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CURRENT REPORTS OF THE STATE HYDROLOGICAL INSTITUTE

V. S. [illegible]

During the first 6 months of 1948, 20 reports were heard at the scientific conferences of GGI* departments which dealt with: the results of scientific work of the Institute, programs of scientific research stations, and momentous dates of native hydrology. Condensed contents of some of these reports are given below.

A. Ya. Oyya, Experimental Computation of the Intensity of Snow Melting.

The author had performed the verification of the effectiveness of the solution to the snow melting problem on the basis of the usual observations of meteorological stations. Thawing computations were made in accordance with the method developed by P. P. Kuz'min (Works of GGI, issue 7, 1948) with following simplifications.

(1) Thermal exchange with the atmosphere (Wa) was computed in accordance with the formula:

$$W_a = 0.004 \left[(\theta_{200} - \theta_n) + 2 (e_{200} - e_n) \right] \times U_{200} \frac{2 \text{ calories}}{\text{Cubic centimeters minute}} \quad (1)$$

according to the basic data: temperature of snow surface (θ_n), temperature and absolute humidity of air at a height 2 meters θ_{200} and e_{200} and wind velocity U_{200}.

(2) Solar radiation absorbed by the snow layer over the period of snow thawing (duration not less than a week) is determined depending on the latitude of observation locality, cloudiness and condition of snow layer, in accordance with the formulas of S. I. Savinov.

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(3) The value of reflection coefficient of snow layer was determined on the basis of a cheme determined experimentally in 1946 and 1947 by P. P. Kuz'min; the basis of this scheme is the consideration of the condition of snow surface (snowfall, thaw, sleet, amount of surface dirt, appearance of thawed off spots, etc.)

(4) Heat loss of the snow layer by effective radiation was computed according to basic network observation data: temperature of the snow surface, cloudiness, and absolute air humidity.

(5) In determining the expenditure of heat on the freezing of thaw water, the amount of the latter in the first day of cooling was determined by multiplying the water content of snow (α) by the snow water reserve, taking α, on the basis of experimental data, to be equal to 10 percent, while for detailed computations consideration was given to daily values of α. Thaw computations were made for 20 thaw cycles observed at 10 meteorological stations of the northwestern portion of the European USSR.

As a result of calculations there have been obtained quantitative characteristics of energy expenditure for thawing due to atmospheric heat transfer and solar radiation, as well as quantities of thus produced thaw water. The latter is compared with thaw water obtained from the snow removal data. Errors due to the comparison of total thaw quantities vary within limits $\pm$40 percent compared with the snow removal data. Distribution of these errors indicates that 30 percent of them are in the interval of 10 to 20 percent of the snow removal values. Thaw calculations for Valday for the years 1946 and 1947 yield results, the quality of which is not inferior to the detailed observations of thermal balance made by P. P. Kuz'min.

O. A. Spengler, On the Question of Maximum Intensity of Snow Thawing in the Northern Part of the European USSR.

This lecturer reported the results of investigation of the intensity of snow thawing which was made on the basis of daily observations, over a period of many years, at 36 stations of European USSR dealing with the height of snow layer. The end purpose of this investigation was to establish a connection between the intensity of snow thawing and the duration of computed period of thaw and the thaw area.

As a criterion of daily intensity of thawing, this author had accepted the decrease in the height of snow layer as shown by a graduated measuring rod. In going from the decrease of snow layer height to the layer of thaw water, a constant density of snow layer was taken to be equal to 0.33. In order to exclude possible cases of decrease in snow layer due to settling or blowing off the snow, which occurs during the initial period of thaw, only those observations were utilized which were made during the period following the decrease in height of snow layer to 75 percent of its initial maximum height. On the basis of those investigations, the author compiled a chart of maximum intensity of thaw for the European USSR.

Maximum intensity of thawing is observed usually at the end of thaw period, about the last quarter of the period. In west and south, in regions of low snow layer, it is observed equally often during the first or second half of the thaw period.

The most frequently occurring, up to 60 - 70 percent of all instances, are the low values of daily thaw intensity which do not exceed 20 millimeters per day. There is also a considerable number of days during the spring season, when no thawing takes place -- 20 to 40 percent of the total number. The manner in which thaw takes place during spring is characterised by alternate periods of lowered and increasing intensity of thawing.

The average daily intensity of thawing decreases with the increase of computed period of thaw, with a faster decrease during the first 3 to 4 days, which becomes slower and decays gradually with the increase of the computed duration of thaw. The average daily intensity of thawing over areas of up to 25,000 square kilometers does not change with the area, however, for areas in excess of 25,000 square kilometers it decreases with the increase of thaw area. The relationship between the maximum intensity of thawing, its computed duration, and the area of thaw, in the case of the Northeastern region of the European USSR, can be expressed by the following equation:

$$i = \frac{A}{\left(\frac{F}{25,000}\right)^{m}} \qquad (2)$$

where i-is the maximum average daily intensity of thawing over a given period of computed duration for an area F(in millimeters per day), A-maximum average daily intensity of thawing for an area up to 25,000 square kilometers, which corresponds to the computed duration data, F-area of thawing and m-is the parameter, the numerical value of which decreases with the increase of computed duration of thawing.

For a one day computed period of thawing m = 0.38, for a 5-day period m = 0.27 and, for a 10 day period, it is 0.13. In view of the inadequate accuracy and reliability of basic snow layer data, the vagueness of the relationship between thawing and the decrease of the height of the snow layer, and also the incompleteness in the utilization of the snow measuring network, all of the obtained conclusions should be regarded as approximate, requiring further refinement.

I. V. Molchanov, Level Variations of the Smaller Lakes of the European USSR.

The lecturer reported the results of investigation of laws governing variations in the level of the smaller lakes in the USSR. In order to investigate this question, he collected and interpreted observations made at 197 lake stations, located on 155 lakes.

On the basis of analysis of the annual variation of level, all of the investigated lakes are divided into 10 groups, which are illustrated by corresponding graphs typical of each group. Analyzing the laws governing level variations, this lecturer noted the presence of a certain interconnection between the height of the spring rise in level and the morphometric features of the lake and its reservoir, and also between the dates of maximum level and dates of ice thawing on the lakes. The compiled schematic isochronic charts of the onset of maximum and minimum level heights as compared with the isochromes of ice thawing dates. In his lecture and appearances, he emphasized the unsatisfactory condition of the network of lake stations with respect to location and methods of observation.

A. M. Norvato, Freezing over and Drying up of Rivers in USSR.

The lecturer had collected and interpreted a voluminous amount of widely scattered source data dealing with freezing over and drying up of rivers, including special questionnaire data. Looking upon the phenomenon of drying up and freezing over as a unified hydrological process in the long run, which leads to the cessation of flow in the river bed, the author points out that the conditions leading to this phenomenon are diverse. While freezing over of rivers takes place at low air temperatures and is connected with the accumulation of water reserves within the reservoir (accumulation of snow, formation of ice and ice floes, freezing of subsoil waters), drying up of rivers takes place at high air temperatures, and, quite to the contrary, is connected with the depletion of water reserves. Thus, the direction of processes leading to the formation of potential possibilities of zero flow, depends upon the relationship between heat and moisture, which determine the intensity of the physico-geographical process in general, and the processes of freezing and drying up of rivers in particular.

The lecture classifies the types of rivers in the USSR according to (1) the nature of freezing over and drying up, (2) duration of the phenomenon,and (3) recurrence of the phenomena.

On the basis of the available data, there was accomplished the regionalization of the USSR territory in accordance with the principle of predominance of one or the other direction of the process leading to the formation of zero flow. The indicated regions are shown on a map.

Within each of the above cited oblasts there are defined regions with characteristic boundaries of intensity (areas of reservoirs subject to drying up and freezing and their duration) in development of phenomena.

As a general index of intensity of phenomenon, the duration and relative spread of the phenomenon over the territory is taken, and the reservoir area is taken as a supplementary indicator. For each region are given the indexes of the upper boundary of phenomenon duration and watershed area, and there are also indicated the period months during which the flow is equal to zero.

G. M. Rimmar, Measurement of Water Discharge by the Method of Ionic Flood (Mixing).

The question of measurement of water discharge by the mixing method is of great practical interest, since in many instances the use of a hydrometer in mountain rivers with turbulent currents is either impossible or results in low accuracy. Besides, the mixing method can only be used to study the movement of a flooding wave on small rivers, to study stream distribution, etc. This method is not widely used mainly in view of its insufficient development, unwieldiness of apparatus and a large demand of indicator. G. M. Rimmar develops the mixing method on the basis of experimental work conducted by the hydrometric department of GGI at the Kantcelyan and Lintula (Karelian Isthmus) rivers, and he recommends the use of newer and more portable apparatus.

The basic feature of the ionic flood method is comprised in the fact that this method does not determine the degree of dilution of flow by the indicator, but determines the entire process of increase and decrease of concentration or the proportional electric conductivity of the solution.

As a result of his theoretical and experimental studies G. M. Rimmar proves the adequate accuracy of this method for mountain streams, which is less than ±5 percent.

This method results in salt economy 3 to 4 times as great as that of the electrochemical method, and no less a degree of measuring accuracy is attained. The author points out the principal error of engineer V. V. Pikush in his development of the mixing method.

A. K. Filippova, Freezing through and Moisture of Soil.

In her report, A. K. Filippova told of the results of investigations in regard to freezing through and moisture of soil, conducted on the basis of observations at meteorological stations of the Leningrad Oblast over the period 1924 to 1940.

On the basis of these data there is demonstrated the effect of climatic factors upon the process of freezing through of soils of different mechanical composition. Special attention was paid by the lecturer to the analysis of the effect of duration and thickness of snow layer on the depth of soil freezing. The freezing process depends on the thickness and nature of the snow layer, and the temperature variation during winter. In accordance with this factor, the lecturer defines 3 types of soil freezing: (1) Intensive initial freezing and slower uniform freezing the rest of the winter, (2) Uniform freezing over the winter period, (3) No increase and an occasional decrease in winter freezing.

For a small thickness of snow layer, depth of freezing increases corresponding to the increase of negative air temperatures.

In regard to soil moisture the lecturer indicated an increase of moisture during winter period over and above the capillary moisture capacity. In loamy soils water reserve does not exceed 400 millimeters, and in heavy clays it does not exceed 670 millimeters. In her conclusions, the lecturer paid attention to the necessity of improving and expanding observations of freezing through, and moisture content of soils, conducted by hydrometeorological stations.

Besides the above-cited reports, the results of studies on the following topics were heard and discussed: Investigations of cloudbursts over the territory of Ukrainian SSR, their development and spreading (Z. P. Bogomazova). Computational scheme of snow thawing and water yield of snow (M. I. Gurevich). Safety curves and their energy equivalents (A. Ya. Yelpidinskiy). Dynamics of soil infiltration by rainwater (G. A. Alekseyev). These studies were published in Works of GGI, issues 6 and 9, 1948.

Especially to be mentioned are the reports devoted to famous milestones in Russian hydrology and the activity of prominent Soviet Russian scientists.

At the meeting commemorating the 20th anniversary of the death of the greatest Soviet scientist-hydrologist D. I. Kocherin, there were heard reports by: D. L. Sokolovskiy on the topic - D. I. Kocherin as a founder of flow study; B. D. Zaykov on the topic - D. I. Kocherin's investigations in the field of geographic generalizations of flow; O. N. Borsuk, on the topic - D. I. Kocherin and his part in the development of small river hydrometry.

G. I. Shamov and Klishevich spoke on personal reminiscences of their work with D. I. Kocherin in Crimea.

These valuable data on the activity of a prominent Soviet scientist-hydrologist, whose work played a very important role in the development of our science, and securing the demands of people's economy in the solution of collossal water supply problems, will be published in the near future.

At a meeting commemorating the 40th anniversary of publication of the classical work of that famous Russian engineer M. E. Dolgov "On the Norms of Kestlin", D. L. Sokolovskiy and Z. P. Bogomazova have indicated, in thorough lectures, the important role of N. E. Dolgovis remarkable investigations in the field of cloud bursts, theory and practice of computation of maximum cloudburst flow. A condensation of D. L. Sokolovskiy's lecture is published in symposium No 5.

A report on the 175th anniversary of publication of "The Ancient Russian Hydrography" was made by A. A. Sokolov, who pointed out that this work, penned by an anonymous writer in 1627, represents the most important memorial of Russian culture of the pre-Peter the Great period, and can be rightly considered as the beginning of Russian hydrography. As is known "The Ancient Russian Hydrography" represents the text to accompany the first official map of the Moscow state -- "The Large Drawing".

A. F. Shibanov had demonstrated his skill in restoring the "large drawing", which unfortunately had not preserved itself up to our time.

V. S. Sumarokov

In accordance with the directive of October 12, 1948, of the Presidium of the Supreme Soviet of RSFSR, the corresponding member of the USSR Academy of Sciences, professor Mikhail Andreyevich Velikanov is awarded the honorary rank of Esteemed Worker of Science and Technology of RSFSR.

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