

# Study on karst development law of Dehou reservoir in Wenshan prefecture of Yunnan province

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## Objectives

Limestone and dolomitic limestone are widely exposed in the reservoir area of the Dehou reservoir (see Fig. 1), the karst development is strong, and the karst hydrogeological condition is complex, the reservoir leakage is the most important engineering geological problem, it is also the key technical problem of reservoir. From the aspects of stratum lithologic, rock mineral composition and chemical composition, geological structure, neotectonic movement and planation surface, modern river discharge datum and so on, the main factors controlling karst development were studied. According to the karst morphology, the elevation of denudation surface, the karst hydrodynamic conditions and other factors, comparative analysis of evolution history of regional karst development, the karst development law of Panlong river, a tributary of Red river basin, was divided into stages, the karst development in the project area has experienced plateau period, Pingyuan period and Panlong river period since the Cenozoic era. The vertical zoning law of karst in Panlong river period and the karst development characteristics of seepage section were studied, and the variation law of deep karst zone with depth was studied, with the increase of depth, the number of karst caves and the degree of karst development decreases. The research results can provide support for determining the bottom boundary of anti-seepage and the basis for determining the anti-seepage treatment scheme.

## Methods

The comprehensive and various approaches are employed to investigate the karst development status of the engineering area in the study, which is as follows:

1) The basic engineering geological conditions are acquired through the surface survey and exploration. Qualitative analysis of non-soluble rock and high-nearby valley area is conducted. And combining with the previous material, the karst development was staged.

2) According to the lithology and related hydrogeological conditions, the soluble rock area between the dam and low-nearby valley is partitioned as mesh. Due to these, targeting investigation is conducted.

3) Based on the results above, combining with the advanced geophysical techniques (see Fig. 2), the condition of karst development is obtained from multiple perspectives and means.

## Results

1) Since the Cenozoic, the karst development in this area has experienced three main karst development periods: plateau period (S1), Pingyuan period (S2) and Panlong river period (S3). The one related to the reservoir leakage is Panlong river period.

2) There are three sections in the reservoir anti-seepage treatment area: the left bank nearby the dam, the left bank nearby the dam, and the reservoir area of the Mili river. The Mili river reservoir area has the largest number of karst caves and the most developed karst; the left bank near the dam is the least, and the karst development is relatively weak; the karst development degree near the right bank of the dam is higher than that near the left bank of the dam.

3) From the analysis of karst hydrodynamic conditions, the number of alternate karst caves is large and karst is developed. The number of excretion caves is relatively small, and the degree of karst development is relatively weak. The number of karst caves in the upper zone of deep karst is the largest, and karst is the most developed. The number of karst caves in the middle zone is second, and the karst development is relatively strong; the lower zone basically did not expose the cave.

4) The karst phenomenon is revealed in the area which is 90 m below the modern discharge base level in the engineering area. The karst development has obvious stratification.



Fig.1 Dehou reservoir

Although the depth of the relatively undeveloped karst is not revealed, the karst development has shown a significant weakening trend, which should be related to the regional hydrodynamic conditions.

5) It is revealed that there is, after the impoundment of the reservoir, to the Panlong river and the downstream of Dehou River whose form is mainly pipe-fissure.

## Conclusions

1) Based on the basic geological engineering condition, combining with the karst evolution history, the study area's karst development is staged, which is beneficial to the further analysis.

2) The basic investigating and advanced geophysical method is comprehensively used to obtain the karst development condition.

3) Considering the lithology, geological structure and so on, the study area is divided into grid area. And targeting investigation is conducted successfully. The analysis and diagnosis of the reservoir's leakage is implemented efficiently and accurately.

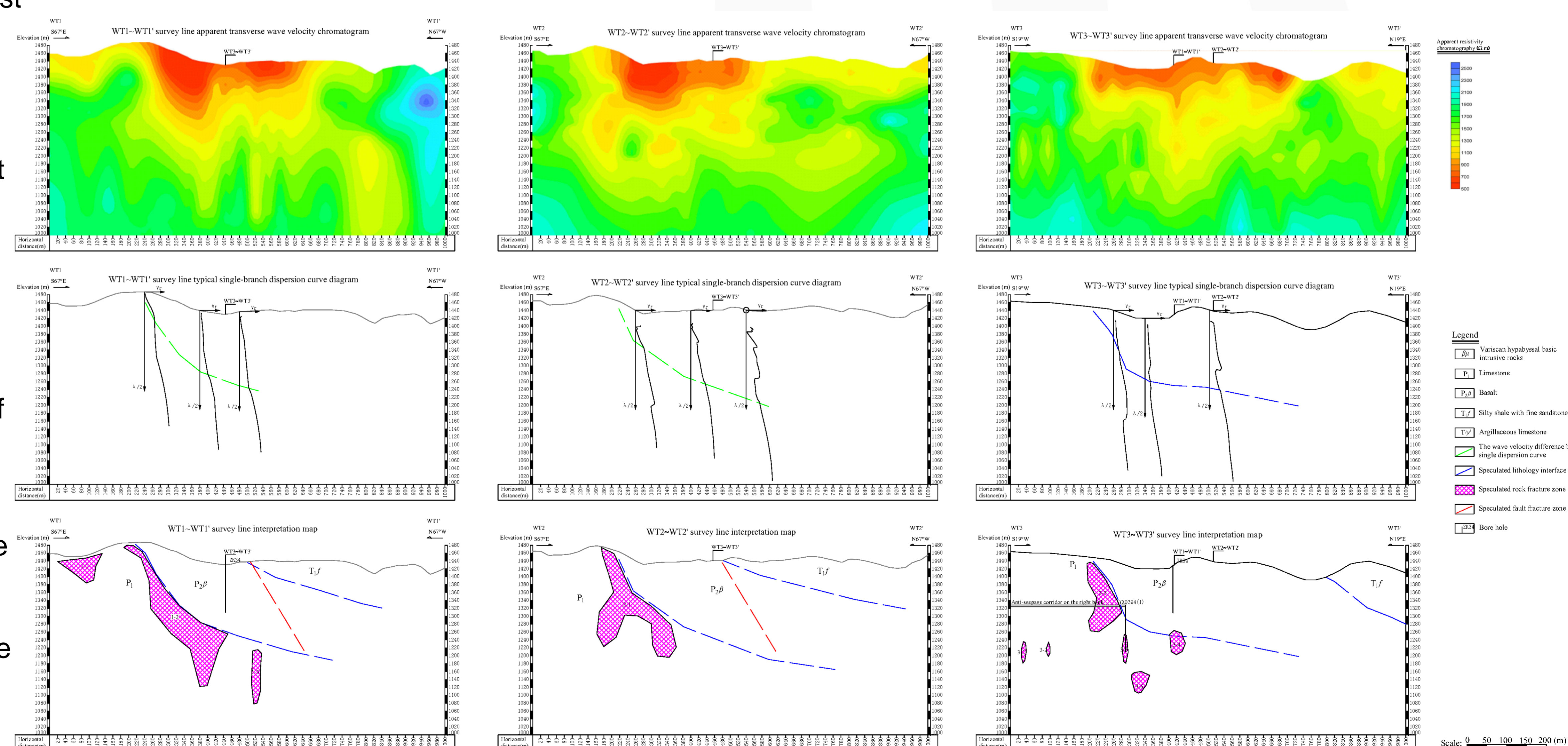


Fig.2 Natural source surface wave detection results