Regional groundwater resource evaluation of Golmud River watershed in the south margin of Qaidam Basin, northwest China

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In the arid and semi-arid area, due to scarce of precipitation and strong evaporation, groundwater becomes not only an important source of water supply but also the safeguard water of the vulnerable eco-environment.

Golmud River watershed is located in the south margin of Qaidam Basin. According to the previous researches, the piedmont alluvial fan deposits thick sand and gravel, which is a good groundwater storage site and have abundant groundwater. In the groundwater overflowing belt, groundwater overflow into spring-fed river because of the rise of groundwater level, and the vegetation development; the whole groundwater is basically in the original state. On the basis of thorough analysis of the hydrogeological conditions, we establish groundwater flow numerical simulation model under unsteady flow by using GMS to determine the Qaidam basin groundwater quantity and analyze the influence of groundwater exploitation on the ecological environment of the overflow zone in Golmud River watershed. The results indicate that the amount of the average annual recharge of the Golmud River watershed accounts for $6.4 \times 10^8 m^3/a$. Based on the water use plan, three kinds of groundwater exploitation schemes with quantity of $0.96 \times 10^8 m^3/a$, $2.92 \times 10^8 m^3/a$ and $3.65 \times 10^8 m^3/a$ were provided.With the increasing exploitation of groundwater, river infiltration basically keeps constant, the groundwater level drops to a certain extent, evaporation will reduce and oasis area will shrink back and retreat. The prediction results of different exploitation schemes show that groundwater exploitation mainly comes from spring discharge, the evaporation of phreatic water, and groundwater storage. Compared to the first mining plan, other schemes distribution area of vegetation suitable water level is reduced by 17% and 23% respectively. Compare the results of different exploitation schemes, we decide the exploitable quantity of groundwater, which is $2.92 \times 10^8 m^3/a$. This research can provide a scientific basis for the rational development and utilization of water resources and ecological environment protection.

Keywords: Golmud River watershed, groundwater resource evaluation, numerical simulation