of the insolation on the active surface. The insolation ranks among the most important elements, especially from the point of view of the power balance of the atmosphere. On the basis of insolation even the temperature balance, as well as the deviations of the daily and annual temperature course and the like, can be established. So for instance in the mesoclimatic map of the South Moravian Region 8 intervals of the total quantity of insolation were distinguished, such as less than 80, 80—85, 85—90, 90—100, 100—110, 110—120, 120—130 and more than 130 thousand major calories per sq. cm per year. Further, the occurrence of local inversions of air temperature has been represented in the maps.

The modified Uhlig's method has been applied in the delimitation of the areas with a presumptive occurrence of a lake of cold air. We do not use this method, of course, in the construction of detailed mesoclimatic maps when necessarily profound temperature research by means of apparatuses is to be carried out and evaluated.

A further climatic characteristic represented in the map is the prevailing wind direction. On the basis of the methods by K. K. Kaminski and E. S. Rubinstein the prevailing and the second prevailing wind directions were computed for the individual stations of observation. On the basis of detailed knowledge of the terrain and of local conditions those indications were then completed with stream-lines of the expected prevailing wind direction. The marking of the areas with a repeated occurrence of local fogs and of the road sections with frequent snow drifts and icy covers is also a very important

element of the general mesoclimatic maps. Industrial towns are usually characterized by strongly polluted atmosphere. In the delimitation of the individual regions of atmospheric pollution the results of the measurements of the dustiness by means of the sedimentation method are made use of. Further, in the general mesoclimatic map the types of the urban coverage and larger areas covered with forests are represented according to the way in which they manifest themselves in the mesoclimate.

Whereas the general mesoclimatic map on 1:200 000 is compiled primarily by means of summing up the well-known data and/or by means of estimation or derivation of the missing values, in the construction of the detailed mesoclimatic map the results of profound field investigations by means of apparatuses are being made use of. The latter thus have a more exact and wider content applied not only in building, agricultural, hygienic and technical practice, but also in the solution of various theoretical problems of local character. In the Department of Climatology and Hydrology of the Institute of Geography, Czechoslovak Academy of Sciences, detailed mesoclimatic maps on 1:25 000 are being compiled. The basic map contents is again the amount of insolation in major calories per sq. cm. Even the border of shading in a certain period (winter, equinox, etc.) is very important for both the building and the agricultural practice. In the delimitation of the lake of cold air, the method of stationary measurements or that of thermometric rides, most frequently the combination of both, were applied. On the basis of the obtained data we can establish the probability of the occurrence of the temperatures of 0 °C and lower in a certain month in different places.

For the construction of the supposed course of the stream-lines and the abating of wind, measurements by means of special terrain anemographs are carried out. We usually carry out those measurements under weather situations when the wind of the prevailing or of the second prevailing direction typical of the area investigated is blowing.

In the detailed mesoclimatic maps too the positions with a more frequent occurrence of fogs are represented. We usually must be content with detailed knowledge of the terrain. Besides, also the areas defining the different character or intensity of coverage in dependence on its influence on the temperature or humidity conditions are marked in the maps. A necessary supplement is the delimitation of the road sections with a repeated occurrence of snow drifts, ice cover and lateral wind. Even the representation of the atmospheric pollution intensity is of great importance. The results obtained on the basis of the sedimentation method of investigation supply a sufficient survey on the value of the dust falling on the Earth surface in t per sq. km per year.

The general as well as the detailed mesoclimatic maps are to be considered a qualitative contribution to the generally quoted and used characteristics lined up in tables or in the text. They are undisputably more lucid, especially as to the comprehensive representation of the distribution of the important climatic characteristics and phenomena in the investigated area in one map. Thus, they permit a much less prejudiced view of the distribution of the entire complex of the climatic elements in the landscape.

In the investigation of the mesoclimatic conditions serving as a base in the compilation of mesoclimatic maps we use different methods. We place in the

area investigated a number of standing meteorological stations, each of them representing the conditions of a certain mesoclimatic type. Besides, investigations of temperature, humidity and wind conditions are being carried out under typical weather situations in several dozen further points of observation. In the definition of the extent of the "lakes of cold air" even thermometric rides are used when an electrical resistance thermometer or psychrometer is placed on the bonnet of the car. In the research of wind conditions terrain recording anemographs constructed also in our department are being made use of.

This entire complex of the questions investigated is suitably completed by the solution of basic hydrological, biogeographical and even geomorphological problems solved in the Institute of Geography, Czechoslovak Academy of Sciences, and even in other scientific institutions.

#### References

- FOLTÁNOVÁ D.: Dynamicko-klimatologické hodnocení teplotních a srážkových poměrů v Brně. Meteorologické zprávy XVII: 33—37, 1964.
- QUITT E.: Mesoklimatický průzkum střední části Dyjskosvrateckého úvalu. Práce brněnské základny ČSAV XXXIII: 77—112, 1961.
- QUITT E.: Method of the establishment of mesoclimatic regions in towns. Supplement for the XX-th International Geographical Congress — London 1964. 105—110, 1964.
- QUITT E.: Methoden und einige Ergebnisse der Klimaforschung im Mährischen Karst. Zeitschrift für Angewandte Meteorologie 5: 3—6, 1964.
- QUITT E.: The Main Climatic Conditions in the Moravian Karst. Problems of the Speleological Research 167—174, Praha 1965.
- QUITT E.: Metody konstrukce mezoklimatologických map. Sborník Československé společnosti zeměpisné 70: 232—250, 1965.
- QUITT E.: Průzkum větrných poměrů v členitém terénu pomocí jednoduchých anemometrů. Meteorologické zprávy XIX: 20—25, 1966.
- QUITT E.: Metoda klimatologické rajonizace území ČSSR. Sborník Československé společnosti zeměpisné 73: 890—890, 1968.

#### Résumé

#### PŘEHLEDNÉ A PODROBNÉ KLIMATOLOGICKÉ MAPOVÁNÍ NA ÚZEMÍ ČESKOSLOVENSKA

Pracovníci oddělení klimatologie a hydrologie Geografického ústavu ČSAV se věnují především řešení dvou základních otázek: 1. vypracování metodiky klimatologického mapování a rajonizace ČSSR, 2. vypracování metodiky a vlastního provádění mezo-klimatologických průzkumů malých oblastí.

Při makroklimatologické rajonizaci jsme použili již zpracovaného klimatologického materiálu v Atlasu podnebí ČSR, z něhož jsme vybrali 14 map potřebných k charakterizování určitého místa pro zemědělské, technické a rekreační účely. Ke zpracování těchto 14 klimatických charakteristik jsme použili zcela zvláštní metody. Území republiky jsme v mapách 1:500 000 rozdělili na 16 000 čtverců o velikosti 3 × 3 km. Každý z nich měl svůj vlastní děrný štítek, do něhož jsme zaznamenali 14 klimatických charakteristik. Z tohoto souboru děrných štítků jsme vytřídili štítky se stejnými hodnotami všech čtrnácti klimatických charakteristik. Na území západní části našeho státu jsme tak získali 111 skupin, z nichž některé se vzájemně odlišovaly v jedné nebo dvou klimatických charakteristikách. Ty jsme seskupili ve větší jednotky. V západní části naší republiky jsme tak vymezili 3 základní klimatické oblasti (teplou, mírně teplou a chladnou).

Při pracích spojených s klimatickou rajonizací území naší republiky jsme sestavili i návrh koncepce přehledných a podrobných mezoklimatických map, které slouží při

podrobném vymezení menších celků o rozloze několika desítek km<sup>2</sup>. K sestavování těchto map bylo použito především zkušeností získaných mezoklimatickými průzkumy terénu v rozličných oblastech naší republiky, kterými se pracovníci oddělení zabývají již řadu let. Podle měřítka a obsahu rozlišujeme přehledné a podrobné mezoklimatické mapy. Základní jednotkou obsahu mapy je znázornění množství dopadajícího slunečního záření na aktivní povrch. Dále je v mapách zakreslen výskyt místních inverzí teploty vzduchu, převládající směr větru, plochy s častým výskytem místních mlh a úseky silnic s často se vyskytujícími závějemi a náledím. Dále jsou na mezoklimatické mapě vyznačeny typy městské zástavby, větší lesní plochy, podle toho, jak se projevují v mezoklimatu, a intenzita, znečištění ovzduší. Do podrobných mezoklimatických map zakreslujeme kromě toho zastínění terénu v určitém období (zima, rovnodennost apod.). Podrobné i přehledné mezoklimatické mapy je nutno považovat za kvalitativní přínos k dosud všeobecně uváděným a používaným charakteristikám seřazeným v tabulkách nebo v textu. Uvádějí totiž komplexně na jedné mapě rozložení důležitých klimatických charakteristik a jevů na studovaném území a umožňují tak mnohem objektivnější pohled na rozložení celého komplexu klimatických prvků v krajině.