5 The Cone Karsts of Guizhou

Guizhou province covers 176,000 km² of which 72% is karstic. The Guizhou plateau has an altitude of between 1000 m a.s.l. to over 3000 m, but is mostly between 1000–2000 m. The plateau extends into the neighbouring provinces of Yunnan, Hunan, Hebei and Sichuan (Fig. 2). It is part of the second great topographic step of China and falls to the E to neighbouring Guangxi. The plateau slopes generally from W to E. It is drained to the N by major tributaries of the Changjiang (Yangtse) and to the S to the Zhujiang (Pearl) river. The average annual rainfall is about 1100 mm, mostly coming in summer with considerable winter drizzle on the plateau. Guizhou has a cloudy climate, like that of Sichuan, as a result of the meeting of different air masses which arrive from the NE in winter and the S in summer. Average temperatures are 11–19°C. Mountain ranges run generally NE-SW, except the Miao range which is E-W.

Almost all the rocks of Guizhou are sedimentary, ranging in age from the Proterozoic to the Quaternary. Up to the Triassic these rocks are mainly shallow sea marine in facies and dominated by limestones 8500–12,000 m thick. The limestones which support the karst features are chiefly the Carboniferous, Permian and Triassic, but some Cambrian limestones are locally important. Structurally, the area is quite complex. The main folding dates back to the Indosinian and Yanshanian movements (Triassic and later Mesozoic). In NE Guizhou, NW Hunan, and W Hubei, the NE-SW tending folds are high angled and close, and part of the S China fold system (Fig. 3). These give rise to long, narrow and steep limestone outcrops – linear karst belts. In middle and western Guizhou the folding is less intense, and dips are generally lower (though occasionally vertical), and thus a greater area of limestone is exposed. Several intercalated non-carbonate strata occur in this area. All these strata in Guizhou were much affected by the Himalayan earth movements; Guizhou lies between the area of intense uplift in Qinghai-Tibet and the area of more gentle uplift in Guangxi. It is believed that Guizhou was uplifted by about 1000–2000 m in the later Tertiary and that even the amplitude of the Quaternary uplift was from 300–500 m. The structures in Guizhou are NNE-SSW and NE-SW in the north and east; N-S in South Guizhou and NW-SE in western Guizhou. In the extreme W of Guizhou and in the neighbouring E Yunnan, Tertiary and Quaternary movements produced N-S block faulting (Yang Zunyi et al. 1986).
The most important karstic limestones are the Baizho dolomites and the Datang and Maping limestones within the Carboniferous. Each of these formations is several 100 m thick and occur in particular in the Shuicheng area in W Guizhou. In the Permian, the Maokou and the Qixia limestones are very important. In the Triassic, the Middle Triassic Falang limestones are a massive bioclastic series, over 300 m thick and form the basis of the famous Longgong karst. The Lower Triassic Guanling limestones and dolomites are represented in the Huangguoshu area. The carbonate strata alternate with clastic rocks, giving rise to multi-layer water-bearing layers and karst belts. Frequent movements during the deposition of the limestones gave rise to a series of planes of unconformity. There are six planes of unconformity in Guizhou – these become the later planes of karst denudation when karst erosion reaches individual base levels. The karst rocks are only sparsely covered by Mesozoic shales and sandstones and some Tertiary red beds and Quaternary deposits – so Guizhou is essentially an area of bare karst.

Strong uplifts in the Tertiary and Quaternary considerably exceeded the rate of karst denudation. Down-cutting did not merely deepen the original valleys, but gave rise to the canyon systems; this development has destroyed the original karst hydrographic networks. A new phase of karstification was initiated, particularly by headward erosion and corrosion which has helped to break up the pre-existing planation surfaces; the karst processes have been revitalized with the canyons as the base level for discharge (Fig. 27). Away from down-cutting rivers and the canyons, it is believed that the pre-existing planation surfaces are preserved and the older karst networks have continued to develop – the ancient hydrographic networks here acting as the base levels for discharge. The landscape of the Guizhou area is thus made up of two highly contrasting units within a unified karst region – the plateau areas and the canyon areas – the two units differing greatly in their landforms and in their underground hydrographic networks. It will be seen that this interpretation of

![Fig. 27. Longitudinal profile of the Maotiao river and its major tributaries, Guizhou plateau. (He Caihua 1987)](image-url)