

## Observations on the Karst Features in the Lingyuan and Leye Counties of Guangxi Province of Southern China

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### Abstract

The scenery in Lingyun and Leye counties of Guangxi southern China constitute an area of classic karst. Massive dolines, doline rous, cone karstand tower karst dating from the Pleistocene, features spectacularly in the landscape. The caves discovered on the expedition are mostly of phreatic origin, some active and some beautifully decorated fossil systems. This paper makes observations on the development of the karst scenery and considers difficulties encountered in the search for caves on the boundary of karst and Permian shales. Particular reference is made to the spectacular Dasheiwu doline, the second deepest doline in the world which has further potential for exploration and potential for tourist exploitation in the future. Pressure will be placed on its delicate ecosystem as a result. Reference is also briefly made to cave life found during the expedition.

### Introduction

The Yorkshire Ramblers Club expedition to Guangxi 2000, took place during the month of October. This was part of the British/China Caves Project, which for many years has been an informal programme of co-operation between a variable team of British cavers, under the auspices of the British Cave Research Association and members of various Chinese institutions.

The area involved in this expedition lies in the Western part of Guangxi province, the Lingyun and Leye Karst which is situated between the You and Hongshui rivers, some 300 kilometres west of Liuzhou. Access to these zones is allowed only after receiving special Government permits from the Ministry of Land and Resources and despite the relatively open attitude and economic tourist development in China, special permission had to be sought.

The Guangxi province of China is considered to be one of the most characteristic karst areas in Eastern Asia. This much eulogised scenery cannot fail to impress even the most seasoned traveller with karst towers and dolines of spectacular dimensions. This vast area is characterised by a sub-tropical climate with a karst peak forest at an altitude of from 150 metres to 2000 metres above sea level.

The expedition comprised of 17 individuals from Europe and one Cave Biologist from Tasmania. 8 Chinese members of the team joined us from the Karst Institute in Guilan. The expedition was split into 2 parts, first to explore the Lingyun region for 1½ weeks and for the remainder time, the Leye county area for a reconnaissance of an entirely new karst area.

### Observations on Geology and Karst

The caves explored by the expedition lie inside limestone, the age of which can be dated between Devonian and Triassic, with a clear cut prevalence of Palaeozoic lithotypes. The karstification in China is closely linked to geologic-tectonic evolution and palaeogeography. The Palaeozoic era witnessed the greatest palaeo-karst development, affecting a large part of the limestone of China. Parts of this region revealed typical examples of palaeo karstification in middle Ordovician carbonate rock. The area was particularly affected by the Caledonian orogeny, the entire area in China being uplifted from the middle Ordovician to the middle carboniferous and subsequently became subject to typical shaping and denudation.

During this geological and tectonic evolution, an important role was played by orogenic movements in the Mesozoic era, which at the end of the Triassic and in the cretaceous, gave rise to an unconformity with two of the stratigraphic series absent due either to the lack of sediment deposition or to the removal of sediment through erosion.

From the upper Triassic to the lower Jurassic most of China had a humid, tropical-subtropical or humid-temperate climate that greatly favoured karst development. The karst of this period is to be seen in many zones in the area the expedition visited.

Studies on limestone moulding and the chronological classification of different types of karstic morphologies have shown that the diversification of the most important types of karst and the related structures began in the Pleistocene. From the middle Pleistocene on, the climate in Southern China became hot and humid and has remained so virtually to this day. This is why karstification underwent such constant development.

Karst areas take up to approximately 12% of the earth's land surface and that is about 20 million km<sup>2</sup>. China, whose carbonate area measures about 2.6 million km<sup>2</sup>, has one of the largest karst areas in the world. The carbonate rock covers more than one third of the country and about half of it is concentrated in the Southern regions.

In the karst land of Lingyuan and to a lesser extent Leye county, the limestones are massively folded and separated by tight sink lines of Triassic shales and sandstones, numerous faults cut through these structures. In many respects, this topology reflects the geology, the sandstones and shale form long high ridges with thick soils and good terraces for farming in contrast to the limestone which presents a chaos of rugged features with thin soils, poor farming and water shortages. At the boundary of the two Permian sandstones and shale sediment drain from surface streams into sink holes often causing massive infill and blockages in caves both active and fossil. Where dolines either reach down to base level with cave resurgences and sinkholes on opposite sides, or have sediment choked floors perched above cave streams. The karst towers are topographically made up of two types, the fengcong, peak cluster depression sub-system, and the fenglin or peak forest plain sub-system, which have different morphologies and an orderly configuration.

The fengcong is also called "cone karst" because its peaks usually have a conical shape. The base of the depression is marked by the presence of sinkholes and shafts. The height of the fengcongs from the depression floor to the top of the peaks ranges from 10s of metres to over 500 metres. One of the most important geomorphological features of the fengcong areas is the almost total absence of rivers and surface water courses, the water usually being assimilated into the substratum.

Although there are different theories about the regular distribution of karstic fenglin and fengcong recent studies have shown that the distribution of the peak cluster depressions and peak forest plains forms are mixed.

### Example of Sites Visited

Towards the end of the second week of the expedition the team of 6 made a reconnaissance trip to the Leye area, 40 miles north of Lingyuan, a fairly isolated mining town situated in the cone karst limestone, boasting a number of very impressive dolines and doline groups. The Dashaiewi doline was visited first and is considered to be the second deepest doline in the world. A river system at the bottom was explored for over 1 kilometre to a confluence where it met another large river, the combined volumes of water making it very difficult to continue. Clearly, there is considerable potential between this sink and the resurgence 30 kilometres away in Beilong, where the river eventually joins the sizeable Hongshui River. This doline in particular may be the subject of tourist exploitation in years to come, if a way can be found to overcome its technically difficult access, concerns about the impact on its ecosystem would be considerable.

The expedition from a cave biology point of view collected over 300 specimens, 100 of which may be new species. An interesting new family of crustacea was also discovered. In total 17 kilometres of cave passage was explored and surveyed with 1153 man hours being spent over a period of 3 weeks in the field.

### Conclusion and Acknowledgements

It is perhaps not unreasonable to be impressed by the Chinese understanding of karst given that their country has such an extensive abundance of limestone. In Lingyuan, particular problems were encountered in the exploration of caves on the karst/shale boundary where sediment infill was much in evidence and frustrated exploration of passage that would otherwise be of great dimensions. In Leye county conversely, the karst was rich in revealing open passage.



Considerable help was given to us by individuals from the Karst Institute at Guilin, in particular Professor Zhu whose knowledge and expertise, gave the expedition an opportunity to formulate an interpretation and understanding of the incredible scenery that abounds Lingyuan and Leye Counties.

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