SBORNÍK ČESKOSLOVENSKÉ GEOGRAFICKÉ SPOLEČNOSTI
Ročník 1984 • Číslo 2 • Svazek 89

JAN MUNZAR

THE PRESENT PROBLEMS OF RECONSTRUCTION OF CLIMATIC VARIATIONS ON THE TERRITORY OF CZECHOSLOVAKIA IN THE HISTORICAL PERIOD

In connection with the World Climatic Programme adopted by the World Meteorological Organization in 1980 a significant increase of world-wide interest in the study of climatic variations may be felt. This is above all the result of the new way of seeing the climate as a variable natural resource of the landscape as well as of the increased sensibility of economic activities experienced recently in connection with climatic variations. The climate has been undergoing changes in the past, in the present time and will undergo changes also in the future. This is why efforts are made to study the regularities of these variations with prospects of their prognostication. The main aim of the World Climatic Programme will be reached if authorities responsible for the planning of social and economic policies will be able to acquire reliable information necessary to weaken man's dependence on the variations or the changes of the climate.

As a basic unit in the study of climatic variations the period of 1000 years is usually taken into account. Yet, meteorological observations both made abroad and on the territory of Czechoslovakia are performed in a relatively shorter time. The only active secular station in Czechoslovakia Praha-Klementinum has produced a series of temperature starting in 1775, and a series of atmospheric precipitation since 1805 (Šebek 1980). If we are to evaluate the spot and the area distribution of climatic variations in the past, a major series of quantitative data can be obtained from measurements carried out during the last one hundred years. This constitutes a relatively short lapse of time if it should be used as the basis for the study of climatic variations, comparable with the 80-year solar cycle. Is there a real prospect of hope for meteorological information from earlier times?

The oldest measurements carried out on the territory of Bohemia have been considered the data obtained from one-year measurements undertaken in Prague in 1752 (Munzar 1969). According to the author's new investigation, however, regular measurements of the temperature and pressure of the air were carried out for some time at Zákupy in northern Bohemia as early as in 1720. Episodic data on the temperature in Prague and Karlovy Vary concern even the winter period of 1709. It is hard to estimate the range of possibility in which these data could be made use of as we do not know anything more precise about them so far. The basic unit in the study of climatic variations is, however, a time

lapse of at least 500—1000 years so that, in any case, it is necessary to turn the attention towards the question of weather reconstruction solely on the basis of indirect observations.

In Central Europe the country with obviously the most complete documentation on the climate in historic times is Switzerland (e. g. Pfister 1983), followed by Hungary due to the lifetime activities of Prof. A. Réthly (published up to the year 1800). Much has been done recently in this field in the Soviet Union where the pioneer works dating from the Sixties by I. E. Buchinski are being continued. In 1981 the 2nd National Seminar on the earth climate reconstruction in the last millennium was held in the Soviet Union; on this occasion it was decided to elaborate a widely conceived study of the history of climate on the territory of the Soviet Union during the last millennium (Zolotokrylin, Lyakhov 1981). Since that time several valuable papers have been published dealing with these questions (Rauner, Zolotokrylin, Popova 1983); quite recently a survey of extreme natural phenomena mentioned in Russian chronicles from 11th to 17th century (Borisenkov, Pasetski 1983).

It is worth noticing here that when establishing the basic meteorological series in a distant past we have to be based on the experience according to which the surveys of climatic variations in historical times are the most precise and the most detailed in those cases where the researcher operates with domestic sources.

In the light of this experience it is quite understandable why the leading professional workers abroad have tried to treat of the sources, or better the „catalogues of weather history" on the basis of observations made in a large number of places. A global synthesis of the latter may constitute a significant contribution to a qualified knowledge of climatic fluctuations in the last 1000 years. Let us see, therefore, what has been done in this respect in Czechoslovakia.

The first attempt was made nearly two hundred years ago by A. Strnad, the director of the observatory at Praha-Klementinum, who compiled a chronological list of cataclysms which took place in Bohemia in the period between 633 and 1700 (Strnad 1790). A hundred years later the first Czech professor of meteorology at the Czech University in Prague F. Augustin was the first to pay attention to the occurrence of drought in Bohemia between 962 and 1893 (Augustin 1894). In both cases it surely was a pioneer work, there was however no critical evaluation of the sources and no attempt at a verification of comparative data from the neighbouring states. K. Pejml rightly notices that in their descriptions of natural phenomena the chroniclers often exaggerated or made other mistakes. The most frequent error is an incorrect quoting of winter season (e. g. 1708/1709 in one case as of the year 1708, while as that of 1709 in another). If we overlook this kind of errors the result of our syntheses may be an overestimate of a number of tough winter seasons. Further it is important to keep in mind that chroniclers mostly put down only climatic extremes — consequently it is necessary to take into account also the density of available information, etc.

An attempt at a broad-based solution of problems in the study of climatic changes in historical times was made in 1931 by S. Hanzlík, professor of meteorology at Charles University, Prague. He based his work on the decision of the International Geographical Congress, in Cambridge in 1928 where an international commission was set up to solve this

question. Five years later Prof. Hanzlík was successful in founding the Czechoslovak National Committee for the Study of Climatic Changes in Historical Times. Its activities had a promising start, first contacts were tied with the Czechoslovak archives, but everything finished at the outbreak of the Second World War. Some collaborators lost their lives during the war, others emigrated from Czechoslovakia. Prof. Hanzlík tried to re-open the activity of the committee after 1945, but in vain. Moreover, the results of the pre-war activities have got lost. S. Hanzlík supposed that the main field of the study of climatic changes on the Czechoslovak territory will help the dendrology, another field of the meteorological-historical studies, the latter being helpful apart from other things in the dating of the annual growth of rings of trees. The last undertaking of the National Committee was the appeal sent to the directorship and to the individual sections of the newly founded Czechoslovak Academy of Sciences in which the latter is called to take over the solution of scientific problems of climatic changes in Czechoslovakia transforming it to one of the projects of its basic research (Munzar 1982).

Since the end of the Fifties the ideas of Prof. Hanzlík have been succesfully realized by K. Pejml from the Institute of Hydrology and Meteorology. K. Pejml has elaborated the basic methods of evaluation on the basis of which he undertook a valuable reconstruction of climatic variations in the vine and hops growing areas of northern Bohemia in periods starting with the beginning of the 16th and ending at the close of the 19th century (e. g. Pejml 1966, 1974). Due to an extraordinarily time-consuming research by methods hard to follow no systematic continuation of this kind of reconstruction of climatic changes in other areas with important farming production or in the whole Czech Lands took place. Only papers dealing with partial aspects of the above problems were published.

Attention should be paid to a well-documented study by the historical geographer J. Vaniš who describes a successful reconstruction of the climatic conditions in the region of Louny in the second half of the 15th century on the basis of data indicating the beginning and the end of the haymaking season, the harvest season, vineyard labour, cutting of ice in the river Ohře, and records of pouring of water out of flooded cellars, which are included in the book of accounts of the town of Louny (Vaniš 1982). The author of the present paper has concentrated his efforts among other things on a preliminary inventory-taking of meteorological information in the period of 1582 to 1597 (i. e. the period in which Tycho Brahe was carrying out his observations on the isle of Hven in Denmark). Among the documents of the respective period from the territory of Czechoslovakia the most interesting are weather observations performed by the Moravian nobleman Karel Starší of Žerotín in the years 1588—1589 and 1591. His records which mostly deal with the town of Náměšť nad Oslavou, Moravia, are written mostly in Latin and only a part in Czech (Munzar 1983 b). At present they are being evaluated and prepared for publication in extenso.

Dr. O. Šebek from the Czech Institute of Hydrology and Meteorology in Prague set up a small working team which should study the problems of climatic changes as a prolongation of the NIR programme (the Nauchno-issledovatelskiye raboty), No. 15, „Climatic changes" within the co-

operation of the hydro-meteorological staffs of the socialist countries. The author of the present paper participates in the 3.2 stage, the aim of which is to investigate materials on the climate in the pre-instrumental period as a possible future analogon of climate. (An application to take part in the solution of these problems was also presented, apart from Czechoslovakia, by the USSR and Poland.) At present research is being carried out of the oldest meteorological measurements in Brno (e. g. of the first half of the 19th century, Munzar 1983 a), and information is being gathered for the purpose of the weather reconstruction in southern Moravia in historical times from qualitative or indirect data.

There are prospects of collaboration of the Czechoslovak Meteorological Society with other public bodies which should result in a national seminary on „Climatic changes" in 1985. On this occasion both the results of analyses of climatic variations established by observations made after 1775, and contributions to the study of climatic and weather reconstruction in the pre-instrument period will be presented. We can hope that the results of these investigations will constitute a concrete contribution to the solution of the problem of climatic change prognostication.

References

AUGUSTIN F. (1894): Sucha v Čechách v době od roku 962—1893. A. Reinwart, Praha.

BORISENKOV E. P., PASETSKI V. M. (1979): Extreme meteorological phenomena according to Russian historical sources of the 10th to 19th centuries. Abstracts of International Conference on Climate and History, July 8—14 th 1979, Norwich.

BORISENKOV E. P., PASETSKI V. M. (1983): Ekstremalnyje prirodnyje javlenija v russkich letopisjach (XI—XVII vv.). 240 pp., Gidrometeoizdat, Leningrad.

LAMB H. H. (1980): Weather and climate patterns of the „Little Ice Age". In: Oeschger H. et al.: Das Klima; Analyse und Modelle, Geschichte und Zukunft, S. 149—160, Springer Verlag, Berlin e. a.

LAMSFUSS J. (1980): Quellen der vorinstrumentellen Epoche zur grossräumigen Analyse. Annalen der Meteorologie. Neue Folge, No. 16, 164—166. Offenbach a. M.

MUNZAR J. (1969): The beginnings of meteorological measurements in Czechoslovakia in the 18th century (in Czech). Dějiny věd a techniky 2:3:183—187. Academia, Praha.

MUNZAR J. (1973): The oldest description of the climate of Moravia from the year 1815. In: Folia Fac. Sci. Nat. Univ. Purkynianae Brunensis, Tomus XIV, Geographia 8, Opus 11, 97—105. UJEP, Brno.

MUNZAR J. (1982): Professor Stanislav Hanzlík and research of climate variations in the historical period (in Czech). Meteorologické zprávy 35:3:93—94. SNTL, Praha.

MUNZAR J. (1983 a): Výzkum podnebí Brna od počátku 19. století (Climate research of the town of Brno from the beginning of the 19th century). In: Geografický výzkum v ČSAV 1952—1982, sympozium Liblice 7.—10. 2. 1983, sborník referátů, s. 74 až 81. Geografický ústav ČSAV, Brno.

MUNZAR J. (1983 b): A contribution to the reconstruction of the weather in central Europe at the end of the 16th century. Abstracts of the Second Nordic Symposium on Climatic Changes and Related Problems, Stockholm May 16—20, 1983, p. 86—87. Det Danske Meteorologiske Institut, København.

PEJML J. (1966): Příspěvek ke kolísání klimatu v severočeské vinařské a chmelařské oblasti od r. 1500—1900 (Beitrag zum Studien der Klimaschwankungen im Nordböhmischen Weinbau— und Hopfenbaugebiet im Zeitraum vom 1500 bis 1900). Sborník prací Hydrometeorologického ústavu ČSSR, No. 7, 23—78. HMÚ, Praha.

PEJML K. (1974): Příspěvek ke znalosti kolísání klimatu v Čechách v 16. až 18. století. Meteorologické zprávy 27:3:90—94. SNTL, Praha.

PEJML K., MUNZAR J. (1968 a): Das Wetter in Basel in den Jahren 1596—1597 nach dem Tagebuch des Mathias Borbonius von Borbenheim. Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich, 113:4:407—416.

PEJML K., MUNZAR J. (1968 b): Matyáš Borbonius z Borbenheimu a jeho meteorologická pozorování z let 1596—1598, 1622. Meteorologické zprávy 21:3:93—95. HMÚ, Praha.
PFISTER CH. (1983): The potential of documentary data for the reconstruction of past climates (early 16th to 19th century); Switzerland as a case study. Abstracts of the Second Nordic Symposium on Climatic Changes and Related Problems, Stockholm, May 16—20, 1983, p. 103—110. Det Danske Meteorologiske Institut, København.
RAUNER J. L., ZOLOTOKRYLIN A. N., POPOVA V. V. (1983): Kolebanija vlažnosti klimata na jevropejskoj territorii SSSR za 4000 let. Izvěstija AN SSSR, ser. geograf., No. 1, 50—59, Moskva.
STRNAD A. (1790): Chronologisches Verzeichniss der Naturbegegenheiten in Böhmen v. J. 633 bis 1700 mit einigen oekonomischen Aufsätzen a. d. J. 1790. Prag.
ŠEBEK O. (1980): The World Climate Programme and some results of the secular series Prague-Klementinum (in Czech). Meteorologické zprávy 33:5:131—133. SNTL, Praha.
VANIŠ J. (1982): Die historische Geographie des Gebietes von Louny in der zweiten Hälfte des 15. Jahrhunderts (in Czech). Historická geografie, No. 20, p. 127—186. Ústav československých a světových dějin ČSAV, Praha.
ZOLOTOKRYLIN A. N., LJAKHOV M. E. (1981): Klimaty prošlych věkov (Climate of former years). Izvěstija AN SSSR, ser. geografičeskaja, No. 5, p. 155—157, Moskva.

Shrnutí

AKTUÁLNÍ PROBLÉMY REKONSTRUKCE KOLÍSÁNÍ KLIMATU NA ÚZEMÍ ČESKOSLOVENSKA V DOBĚ HISTORICKÉ

V souvislosti se Světovým klimatickým programem, který přijala Světová meteorologická organizace (WMO) od roku 1980, významně vzrostl celosvětový zájem o studium kolísání klimatu. Souvisí to jak s novým pohledem na podnebí jako na proměnný přírodní zdroj krajiny, tak se zvýšenou citlivostí hospodářské činnosti na výkyvy podnebí v poslední době. Je proto snaha studovat zákonitosti tohoto kolísání s výhledem na jeho předpověď.

Za základní jednotku pro studium kolísání klimatu se obvykle považuje 1000 let, ale přístrojová meteorologická pozorování v zahraničí i na území Československa se vzhledem k délce tohoto období provádějí po dobu relativně krátkou. Jediná čs. sekulární stanice Praha-Klementinum má řadu teplot souborně publikovanou od r. 1775, srážkovou řadu od r. 1805. Pro hodnocení plošného rozložení povětrnostních výkyvů v minulosti však nemáme informace o mnoho delší než za posledních 100 let. Je proto nutné vycházet z rekonstrukce počasí na základě nepřímých údajů.

Je uveden přehled dosavadní dokumentace podnebí v době historické jak v některých státech střední Evropy, tak na území Československa. První chronologický přehled přírodních pohrom v Čechách od nejstarších dob do r. 1700 sestavil A. Strnad. Výskytu sucha v Čechách do r. 1893 si všímal F. Augustin. Před 2. světovou válkou se pokusil o rozsáhle koncipovaný výzkum klimatických změn v době historické S. Hanzlík. Myšlenky S. Hanzlíka začal od konce 50. let úspěšně realizovat K. Pejml, který vypracoval jak základní metodiku hodnocení, tak provedl rekonstrukci kolísání klimatu v severočeské vinařské a chmelařské oblasti od počátku 16. do konce 19. století.

Z poslední doby je zmíněna práce J. Vaniše, týkající se rekonstrukce klimatických poměrů na Lounsku v druhé polovině 15. století, která vyšla z nepřímých údajů v Knize počtů města Louny. Autor tohoto příspěvku provedl předběžnou inventarizaci meteorologických informací z území Čech a Moravy ke konci 16. století. Nejzajímavější z nich jsou meteorologická pozorování Karla staršího ze Žerotína z let 1588—1589 a 1591, která patří k nejstarším denním záznamům na území našeho státu.

V roce 1985 má Československá meteorologická společnost při ČSAV uspořádat národní seminář k tématu „Změny klimatu". Lze doufat, že se do té doby podaří vyřešit otázku zařazení této problematiky do státního plánu základního výzkumu, aby bylo možné přikročit k práci na katalogu „dějin" počasí — podkladu pro rekonstrukci kolísání klimatu u nás — od nejstarších dob do počátku 20. století pro celé území ČSR, popř. i ČSSR. Jednalo by se o konkrétní přínos pro řešení problému předpovědi klimatických změn.

(Address: Geografický ústav ČSAV, Mendlovo nám. 1, 662 82 Brno.)