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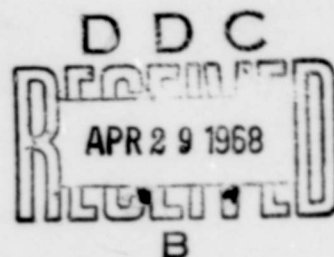
THE POSSIBLE INFLUENCE OF ADDITIONAL EVAPORATION FROM
RESERVOIRS AND IRRIGATED TRACTS ON PRECIPITATION

by

A. S. Grigoryeva

Translated from the Russian by S. M. Olenicoff

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THE POSSIBLE INFLUENCE OF ADDITIONAL EVAPORATION FROM
RESERVOIRS AND IRRIGATED TRACTS ON PRECIPITATION*

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TRANSLATOR'S ABSTRACT

It is shown that measures for the creation of reservoirs, and the irrigation and watering of lands, which are projected through 1980, will only slightly affect precipitation over large territories.

* Source: Trudy of the Main Geophysical Observatory, Issue 211, 1967.

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In connection with the complex utilization of rivers, large measures have been planned for the creation of reservoirs, and for the irrigation and watering of lands in the south Ukraine, the northern part of Crimea, the north Caucasus, the left bank of the Volga, the Volga-Akhtuba flood-lands, and other regions. As a result of these transformations of natural conditions, the atmosphere will receive an additional quantity of moisture.

In studies dealing with the investigation of the meteorological regime over reservoirs and with the influence of reservoirs on the meteorological regime of contiguous territory, it is shown that this influence depends on the latitude of the location and increases from north to south. At the same time, the meteorological regime over the reservoir itself changes substantially in comparison with the flooded lands, and the influence of reservoirs on the surrounding territory is limited to a rather narrow zone.

During the warm part of the year, a large reservoir, such as the Aral Sea, exerts a considerable influence on the coastal areas, increasing the surface relative humidity by 10 to 15 percent, and the absolute humidity by approximately 4 mb. However, at distances from a few kilometers to 50 km, this influence becomes so small that it no longer has any practical value.

Data on irrigated tracts and reservoirs were taken from the works of A. B. Avakian, V. A. Sharapov [1], S. L. Vendrov [5], and others.

The influence of additional evaporation from reservoirs and irrigated tracts, projected through 1980, on the precipitation over large territories, was computed for two regions: (1) the south of the European territory of the Soviet Union, (2) the south of Western Siberia and North Kazakhstan. Situated in these regions are the principal irrigated territories and the larger reservoirs. Furthermore, in these regions the need is greatest for an evaluation of the role of the moisture entering the atmosphere as a result of transformations of nature.

A comparison of the measured values of evaporation and those calculated by different authors at various reservoirs, has shown that the evaporation from reservoirs in the south of the European territory of the Soviet Union constituted, on the average, about 720 mm, while

evaporation from land areas where reservoirs are now situated or will be situated was about 300 mm, and so, additionally as a result of evaporation from reservoirs, the atmosphere over the reservoir will receive around 400 mm of moisture.

The calculation of the additional moisture entering the atmosphere as a result of irrigation was performed for optimal conditions. In all regions of proposed irrigation, the difference between evaporability and evaporation was calculated using L. I. Zubenok's data, and it was found that the additional evaporation from irrigated territories is approximately 430 mm.

The variation in precipitation under the influence of additional evaporation will have a spotted character depending on the layout of the source of the additional vapor and of the surrounding relief. Unfortunately, we do not yet know how to calculate in detail the increase in precipitation having a local character. Furthermore, we are confronted with the problem of how the influence of additional evaporation manifests itself on the precipitation of large territories. Therefore, we uniformly distribute the additional evaporation from reservoirs and irrigated tracts over the entire southern territory of the European Soviet Union. It turned out that, as a consequence of existing and planned transformations of nature, the atmosphere during the warm period will additionally receive, on the average over the south of the European territory of the Soviet Union, approximately 25 mm of moisture, of which about 5 mm will be due to evaporation from reservoirs and around 20 mm will be due to evaporation from irrigated lands.¹

As was shown by the calculations with the previously chosen method, this moisture leads to a very insignificant increase in precipitation over the southern territory of the European Soviet Union, being on the order of 1.5 percent, which would constitute approximately 5-6 mm, and if we take into account the diffusion of water vapor, then this value will be even smaller.

Analogous calculations were performed for the south of Western Siberia (roughly to the south of 60° n. lat. and to the west of 85° e. long.) and the northern part of Kazakhstan (to about 46° n. lat.), with an area of approximately $2,500,000 \text{ km}^2$. The atmosphere will receive, as a result

of evaporation from reservoirs, a 2 mm layer of moisture, and another 7 mm as a result of evaporation from irrigated lands, and the atmosphere will thus receive, for the entire warm period, an addition of less than 10 mm of moisture, which will have practically no effect on the variation of precipitation.

Thus, it can be said that those transformations which are planned through 1980 in the south of the European territory of the Soviet Union, the south of Western Siberia and in Northern Kazakhstan, will manifest themselves only very slightly in the precipitation over large territories. In order to bring about noticeable variations in precipitation over large territories, large-scale transformations of the general circulation of the atmosphere are required.

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