

## 黑河流域地下水循环演化规律研究

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**摘要:** 大量野外调查研究表明, 气候变化和人类活动对黑河流域地下水循环和更新演变具有重要影响; 平原区浅层地下水主要是现代水补给, 35%来自祁连山区基岩裂隙水通过地表径流转化补给, 其他是降水和冰雪融水在山前戈壁带入渗补给, 具有较强的更新能力; 深层承压水主要形成于地质历史时期区域性补给, 与现代水循环有联系; 中游区人类活动是造成下游区地下水补给能力减弱、地下水水位持续下降和生态环境退化的重要因素。因此强化中游区人类活动的科学调控, 是实现黑河流域地下水可持续利用和下游区生态环境有效保护的关键。

**关键词:** 黑河流域; 地下水循环演化; 中游区人类活动; 科学调控; 可持续发展

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### Evolution of groundwater circulation in the Heihe River drainage area

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**Abstract:** Field investigations and studies indicate that climatic variation and human activities have important impacts on groundwater circulation and regeneration-evolution in the Heihe River drainage area of the northwest endorheic drainage region. Shallow groundwater in the plain is mainly recharged by modern water. 35% of it is recharged by surface runoff transformed from bedrock fissure water of the Qilian Mountains and the rest is recharged by infiltration of precipitation and melt water in the piedmont Gobi belt, both of which have a strong regeneration ability. Confined groundwater mainly originates by recharge of regional meteoric water and river water in the geological history, which has relation with modern water circulation. The influence of human activities in the middle reaches of the river is an important factor responsible for the weakening of the groundwater recharge ability, sustained lowering of groundwater level and eco-environmental degradation in the lower reaches. Therefore, the scientific regulation of the human activities in the middle reaches is the key to realizing sustainable utilization of groundwater resources in the Heihe River drainage area and effective protection of the ecological environment in the lower reaches.

**Key words:** Heihe River drainage area; evolution of groundwater circulation; human activity in the middle reaches; scientific regulation; sustainable development