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HYDROCHEMICAL CONDITIONS OF THE RIVER TISZA 1. MINERAL MATTER CONTENT AND ION-DYNAMISM ON THE BASIS OF THE INVESTIGATIONS IN 1973 AND 1974

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Abstract

The paper is dealing with the change in the mineral matter content of the Tisza. The changes in the water type, that may be interpreted as an effect of damming and concentration, alow an inference to the Tisza having a natural disposition to change the type.

Introduction

The mineral composition of the Tisza was determined under natural conditions first of all by the geochemical properties of the watershed area of the river. This establishment was unequivocally proved by the investigation of the flood-waves passed in 1974. In the time of flood, the types and quantitative proportions of the waters coming from the watershed areas are dominating in the formation of the mineral matter content of the Tisza flowing without being dammed up, while at the floods passing the water coming back from the flood-plain and the effect of damming, as well, became influencing factors.

Material and method

We have investigated a 70 km stretch of the Middle Tisza Region at five sampling points, with a fortnightly, resp. weekly frequency. For the chemical investigations we took a 5 l dipped-out sample. The determinations were carried out with the „VITUKI" methods of water investigation (1970) and on the basis of Felföldy's work (1970).

Mineral matter content of the Tisza

As a first step, we have investigated how the concentrations of cations (sodium, calcium, magnesium) respond to the changes in water output. It may be established on the basis of the results of the water-sample investigations that the sodium content decreased at the increase of water output and increased in case of a decreasing output (Fig. 1).

The shift of the calcium-magnesium rate met with at small water output, in the late summer — autumn period of 1973 (ÁDÁMOSI *et al.* 1973), in 1974 did not appear,

in a striking way, just owing to the flood-waves following one another. In Fig. 2, anyway, it may be observed well that at the small water outputs lasting for a comparatively short time between the times of floods, the increase in magnesium concentration began, without reaching the calcium concentration. By comparing the calcium and

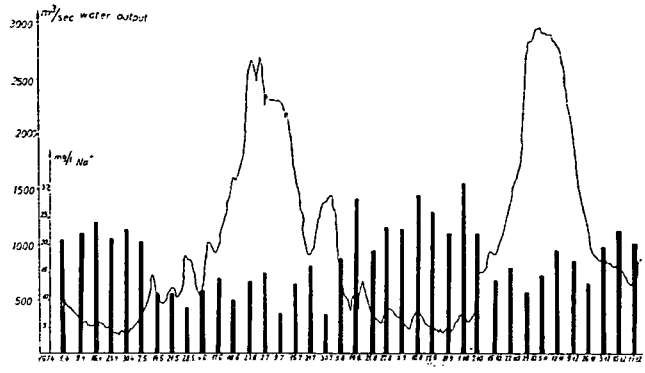

Fig. 1. Change in Na+content and water output in the Kisköre profile in 1974.

magnesium values measured at Kisköre in 1973 and 1974, as well as the water outputs belonging to these, it could be demonstrated that a considerable increase in the magnesium concentration, as well as a decrease in the calcium content, that is to say, a change in the water type can or did take place till 500 cc.m/sec. water output, as a function of the permanence of water output and as a result of damming. The probability of that, however, decreases more and more together with an increase in the water output because in case of a larger water output also its disposition to be durable increase considerably (Fig. 3).

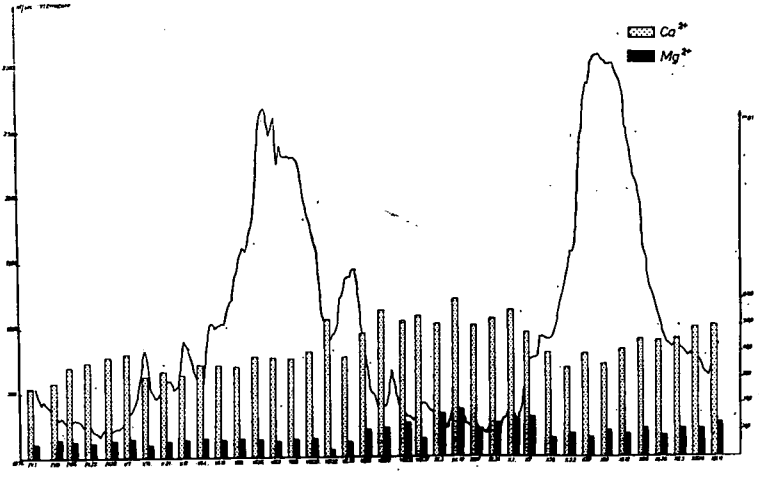

Fig. 2. Change in Ca^2+and Mg^2+content and water output in the Kisköre profile in 1974

The conductibility that considerably depends upon the mineral matter content of the water increased generally with a decrease in water output, the degree of that was, however, determined by the simultaneous effect of several parameters (tempera-

ture, lastingness of the water output, damming up, etc.). The formation of the ion-concentration in the dammed water, as well as the possible changes in types, will be determined first of all by the increase in water surface, the rise in the water temperature, the concentration followed as a result of the artificial heat pollution. It became, therefore, necessary to investigate the quantitative relations of cations and anions, taken as a function of a change in conductivity instead of that in water output.

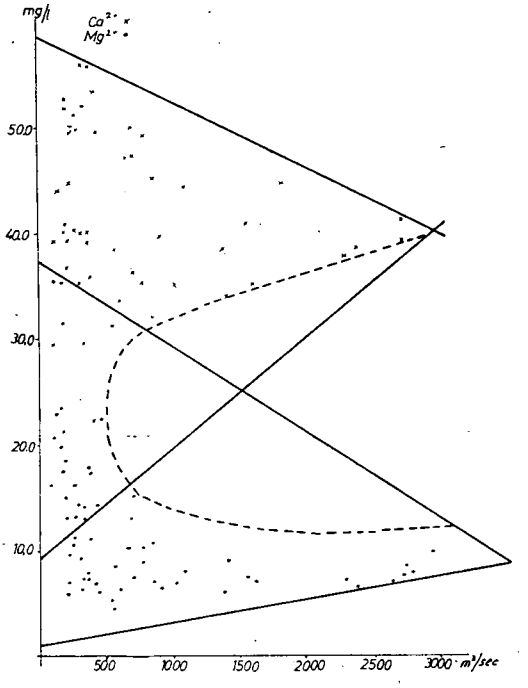

Fig. 3. Change in $Ca^{2}+$ and $Mg^{2}+$ content, taken as a function of the water output, on the basis of data from 1973 and 1974

The conductivity of the clear water of natural flow (without damming) — owing to the comparatively small water surface, a low evaporation, and a continuous change in water mass — did generally not rise over the 500 micro-Siemens value; the halobity of water was beta-alpha oligohalobic, its type calcium-hydrocarbonic.

Our systematic investigations in 1973 and 1974 produced some results from which a conclusion may be drawn concerning the disposition of the Tisza to change the water type. The storage-induced concentration conduces to a considerable rise in conductivity. The rise in conductivity is connected with a decrease in calcium and hydrocarbonate that determine the water type of river Tisza, and an increase in some ions that so far dominated but a little or not at all, like magnesium, sodium, chloride and sulphate, resulting from time to time in changes in the water type (Fig. 4).

Apart from the changes in type (calcium-magnesium-hydrocarbonate, and later magnesium-hydrocarbonate-sulphate types), the increase in the sodium and chloride concentration, influencing the quality of irrigating water, calls the attention

to one of the natural sources of danger in connection with the storage of Tisza water (Fig. 5).

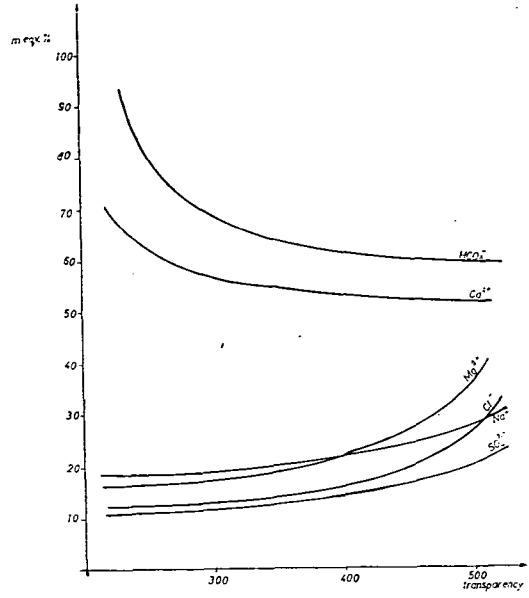

Fig. 4. Direction of the Tisza disposition to change the water types, taken as a function of the meq. percentual rates of ions and of conductivity, on the basis of data from 1973 and 1974

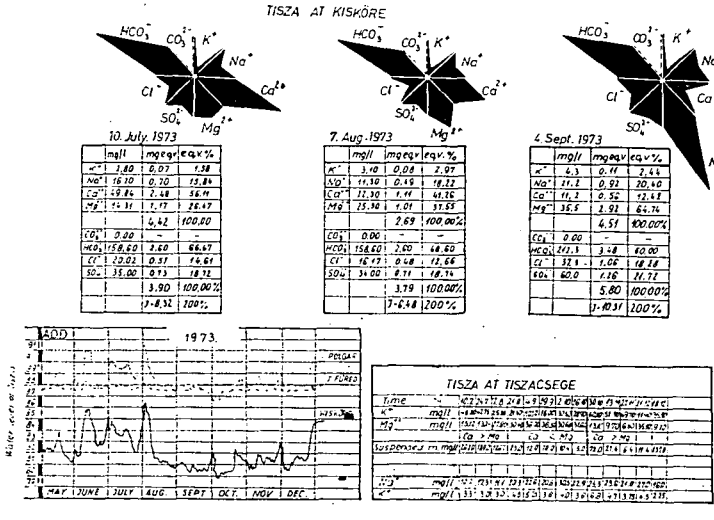

Fig. 5. Change in the water type of the Tisza in 1973, in a period of permanent little water, as a result of damming. In ÁDÁMOSI *et al.* 1974)

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