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ISOTOPIC INVESTIGATIONS OF SURFACE AND GROUNDWATER DYNAMICS

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The variations in the monthly mean isotopic composition of precipitation in East Estonia are essentially correlated to the air temperature variations. The last-squares fit to these data is $\delta^{18}O = 0.35T-12.5$ with a correlation coefficient of $r = 0.82$. Long term monthly weighted mean $\delta^{18}O$ of the precipitation is -11.0 o/oo. Average isotopic composition of precipitation in summer period is -9.1 o/oo and in winter -14.2 o/oo. The amplitude of yearly $\delta^{18}O$ variations is 7 o/oo.

Considerable seasonal changes in the isotopic composition of atmospheric precipitation served as a basis for the application of oxygen-isotope method to the study of the dynamics of surface and groundwaters.

The water samples from Ordovician and Cambrian aquiferous layers in North East Estonia revealed variations of $\delta^{18}O$ in the limits -10.8 o/oo ÷ -12.6 o/oo, thus showing the great role of atmospheric precipitation in general balance of groundwater. The results of oxygen-isotope, radiocarbon and tritium analyses of groundwater show the relatively high infiltration rate of surface water to rather great depth in study area.

Water in studied rivers originate mainly from surface run-off of precipitation and from groundwater. As the water of upper water-carrying horizons in North Estonia is formed mainly from current atmospheric precipitations, the isotopic composition of river waters in the first approach reflects the mean annual isotope composition of precipitation.

The formation of the isotope composition of lake water appears to be more complicated. In drainage lakes the seasonal changes of $\delta^{18}O$ in general coincide with those in rivers. In the closed lakes the seasonal variations in $\delta^{18}O$ values as well as changes in $\delta^{18}O$ values in their vertical profiles enable to carry out balance calculations and to exactify values of the fractionation factor by liquid-vapour phase transition.