N E W S
OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN
SERIES OF GEOLOGY AND TECHNICAL SCIENCES
ISSN 2224-5278
Volume 6, Number 426 (2017), 157 – 170

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DEVELOPMENT OF REGIONAL MATHEMATICAL MODEL OF THE HYDROGEOLOGICAL CONDITIONS OF THE SYRDARYA ARTESIAN BASIN

Abstract. As a result of negative changes in the environment conditions and progressive deterioration in the quality of surface water, the ground waters of the Syrdarya Artesian basin become the main source of economic and drinking water supply in the region. At the same time, uncontrolled water extraction can exacerbate the situation and lead to depletion of groundwater resources and deterioration of surface water quality, have a negative impact on soil and vegetation conditions, exacerbate health problems, etc. Therefore, the tasks of rational use of the groundwater resources of the Syrdarya Artesian basin, protecting them from depletion and pollution become especially topical. The need to capture numerous natural and man-made factors having impact on the hydrogeological object conditions, as well as the large amount of heterogeneous information, makes geoinformation and mathematical modeling the only possible method for solving such problems. Institute of Hydrogeology and Geoecology named after U. M. Akhmedsafin developed the mathematical model of hydro-geological conditions of the Syrdarya Artesian basin to solve these tasks. For calibration, the model solved the inverse stationary (as of 1960) and epigenetic hydrodynamic problems. Forecast of changes in the hydro-geological conditions of the object has been carried out for a 30-year period for various schemes of water extraction. Based on the results of the simulation, one may conclude that the man-made factors prevail over natural factors regarding the hydro-geological conditions of the Artesian basin, about the possible increase in the mineralization of groundwater in the Cretaceous sediments because of the flow of brackish waters from adjacent horizons under intensive water extraction, and deterioration of the ecological situation in the region.

Keywords: groundwater, mathematical model, geographic information system, Syrdarya artesian basin.