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Evaluations of ratios of various transition processes of uranium in groundwater from rocks by uranium isotopic data

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To analyze the relationship of the chemical dissolution and leaching of uranium-bearing rocks of the radiation, the estimates of the relative residence time of groundwater in the aquifer was carried out. To do this was used the generic design variable p: probability of 234U atom yield in the water under 238U atom decay in the rock. In the first approximation its value of 0.45% is determined on the basis of geological dating, hydrodynamic and balance calculations. Groundwaters of the North Dvina basin are between 130 000 to 700 years with this value of p. In almost all samples uranium content is largely determined by its chemical dissolution. The most intensive, compared with radiation leaching, this dissolution exerted on the sides of the depression, where the development of the youngest water. This is mainly fresh water, most non-equilibrium with the surrounding rocks and therefore, the most aggressive towards them. As ground water moves to the discharge zone and increases their salinity, water aggressiveness decreases and the processes of chemical dissolution become weaker by comparison with the radiation leaching. Rough estimates show that in most ancient waters the observed concentration of uranium were formed by chemical dissolution of 0.01% and due to radiation damage of 0.02% of mineral components of rocks. At this rate of both processes at p = 0.45% all rocks will be destroyed with the partial formation of new mineral phases for 430 million years, but only by radiative processes - over 650 million years. However, due to uneven distribution of uranium in sand rocks with its concentration in the clay-iron cement near the contact of water-rock, major transformation of rocks will occur in this zone.