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RELATION BETWEEN SURFACE WATER AND GROUNDWATER AS THE FACTOR FOR FORMATION OF GROUNDWATER RENEWABLE RESOURCES ON THE TERRITORY OF KAZAKHSTAN

Abstract. The article describes the regularities of the groundwater formation and distribution and their relation to surface runoff. The study of hydrogeological structures and the establishment of the relation between surface river water and groundwater. The processes of underground recharging of rivers during the low water season contribute to the preservation of the natural balance of ecosystems, ensuring the normal state of the vegetation cover of the adjacent territories, biota survival and reproduction. The interrelation between surface and groundwater of different geomorphological regions is shown; these regions are represented by mountain, piedmont and flat relief. A flow diagram of the interrelation between the individual elements of the water balance of the active water exchange zone (precipitation, water infiltration in the aeration zone, firstly from the surface of the aquifers, sloping on-site and groundwater runoff etc.) is presented for illustrative purposes in this work. Separately, a methodology is given for studying and carrying out quantitative assessment of the interrelation between river and groundwater in the features of the of groundwater runoff formation.

Keywords: water exchange, surface runoff and groundwater runoff, natural (annually renewable) resources.

Introduction. A regional assessment of the interrelation between surface and groundwater, the objective quantitative indicator of which is the groundwater run-off to the rivers, as well as the reverse process of groundwater recharging due to stream run-off during the spring flood, are of great scientific and applicable merit. The accurate accounting of all components of surface runoff and groundwater runoff of the territories is of great practical importance in arid climate conditions for solving the problems of water supply to the population and economic sectors [1-3].

The water exchange intensity is determined by the mobility of natural waters when moving within the system or part of it. It depends on the boundary conditions, the spacial distribution of parameters and the size of the geofiltration flow. The water exchange intensity integrally reflects the entirety of the listed factors. The quantitative indicators of the water exchange intensity may be the rate of groundwater flow, the groundwater discharge and the duration or rate of water exchange, which is determined by the ratio of the groundwater capacitive resources to the flow rate and reflects the possible conditional time for substitution of groundwater contained in the isolated volume of the system. Hence the following units of measurements are selected: m/day×m^3/year; Flow rate in modular form - m^3/(day×km^2), m^3/(year×km^2); rate of water exchange - years.

Conclusions. For arid regions an estimate of the underground outflow of river waters is very important, since most of the time of the year the rivers are recharged by the underground aquifers. But, during the onset of the so-called"dry time", when the air temperature begins to rise and atmospheric precipitation ceases, the rivers transit to underground recharging by discharging them into deep reaches. This situation has a very positive effect on the saving of river biota and the ecosystem as a whole.

As researches have shown, the initial hydrological and hydrogeological information serves as a basis for an objective assessment of the features of the interrelation of surface river water and groundwater. The list of basic hydrogeological information consists of the following data:

1. the general characteristic of the hydrological exploration degree of the territory is needed;
2. the characterization of the drained aquifers distribution according to the lithologic and stratigraphic characteristics and general physical and geographical conditions;
3. the information on the location of surface and groundwater watersheds in different parts of the watershed area of the main river and its tributary streams;
4. the characteristic of underground recharging of rivers in separate sections of the river basin with respect to the number of drained aquifers and the degree of their participation in the formation of an underground tributary stream.
5. the information on the features of the hydraulic connection between river waters and aquifers drained by the river;
6. the characterization of the intra-annual irregularity of groundwater runoff in the watershed, primarily in relation to its discreteness, depending on the lithologic and stratigraphic features of the drained aquifers and their water regime;
7. the information on the relationship between the amplitudes and rates of changes in the groundwater level in the near-river zone and river waters to determine the possibility of bank storage developing and calculating the dynamic amplification factor of the groundwater inflow to the river under conditions of the bank storage;
8. the quantitative characteristics of the coefficients of intra-annual dynamics of groundwater runoff in watersheds and groundwater inflow to the rivers based on the results of full-scale observations, by hypothesis or established by expertise on the basis of analysis of materials obtained in previous studies [1-4].

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СВЯЗЬ ПОВЕРХНОСТНЫХ И ПОДЗЕМНЫХ ВОД КАК ФАКТОР ФОРМИРОВАНИЯ ВОЗОБНОВЛЯЕМЫХ РЕСУРСОВ ПОДЗЕМНЫХ ВОД НА ТЕРРИТОРИИ КАЗАХСТАНА

Аннотация. В статье рассматриваются закономерности формирования и распределения подземных вод и их связь с поверхностным стоком. Изучение гидрогеологических структур и установление связи поверхностных речных вод и подземных вод. В работе для наглядности представлена блок-схема взаимосвязи отдельных элементов водного баланса зоны активного водообмена (атмосферных осадков, инфильтрации вод в зоне аэрации, в первых от поверхности водоносных горизонтах, склоновые местный сток и подземный сток и т.д.). Отдельно дается методика изучения и количественной оценки взаимосвязи речных и подземных вод по особенностям формирования подземного стока.

Ключевые слова: водообмен, поверхностный и подземный сток, естественные (ежегодно возобновляемые) ресурсы.

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ҚАЗАҚСТАН АУМАҒЫНДАҒЫ ЖАҢАРТЫЛҒАН ЖЕР АСТЫ СУ РЕСУРСТАРЫНЫҢ ҚАЛЫПТАСУ ФАКТОРЫ РЕТІНДЕ ЖЕР ҮСТІ ЖӘНЕ ЖЕР АСТЫ СУЛАРЫНЫҢ ӨЗАРА БАЙЛАНЫСЫ

Аннотация. Мақалада жер асты суларының қалыптасуы мен таралу заңдылықтары және олардың жер бетіндегі ағын суларымен өзара байланысы қарастырылады.Гидрогеологиялық құрылымдарды зерттеу және өзен суларының мен жерасты суларының байлынысын анықтау.Межелеу кезеңінде өзендерді жер асты қоректендіру процестері экожүйелердің табиғи теңгерімін сақтауға, көршілес аумақтардың өсімдік жамылғысының қалыпты жағдайын қамтамасыз етуге, биотаның тірі қалуына және көбеюіне ықпал етеді. Тау және тау бөктері, жазық рельефті түрлі геоморфологиялық аймақтардың жер үсті және жер асты суларының өзара байланысы көрсетілген.Жерасты суларының қалыптасу заңдылықтары және өзен жүйелерінің беткі ағындарының оларға әсер етуі құрылды.Жұмыста түсінікті болу үшін белсенді су айырбастау аймағының су балансының жекелеген элементтері арасындағы өзара әрекеттесудің блок-схемасы көрсетілген (жауын-шашын, аэрациялық аймақта судың инфильтрациясы, сулы қабаттардың беткі горизонты, көлбеу жергілікті ағын және жер асты ағыны және т.б.,). Жер асты суларының қалыптасу ерекшеліктеріне өзен мен жер асты суларының өзара байланысын зерттеу және сандық бағалау әдістемесі берілген.

Түйін сөздер: су алмасу, жер үсті және жер асты ағыс, табиғи (жыл сайын жаңартылатын) ресурстар.

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