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Assessment of Groundwater Source of Piedmont Plain Area of China Northwest Arid Region Based On Numerical Modeling

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After the middle of 1960s,along with the appearance and extensive utilization of computer featured in large capacity and rapid speed, numerical method(mainly include finite difference method and finite element method) was promulgated in the calculation of underground water, solving the hydrogeological calculation problem under complex condition that difficult to solve in analytical method calculation of unsteady flow. Especially it has more extensive application on the aspects such as water volume calculation, resource assessment, prediction of groundwater pollution, development of underground water, management of groundwater etc. After over 50 year exploration and practice, it indicates that numerical modeling plays an important role in solving some theoretical and actual problems in subject of hydrogeololgy, forming one of the important power for the formation and development of modern hydrogeology subject. It becomes a necessary tool for people reminding hydrogeological law，resource assessment and management.

Xiangride-Ruomuhong piedmont plain area is located in the north part of Kunlun Mountains, it has huge thick cenozoic sedimentary and provides good a place for the storage of underground water, it is a region with very rich groundwater source.

The paper analyzes the supply, runoff, discharge and other dynamic characteristics of groundwater in research area. The region with very rich groundwater is mainly distributed in the Gobi gravel belt of Xiangride, Ruomuhong alluvial-proluvial fan and the axis of Hatu river, Qingshui river, Hongshui river alluvial-fluvial fan, it is belonged to pore water featured in single huge thickness, the thickness of water-bearing stratum is greater than 100 m, the surging water volume of single well is greater than 5000m^3/d,the water quality is good.For the middle and front edge of Gobi gravel belt, the embedding depth of water level is 10~15 m, it is easy to exploit, which can be taken as main water supply source. The groundwaterof Xiangride-Ruomuhong piedmont alluvial-proluvial fan is mainly supplied by the penetration of mountain rivers after running out of mountain pass, secondly it is supplied by the penetration of channel and returning water of irrigation. Because the topographic slope of Gobi gravel belt is big (about 10‰) ,the lithology particles are coarse with strong water permeability, the pore water of loosen lithology flows to the center of basin from south to north. After entering fine soil plain, because the terrain slope becomes small (about 5‰）and the water bearing media becomes thin, appearing multiple level structure, partial groundwater overflowing out of ground surface and supply to Qaidam river. Partial water flows to the north in the form of underground runoff. Finally they are consumed by the discharge and evaporation of spring water.

Through establishing hydrogeological conceptual model and numerical simulation model，it carries out numerical modeling research on the waterflow movement in groundwater system of research area. And use the known hydrogeological data (file) to carry out identification and verification on the established model. On this basis, it conducts assessment on allowable exploration volume under various situations of research area. The assessment conclusion is that the total groundwater supply volume in Xiangride-Ruomuhong piedmont plain area is $180.30\times10^4m^3$/d. In which the penetration supply volume of Xiangride alluvial-proluvial fan is $113.50\times10^4m^3$/d；The penetration supply volume of Hatu river alluvial-

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proluvial fan is $19.41\times10^4m^3/d$; the penetration supply volume of Qingshui river alluvial-proluvial fan is $7.63\times10^4m^3/d$; the penetration supply volume of Hongshui river alluvial-proluvial fan is $4.26\times10^4m^3/d$; the penetration supply volume of Ruomuhong river alluvial-proluvial fan is $35.50\times10^4m^3/d$.In addition to current yield $2.925\times10^4m^3/d$,the remaining are all consumed in the spring discharge of discharge belt and the evaporation of shallow burying belt. On the basis of resource assessment, it optimizes the exploration program of existing groundwater exploration program in research area,the research conclusion can provide technical support to future groundwater exploration, water resource scheduling and management, so as to provide basis for the industrial and agricultural layout of Qaidam recycling economic zone, as well as for the initial design and exploration of water source site.

Key words: groundwater source, numerical simulation, piedmont plain area, Xiangride-Ruomuhong, Qaidam Basin

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