

## Abstract

Islands and reefs are important parts of China's territory and they are great significant for China's national security and national defense. And groundwater resources of the islands play important roles in future island operations in the water supply security. Simulation of groundwater flow field is an important means to study the distribution of groundwater. Due to complex hydrogeological conditions, few available observation wells and other reasons, the precision of hydrogeological model generalization is not high and the initial conditions are difficult to obtain, which restricts the accuracy of simulation of underground water flow field in bedrock islands. This research relied on the scientific research project of the general armament department, "the research on key technologies for ※※ based on remote sensing information", and the national key special project, "the research and demonstration of the monitoring technology of ecological construction and ecological Internet of things of typical islands in the south China sea". Studying on simulation technology of bedrock island underground flow field based on remote sensing assessment of shallow groundwater, this study took Wailingding island of Zhuhai in Guangdong province as the research case. The main work was following:

(1) The groundwater of bedrock islands is mostly stored in the form of "freshwater mushroom body", which is different from the sandy islands. Based on the characteristics of bedrock islands, the law of recharge and discharge of groundwater and its water balance was summarized. According to the specific bedrock or lithology of the island, the movement equation of its groundwater flow was concluded. In this paper, the present situation of groundwater simulation of bedrock islands was summarized, and the research on the intrusion of seawater and the fixed boundary of bedrock islands were introduced and dis-

cussed.

(2) This paper analyzed the main progress and existing problems of current remote sensing evaluation of shallow groundwater enrichment, using GF-1 data, DEM data and others as data sources. This paper took lithology index, relief index, slope index, vegetation-fraction index, land-temperature index, water-density index, soil-humidity index as extraction indexes. And this paper used image grayscale statistics and clustering analysis as the main means to get the weight of each index between:  $W_L:W_R:W_P:W_{VF}:W_{LT}:W_{WD}:W_{SH} = 0.3448:0.3153:0.2832:0.0184:0.0327:0.0035:0.0021$ , to avoid the subjective factors of experts in determining weights. And this paper constructed a remote sensing model of shallow groundwater potential. The paper got the results of I~V level charts of assessment of shallow groundwater potential. And the results were verified according to the water yield of the wells and springs. The results showed that the assessment results can meet the requirements of error precision. This method can be used to assess shallow groundwater potential, the amount of water in small scale islands.

(3) Based on the data of actual wells and springs, the depth,  $h$ , of water level was obtained. And  $h$  was fitted with the value,  $S$ , of assessment shallow groundwater by using remote sensing. Then the initial water level,  $H$ , of shallow groundwater was obtained according to the curve equation and DEM data of elevation in this area.  $H$  can be used as the initial water level in the simulation of shallow groundwater flow field, thus overcoming the difficulty in obtaining the water level of shallow groundwater in the bedrock islands. Stratification of island strata by using geophysical survey results combined with hydrogeological data and importing DEM data to transform TIF file in GMS software to build the geological body which improved the accuracy of simulation model of shallow groundwater flow field. Then, changing the initial conditions of the simulation model of shallow groundwater flow field, such as rainfall, evaporation capacity and so on, to predict the distribution of shallow groundwater flow field

at different times. Finally, the actual yield of water of springs and wells and the geophysical data were used to verify the results, and the accuracy can meet the requirements.

**Keywords:** bedrock islands, application of RS technology, shallow groundwater, numerical simulation of groundwater flow