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KARST DISTRIBUTION IN EAST CHINA AS INFERRED FROM SEDIMENT ANALYSES : AN OUTLINE

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(4 figures and 1 table)

ABSTRACT.- The study suggests that the paleogeographic environment has fluctuated several times in Eastern China. Therefore, the temporal and spatial distribution of karst can be divided into six strong and stronger stages, as well as three regions in this area.

RESUME.- La répartition des types de karst dans l'est de la Chine en fonction des données de la sédimentologie. L'environnement paléogéographique a varié à de nombreuses reprises dans l'est de la Chine. L'étude permet de distinguer six épisodes de karstification — les uns forts, les autres plus forts encore — et, sur le plan spatial, trois régions distinctes par leur type de karst.

I.- INTRODUCTION

The studied region is located in east China between latitudes 25° to 36° N. The karst landscape in east China varies from the transitional features of the Fenglin in south China to the karstified hills and dry valleys in the north (fig. 1).

Sediment analyses suggest that the paleoclimate fluctuated frequently, and that the climate belts have shifted northward or southward several times since the Cenozoic. In this way, the geochemical and bioecological environments show a remarkable differentiation in time and space.

II.- SEDIMENT ANALYSES

Typical analyses of the main sediment types are given below.

1. The red clastic sediments with evaporite interlayering show a dominant position of *Taxodium sp.* in the pollen assemblage. This reflects a dry and hot environment during the Eocene epoch.
2. The reticulate laterite is characterized by a lower SiO_2/R_2O_3 ratio of 1.8-2.1 (tab. 1) and by kaolinite as the dominant clay mineral (fig. 2).

Table 1.- Main chemical composition of clays in part of the reticulate laterite sediments.

Sample numbers	Composition of constituents (%)			$\frac{SiO_2}{Al_2O_3}$	$\frac{SiO_2}{R_2O_3}$
	SiO_2	Al_2O_3	Fe_2O_3		
8 308	42.08	27.47	13.11	2.59	1.99
8 307	44.50	28.74	9.23	2.62	2.18
82 147	40.91	28.17	12.06	2.46	1.93
82 175	43.27	27.59	11.56	2.66	2.09

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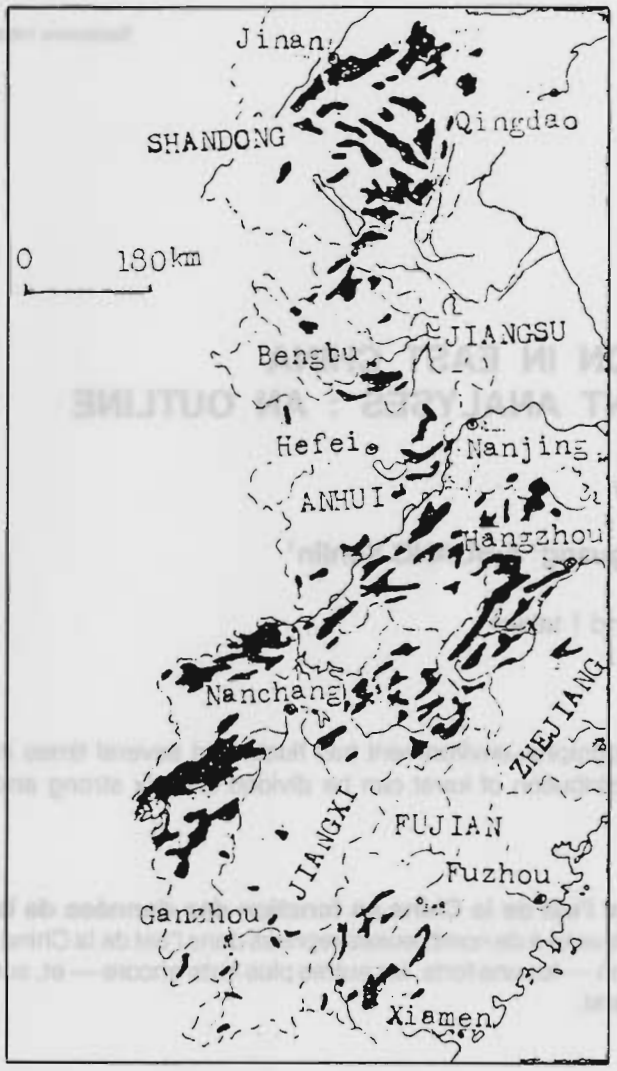

Fig. 1.- Location map showing karst distribution in east China.

Wood plants such as *Liquidambar sp.* and *Quercus sp.* dominate the pollen assemblage. The stable minerals constitute up to 63-94 % of the clastic mineral components. In the *terra rossa* deposits of the karst areas, the rounded quartz and sand particles show V-shaped collision features as observed with the scanning electron microscope (fig. 3), thus indicating abundant water flows during the sedimentation. Fossils characteristic of the *Ailuropoda-Stegodon* mammalian fauna, such as *Stegodon sp., Rhinoceros sp., Tapirus sp.* were collected from cave deposits within this sequence. These suggest animals from humid and hot forests and marshes in a more humid and hotter environment in the Middle Pleistocene.

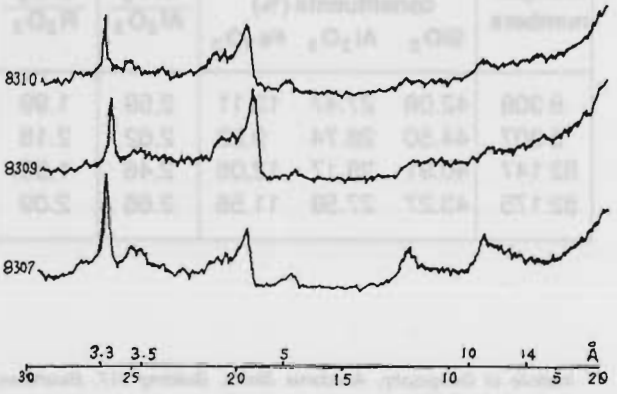

Fig. 2.- X-ray diffraction of clay sampled from reticulated laterite sediments.

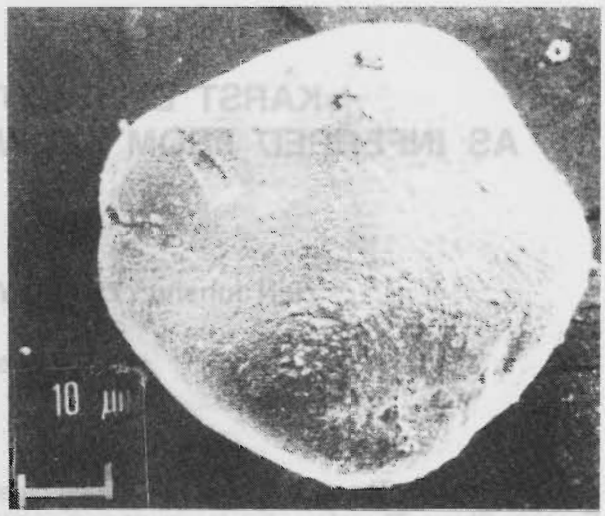

Fig. 3.- Rounded quartz sand grain showing V-shaped surface marks, from *terra rossa* deposits in Tonglu, Zhejiang Province. SEM.

3. The Xiasu loess is characterized by a 2.7-4.0 SiO_2/Al_2O_3 ratio and by illite as the dominant clay mineral (fig. 4). Especially the stable isotope $\delta^{18}O$ of speleothems shows that the annual mean temperature during the loess deposition (17 000 – 11 000 B.P. as dated by ^{14}C) was about 5°C and more, lower than the present one. This indicates a dry and cool climate for the latest Pleistocene.

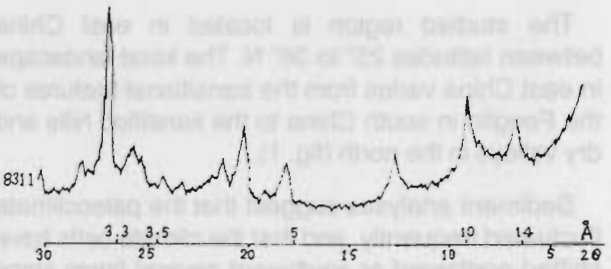

Fig. 4.- X-ray diffraction of clay sampled from Xiasu loess.

4. Herbs constitute more than 51 % in the pollen assemblage in Shen-xian Cave sediments, southern Jiangsu Province. This suggests a dry cool climate in the Early Holocene. Stable isotope $\delta^{18}O$ of speleothems, dated 6 400 B.P. by ^{14}C, indicate that the mean annual temperature was about 2°C higher than today in the same area.

III.- TEMPORAL DISTRIBUTION OF KARST

In east China, the karst development is marked by six strong and stronger stages : 1. The mid Eocene /

early Oligocene stronger stage ; 2. The mid Miocene / mid Pliocene strong stage ; 3. The early / mid Pleistocene stronger stage ; 4. The mid and late middle Pleistocene strong stage ; 5. The mid / late Pleistocene stronger stage ; 6. The mid Holocene stronger but short stage.

IV. SPATIAL DISTRIBUTION OF KARST

According to the differentiation of paleogeographical latitude zones, the shifting of the northern boundary of reticulated laterite and southern boundary of Xiasu loess deposits, the presence of carbonate rocks and the occurence of neotectonic movements, three main karst regions including several subregions can be recognized : 1. The southern region with Leifenglins (similar to the Fenglin or tower karst) ; 2. The middle region along the Yangtse River with rounded and short cone karst ; 3. The northern region with karst hills and dry valleys or karst plains.

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BIBLIOGRAPHY

BÜDEL, J., 1982.- *Climatic geomorphology.* Princeton University Press.

GAMS, I. (Ed.), 1975.- Karst processes and relevant landforms. *Proceedings of the International Symposium on Standardization of Field Research Methods of Karst Denudation,* University of Ljubljana.

GROUP OF KARSTOLOGY, Institute of Geology. Academia Sinica, 1979.- *Karst Research of China,* Science Press.

JAKUCS, L., 1977.- *Morphogenetics of karst regions.* Adam, Hilger, Bristol.

LIN, J. *et al.,* 1982.- An analysis on the palaeogeographic elements of karst development in the Wu-min Basin. *Acta Geographica Sinica,* 37 (2).

LIN, J. & ZHANG, Y., 1985.- *Progress of karst speleology study in China.* Karst Geomorphology and Speleology, Science Press.

LIU, T.S. *et al.,* 1983.- Paleoenvironmental characters and their developmental history since Neogene. *Earth Science Journal of Wuhan College of Geology,* 4 : 15-27.

MAHANEY, W.C. (Ed.), 1984.- *Quaternary dating methods.* Elsevier Science Publishers, Amsterdam.