LL9

La LETTRE du LOESS

LOESS LETTER No. 9

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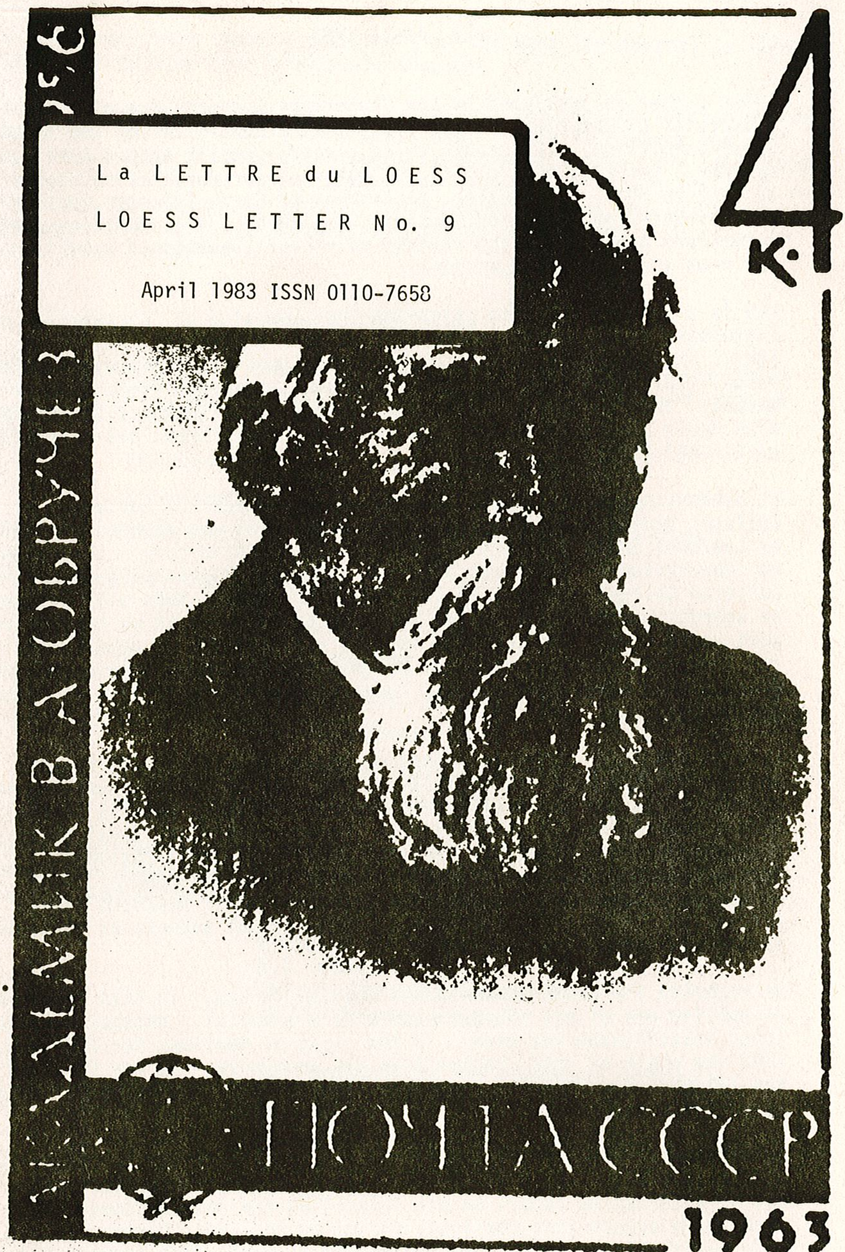

LL9: April 1983

Loess Letter is published by the Quaternary Research Group of the University of Waterloo; it is the informal newsletter of the INQUA Loess Commission. LL appears twice a year, usually around April and October. Requests for copies, and material for publication should be sent to Prof. Ian Smalley, Department of Earth Sciences, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1. Brief research papers are published, also reviews of recently published material, and news items and announcements.

LL9 is a special issue to celebrate the symposium on 'Correlation of Quaternary Chronologies' to be held at York University, May 26-29, 1983. This accounts for the emphasis on loess stratigraphy in this issue. For details of the York conference, contact: Prof. W. C. Mahaney, York University, Atkinson College, Department of Geography, 4700 Keele Street, Downsview, Ontario, M3J 2R7 (Phone: 416-667-3923 or 416-667-2513).

LL sends congratulations to the Geology Department of Carleton College, Northfield, Minnesota; the department was founded in 1932 by Laurence Gould and to celebrate its 50th Anniversary a symposium on 'Revolution in the Earth Sciences 1932-82' will be held at Carleton College on April 14-16, 1983. Dr. Robert Ruhe will deliver an address on 'Advances in the Study of Loess' - which we hope to report on in LL10. The Carleton meeting will provide an opportunity for a discussion on the 1983-87 program for the North America Working Group of the Loess Commission - these discussions will also be reported in LL10.

LL10 is due to be a special issue on 'Scanning Electron Microscopy and Loess' - to mark the occasion of the 'SEM in Geology' meeting to be held at Oxford University, September 6-8, 1983. Details of the Oxford meeting can be obtained from The Administrator, Royal Microscopical Society, 37/38 St. Clements, Oxford OX4 1AJ, England. Abstracts should be submitted by 15 June, 1983 - on special forms which are obtainable from The Administrator, RMS. Research papers are called for which emphasise the microscopical aspects of geological investigations.

We reported the death of Alexander Alexiev in LL8. In this issue we re-publish one of his shorter papers as a memorial. Another notable loess investigator has died; in the issue of Geotimes for February, 1983 the death of John Chapman Frye was announced. He was Chief of the Illinois Geological Survey from 1954 to 1972, and author of many major loess papers.

Corrections: Some errors crept into LL8. We contrived to change Ed. Gill's initials - he is E. D. Gill, not E. G. Gill. Ed. Derbyshire has an alternative report on his lecture on the Chinese loess: E. Derbyshire argued that the loess making up the Loess Plateau is not made up of glacial rock flour but formed by weathering processes in the <u>Ordos</u> Desert (not the Tibetan). In support of his argument he

cited recent work showing that the glaciers (<u>not</u> ice sheets) in Tibet were much smaller than previously thought.

Cover: If a philatelist were to assemble a thematic collection on the topic of 'Loess' it would be a small one. There is however one postage stamp which celebrates a famous loess investigator, the 1963 stamp issued by the Soviet Union to mark the centenary of the birth of V. A. Obruchev. Its time for another loess stamp, perhaps for INQUA '87. Some governments (e.g. NZ) will respond to suggestions - so write to your Chief Postmaster.

LOESS COMMISSION

A business meeting of the Commission was held in Moscow at the INQUA '82 Congress. For the inter-congress period 1983-87 the officers of the Commission are:

President:	Marton PECSI, Hungary
Vice-President:	Karl BRUNNACKER, Germany, BRD
Secretary:	Jean-Pierre LAUTRIDOU, France

Full members of the Commission are:

Jim BOWLER, Australia

A. E. DODONOV, U.S.S.R.

Günter HAASE, Germany, DDR

LIU Tung-Sheng, China

G. A. MAVLYANOV, Uzbeg SSR (U.S.S.R.)

Ian SMALLEY, Canada

Apart from the already existing regional working groups within the Commission (North American Working Group: R. V. Ruhe and Western Pacific Working Group: J. Bowler) two new ones have been created:

Geotechnical properties of loesses
N.I. KRIGER
PNIIIS, Okruzhnoy proezd 18
105058 Moscow, U.S.S.R.

Geochemistry and environmental chemistry of loesses and loess soils
Otto FRANZLE
Geographical Institute, University of Kiel
D-23 Kiel-1, Olshansenstrasse 40-60
Germany BRD

The editorial board for Loess Letter is: Marton Pecsi, Karl Brunnacker, Jean-Pierre Lautridou and Ian Smalley. We hope to expand it soon so that world-wide representation is obtained. The main function of LL remains that of communication between members of the Loess Commission and dissemination of news about loess.

GEOTECHNICAL STUDIES OF LOESS IN NORTH AMERICA

It is proposed that a sub-group of the North American Working Group be formed to promote geotechnical studies of loess in Canada and the U.S.A. If you are interested please contact Dr. Alan Lutenegger, Geotechnical Test Systems Inc., P.O. Box 2265, Ames, Iowa 50010, U.S.A.

Terraces in the Loess Plateau of China. Fang Zhengsan, Zhou Piehua, Liu Qiande, Liu Baihe, Ren Letian and Zhang Hanxiong in: Soil Conservation; Problems and Prospects, ed. R.P.C. Morgan, Wiley, Chichester 1981, 481-513.

1. Introduction

The Loess Plateau of China is bounded by the Riyue Mountains on the west, the Taihang Mountains on the east, the Qinling Mountains on the south, and the Yinshan Mountains on the north. Of its area of 580,000 square kilometres, 430,000 square kilometres are soil-eroded lands (Huang Wei, 1978).

On the basis of landform, the Loess Plateau may roughly be divided into four regions. They are (1) the rolling highland region, (2) the relatively flat highland region, (3) the sandstorm region, and (4) the earth and rock mountain region. The most seriously water-eroded areas are located in the first region (Figs 1 and 2) and next comes the second region. In the third region wind erosion prevails. Water erosion and wind erosion are not so serious in the fourth region.

In the first region, 5,000–10,000 t/km^2/y of loess may be washed away, the maximum value being 20,000 tons/km^2/y. On average 1.6 billion tons of the sediment carried each year by the Huang He to its lower reaches come from the Loess Plateau (Qi Wen, 1979).

The main cause of the severe soil erosion in the Loess Plateau is that a great part of the sloping lands were formerly cultivated without any conservation measure. The quantity of eroded soil from these sloping, cultivated lands with slopes of 8–30^o varied from 50 to 200 t/ha/y, and the corresponding water loss amounted to 300–500 m^3/ha/y. So the yields of farm crops were very low, ranging from 500 to 800 kg/ha.

3.2 Infiltration The infiltration rate of the loess was determined in situ at several places in the Loess Plateau using a double-ring infiltrometer keeping a constant head of water at around 2 cm. An infiltration formula was derived as follows (Fang, 1957; Fang et al, 1958).

$$K_t = K + \frac{K_1}{t^a} \qquad (2)$$

in which

K_t is the instantaneous infiltration rate at time t;
K_1 is the instantaneous infiltration rate at the first unit time;

t is the time of test;
K and a are constants.

The average infiltration rate (Kav) during a certain period of time is calculated by the following formula:

$$Kav = K + \frac{1}{t-1}\int_1^t \frac{K_1}{t^a}\,dt = K + \frac{K_1}{1-a}\left(\frac{t^{1-a}-1}{t-1}\right) \qquad (3)$$

There are three main characteristics of the loess which influence the infiltration rate. They are:

(1) Texture. Other things being equal, the higher the percentage of sand in the loess, the larger is the infiltration rate (Figure 3).

(2) Moisture content. Other things being equal, the higher the moisture content, the smaller is the infiltration rate (Fig 4).

(3) Structure. Other things being equal, the higher the percentage of aggregates, the larger is the infiltration rate. But the influence of the structure on the infiltration rate is much more conspicuous than the influence of the other two factors (Table 4).

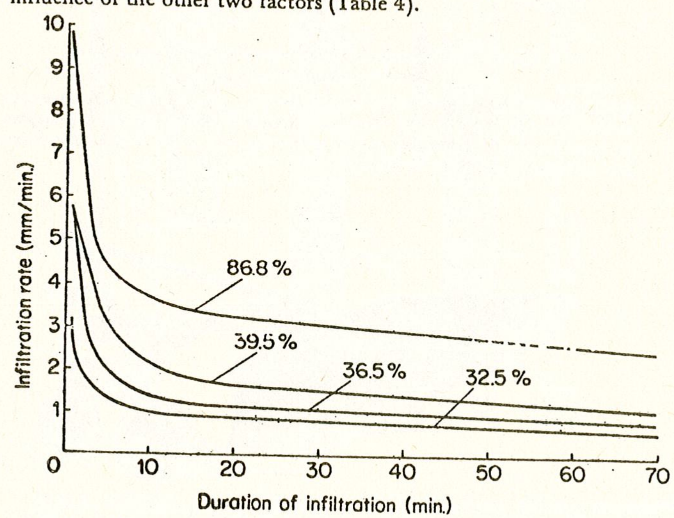

Figure 3. Infiltration curves for the loess at different sand contents.

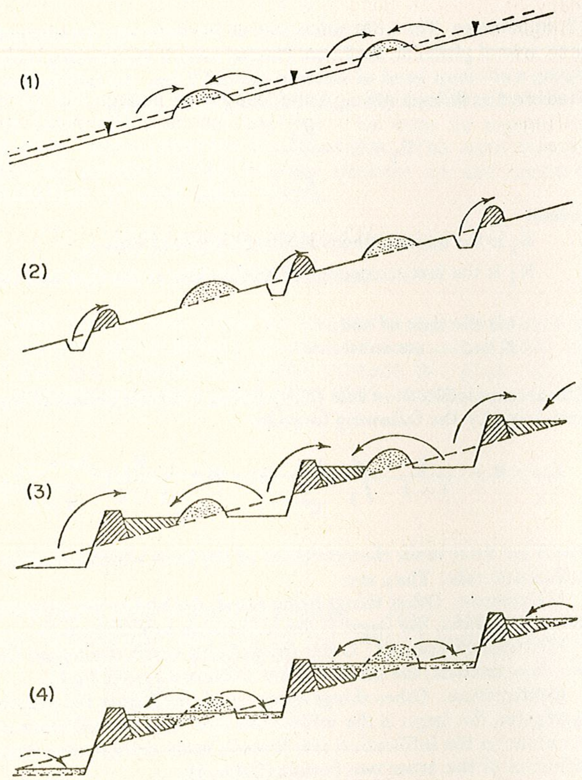

Figure 22. The steps in terrace construction by machine on relatively gently sloping land.

(1) Collecting the surface soil by shovel-thrower. (2) Building terrace bank by dammer plough (Fig 23). (3) Removing subsoil by shovel-thrower and shaping bank by hand tools. (4) Spreading surface soil evenly over entire field by shovel-thrower and levelling land surface by grader.

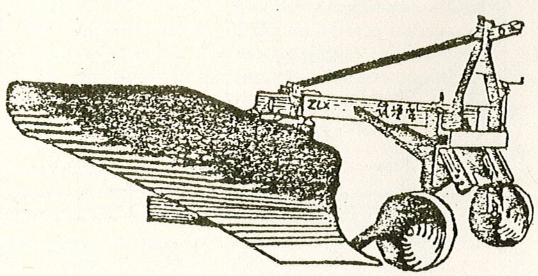

Figure 23. Dammer plough used to build the retaining wall of terraces.

Quaternary Studies in Hungary. Editor in chief: M. Pecsi. Published by the INQUA Hungarian National Committee & the Geographical Research Institute of the Hungarian Academy of Sciences, Budapest 1982, pp.313.

Published for the INQUA '82 Congress; 21 papers, 6 of which deal with Loess, Wind-blown sand & Periglacial phenomena and 6 with Engineering-geological studies.

THE MOST TYPICAL LOESS PROFILES IN HUNGARY

PÉCSI, M.

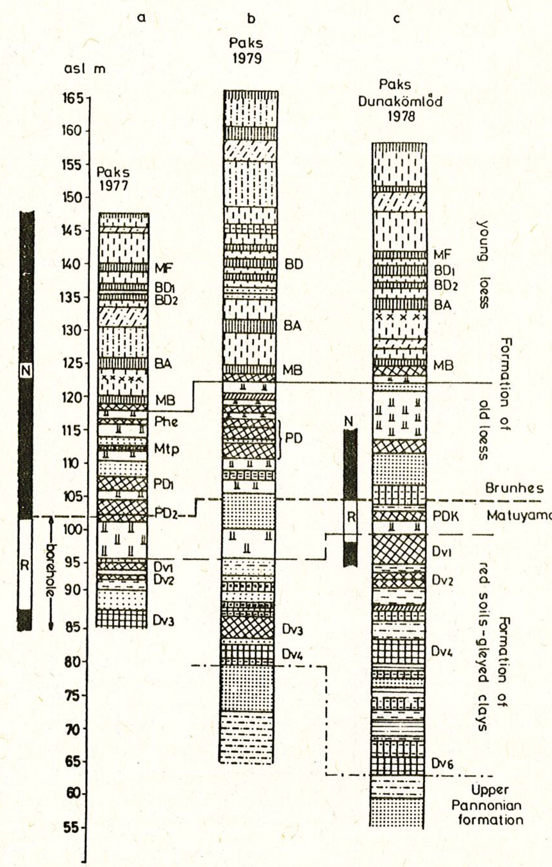

FIG.9: Lithostratigraphical parallelization of the exposures of the Paks brickyards and the borehole-profiles of the loess plateau of Paks
a = Paks brickyard exposure 1977; b = Paks borehole 1979/near the hilltop/; c = Paks-Dunakömlőd borehole 1978.

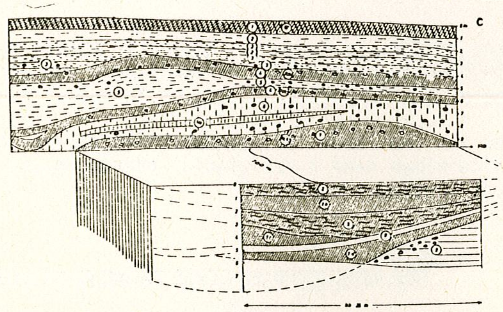

FIG. 4: Young loess in hilly region

CHRONOLOGICAL EVALUATION OF LOESS SNAILS FROM PAKS USING THE THERMOANALYTICAL METHOD

SZÖÖR, Gy. - BORSY, Z.

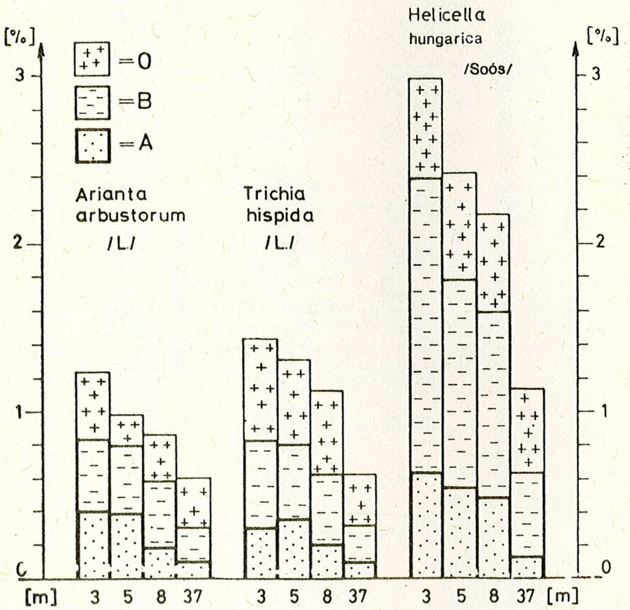

FIG. 6: Comparison of the derivatographic parameters of Pleistocene loess snails of Paks. Amounts of material released at temperatures of 2o--2oo°C /A/, 2oo--4oo°C /B/, 4oo--65o°C /O/, determined by the evaluation of the DTG, TG curves.

ENGINEERING MORPHOLOGICAL INVESTIGATIONS OF THE CELLARS IN THE HISTORICAL TOWNS OF HUNGARY

Mrs. SZENTIRMAI, L. - SCHEUER, Gy.

FIG. 1 Sketch plan showing the towns endangered by cellar collapse

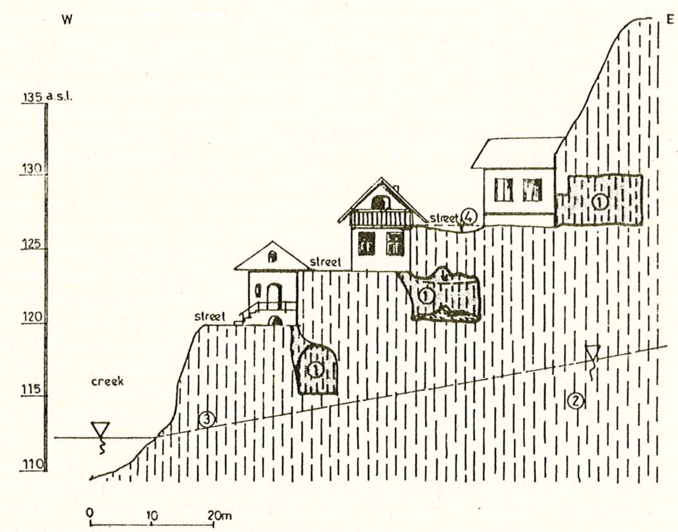

FIG. 6 Engineering-morphological sketch profile at Szekszárd 1: cellars; 2: loess sequence; 3: groundwater; 4: road subsidence caused by partial cellar collapse.

Due to water seepage from public utilities and poor drainage the loess strata have locally been moistened, and have lost their stability causing collapses that have endangered overlying establishments. Survey work and damage preventing activities are now in processes.

The loess at Jiuzhoutai, Lanzhou, People's Republic of China - a note

Edward Derbyshire

Soils Research Laboratory, University of Keele, Keele, Staffs, ST5 5BG, England.

The greatest thickness of loess so far recorded makes up the bulk of the mountain Jiuzhoutai (2067 m), 4.5 km northwest of the city of Lanzhou on the dry western margins of the Loess Plateau of central China. Some 335 m of loess and loess-derived sediments rest on a fluvially-planed and faulted basement of Neogene to Precambrian rocks at the level of the fourth terrace of the Hwang He. The sequence includes a basal imbricated fluvial gravel, 10 m of laminated alluvial silts and the three Pleistocene loess units recognised in the type of region to the east: 91 m of Wucheng loess (Lower Pleistocene), 204 m of Lishih loess (Middle Pleistocene) and 34 m of the Upper Pleistocene Malan loess.

The mean grain size of the Malan loess at Jiuzhoutai (5.2Ø: coarse silt) is coarser than the underlying Lishih and Wucheng loess (7Ø: medium silt). Co-plots of mean size v. sorting coefficient suggest two distinct populations (Fig. 1). The silt grades consist of quartz (over 60%), with feldspars and mica. Carbonates total 8-19% but, like the sulphates, are generally dispersed. 'Loess dolls' are rare. The palaeosols lack the bright colours of those farther east and organic contents are low even in the best developed buried soils. Analysis by the writer of a palaeosol in the Wucheng loess at Jiuzhoutai showed a gradation down the profile in both total carbonates (8.7 - 16.3%) and organic matter (0.8 - 0.44%) and a similar result was obtained fram analysis at Keele of a Lishih palaeosol (11.6 - 15.3% and 0.44 - 0.38% respectively).

The clay grade mineralogy is also dominated by quartz, with feldspar, calcite and illite/hydromica as ancillaries. Montmorillonite, present in the Luochuan type section in Shaanxi (Han 1982), has not yet been recognized in XRD traces at Keele: there is a broad peak at 14A in some samples but they do not appear to be smectites. The XRD traces of Malan, Lishih and Wucheng loesses from Jiuzhoutai are remarkable for their consistency, the composition being accordant with derivation from a dry, alkaline environment in which eluviation was relatively weak (cf. Wang, Wu and Yu, 1978).

The geomagnetic chronology at Jiuzhoutai is not year clear. The Matuyama-Brunhes boundary occurs 105 m above the base and there are two appreciable thicknesses with normal polarity 80 m and 58 m above the base with a thin normal polarity at 44 m. On the south side of the city of Wuquanshan, however, the Jaramillo normal event has been determined 14 m above the base. Loess began to accumulate at Lanzhou, therefore, less than 1.6 m yr. ago and perhaps less than 1.2 m yr. ago (cf. Wang and Yue 1982). The loess at Karamaidan in the Tajikistan S.S.R. is thinner but apparently older (2.4 m yr: Pen'kov and Gamov 1980) than the basal Jiuzhoutai loess. This raises the fundamental question of the primary causes of loess accumulation in different

parts of the Eurasian loess belt.

The Jiuzhoutai loess, made up of rather angular quartz with feldspars and mica, was almost entirely sedimented from the air. It has a loose, single-grain fabric with clay grade particles occurring as coatings, clusters and buttresses between silt grains. Voids ratios are high (>0.8) and, with a collapse ratio of 10% more, it satisfies the collapsing soil criteria of both Denisov (1951) and Feda (1966). The microfabric varies with overburden and weathering history, and hence with age. Symmetrical silt-sized aggregates of clay-size quartz, feldspar and mica occur occasionally: they may represent flocs deflated from desert pans and wadi courses which cover substantial areas to the north and north-west. Wetting and drying after deposition also leads to flocculation especially as cationic concentration increases during decreases in porewater content. Clay grade aggregations are thus drawn by porewater menisci towards pore margins giving rise to the clay bridges visible in loess of all ages.

Normal consolidation with depth occurs by 'dry' compaction. In this case, the process is intergranular shearing: clay buttresses are disrupted but not dispersed. Local saturation of the loess, however, results in hydroconsolidation. This destroys clay buttresses, reduces the voids ratios and increases the anisotropy of the fabric (Derbyshire 1983 <u>in press</u>). This has been an important process in the past during colluviation and alluviation. The microfabric of loessic colluvium and alluvian displays dispersed clay and fine silt grades mantling the coarser silts throughout. The microfabric of loess thus provides a means of discriminating it from loessic colluvium and loessic alluvium.

Although rather low in carbonates, the Jiuzhoutai loess contains siliceous cements and coatings in the palaeosol horizons. Iron is an accessory mineral in these cements. Silica occurs as inter-grain cements and overgrowths in the Wucheng and Lishih loesses. This is rare in the coarser silt skeleton of the Malan loess.

Only limited, small scale edge damage occurs on the Jiuzhoutai loess particles: they cannot be compared to the edge-crushing to be seen on glacially-comminuted silt. Concave surfaces produced by simulated salt weathering and hydration in the laboratory (e.g. Sperling and Cooke 1980) are similar to those seen on the younger loess particles. These grains lack the Hertzian cracks and partly-rounded corners which are fairly common on subglacially-processed grains.

Re-evaluation of the evidence of Pleistocene glacial extent in China (e.g. Cui 1980; Zheng and Li 1981; Shi 1982; Derbyshire 1983a <u>in press</u>) suggests that glaciers did not develop in south-east China and that the extent of valley and piedmont glaciers and ice caps (<u>but no ice sheets</u>) was limited and localised in Tibet.

Conclusion

1. Particle shape, size and fabric are consistent with origin by deflation of silts from wadis, fans and desert plains to the

north and north-west of Lanzhou.

2. The loess of the Lanzhou region is a product of the desiccation of High Asia. This began in the Lower Pleistocene with an uplift (exceeding 3,500 m in 2 million years) of the Tibetan plateau and the Himalaya (Li et al. 1979). It is thus a concomitant of, rather than a product of the localized glaciation to the southwest.

3. The vast majority of the loess at Jiuzhoutai is an aeolian silt or siltstone. The microfabric and metastable behaviour of this material is quite distinctive and different from those silts translocated and deposited in slurries and streams. Such sedimentation produces loessic colluvium and loessic alluvium, respectively, but not loess.

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Lautridou, J.P. and Ozouf, J.C., 1982. Experimental frost shattering: 15 Years of research at the Centre de Geomorphologie du CNRS. Progress in Physical Geography 6, no. 2, 215-232.

We conclude by stressing the importance of our experiments as a means of obtaining information about the provision of fine rock material by frost shattering. In the context of contemporary discussions on the origin of loess, it is possible to assert that the freezing of unweathered rocks can, if favourable moisture conditions persist, provide only small amounts of fine rock material, but that chalks and argillaceous rock types can liberate large amounts of particles in the silt and large clay-sized ranges. Moreover, altered siliceous rock types can release considerable amounts of fine material. We believe that these findings explain the abundance of fine rock material in the Saalien-Weichselian 'head' deposits of Normandy, frost shattering having acted on weathered rock during the preceding interglacial period. Lastly, we assert that frost shattering could have supplied loesses with silt-sized material and even coarse clay-sized particles (but not fine clay-sized particles, except in the case of argillaceous rocks, marls and some weathered types).

The results of our research must be viewed within the framework of a continuing programme of research. We are aware that modification of the schema outlined above is always possible as we continue to explore new techniques and examine more rock types. However, at present, we are in a position to define, prior to a frost shattering experiment, the relative frost susceptibility of a rock and the characteristics of the debris which it will furnish. Further, we can distinguish loess deposits from deposits formed by frost shattering. Lastly, by examining the characteristics of frost shattered periglacial deposits, we may be able to estimate the number of freeze-thaw cycles responsible for their formation and speculate on the climatic environment in which they developed.

Quaternary Dust Mantles of China, New Zealand and Australia: edited by R. J. Wasson, Australian National University 1982, pp.253 (to order send A$5.00 to the Secretary, Dept. Biogeog. & Geomorph., Res. Sch. Pacific Studies, ANV, P.O.B.4, Canberra City ACT 2600, Australia).

This is the Proceedings of the WPWG Dust Mantle Workshop held in Canberra in late 1980; 8 papers from China, 4 from NZ, 17 from Australia and one from Nigeria. LL echoes Jim Bowler's words in the preface: If the Workshop and Proceedings provided an opportunity to acknowledge the contribution of Liu Tung-sheng to China's loess studies, it did likewise for his Australian counterpart, Bruce Butler, author and pioneer of parna. During this Workshop and field trip many of us acknowledged the reality of parna and took occasion to pay tribute to the man who first recognized it.

We can only reproduce a few items - we focus on loess stratigraphy in China.

AEOLIAN PROCESSES AND DUST MANTLES (LOESS) IN CHINA

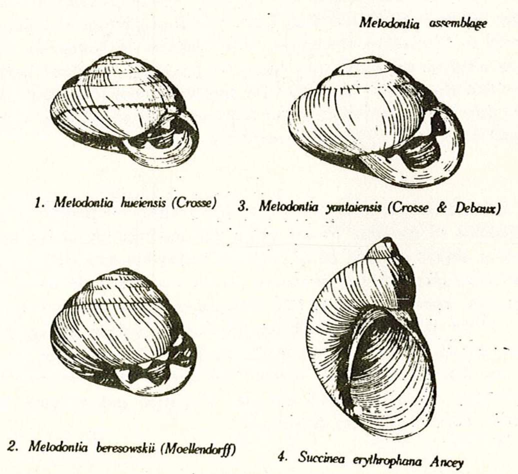
Liu Tung-sheng[1], An Zhi-sheng[2], Yuan Bao-yin[1]

1. Institute of Geology, Academia Sinica, China
2. Institute of Geochemistry, Academic Sinica, China

ABSTRACT

Distributional patterns, environmental characteristics and stratigraphy of loess in China are discussed. Loess and palaeosols occurred alternately during the Quaternary period in northern China. A palaeoclimatic curve is proposed and tentatively correlated with the palaeoclimatic curve of deep sea core V28-238.

Aeolian processes and deposition of dust during the Quaternary in China has been closely related to the effect of aridity and cooling of the atmosphere, development of the westerlies, fluctuation of sea level as well as the uplifting of the Qinghai-Xizang (Tibet) Plateau. These factors are important in any attempt to determine the mode of generation, transportation, and accumulation of the dust mantle (loess), and also the reconstruction of the history of the Quaternary.



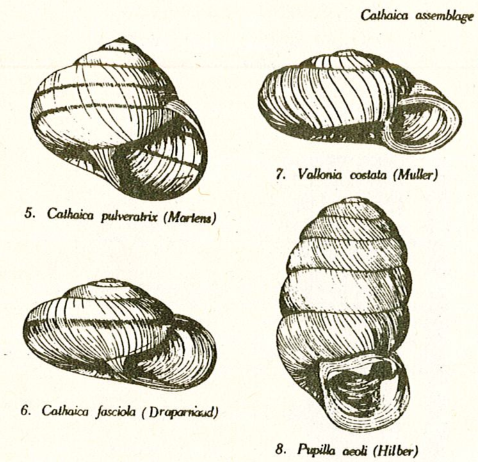


Figure 2. Fossil snails from the Loess Plateau

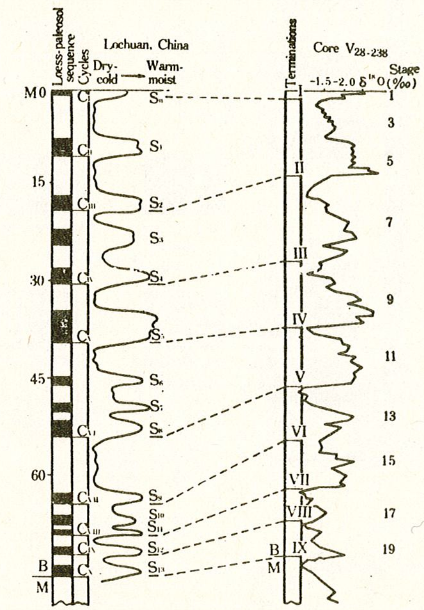


Figure 7. Longterm climatic fluctuation curves of Lochuan, compared with the oxygen isotope records in core V28-238 (after Shackleton and Opdyke, 1973)

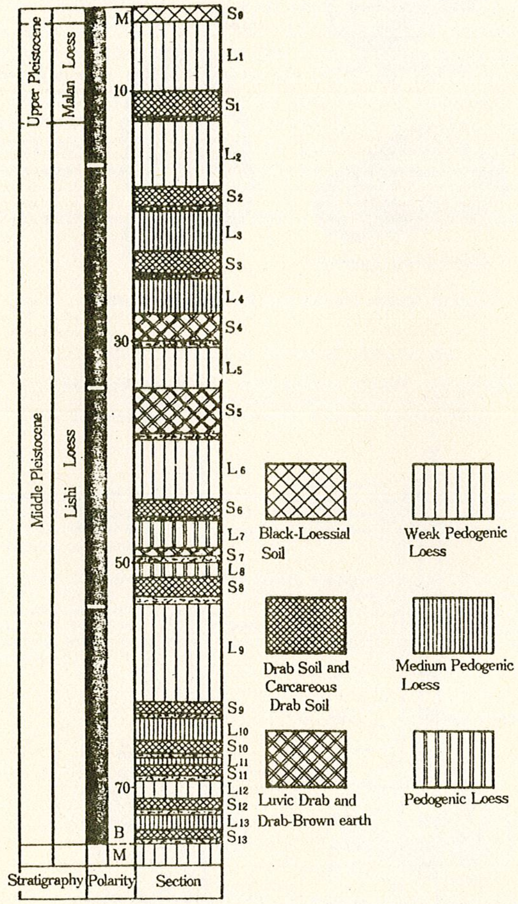


Figure 5. Different loess types and soils in the loess of Lochuan

GEOLOGICAL ENVIRONMENT OF LOESS DEPOSITS ON LOCHUAN YUAN

Wu Zi-rong, Yuan Bao-yin, Gao Fu-ging

Institute of Geology, Academia Sinica
Beijing, China

The term 'yuan' is used to refer to a flat highland cut by deep valleys in loess deposits (Fig. 2). The Lochuan yuan is located in the Lochuan county, Shaanxi province, in the loess region.

There are many loess yuans on loess plateaus in China. The five largest yuans are the best preserved (Fig. 1). They are named from west to east: Baicao Yuan in western Gansu, Dongzhi Yuan in eastern Gansu, Lochuan Yuan and Ji Yuan in nothern Shaanxi, and Jixian Yuan in Western Shaanxi. The Lochuan Yuan has the most complete profile of loess. We shall describe the geological environment of loess deposits on Lochuan Yuan, permitting us to recognise the geological conditions for loess deposition on the loess plateau as a whole.

GEOLOGICAL BACKGROUND FOR FORMATION OF LOCHUAN YUAN

Lochuan Yuan lies in the southwestern part of Northern Shaanxi loess plateau, and is tectonically a small-scale intermontane basin on the Ordos platform (Fig. 3) at an average altitude of 1100 m. The basin is bounded by mountains on three sides; Huanglongshan on the east, Ziwuling on the west, and Beishan (Miaoshan and Yufenshan and others) on the south. The altitude of these mountains is 1500-1900 m and their relative height above the basin is 400-600 m. The basin is oriented northwest to southeast (Fig. 4), and the centre of the basin lies to the south of Lochuan City. The Lohe River meanders through the basin from north to southeast and then into the Weihe River.

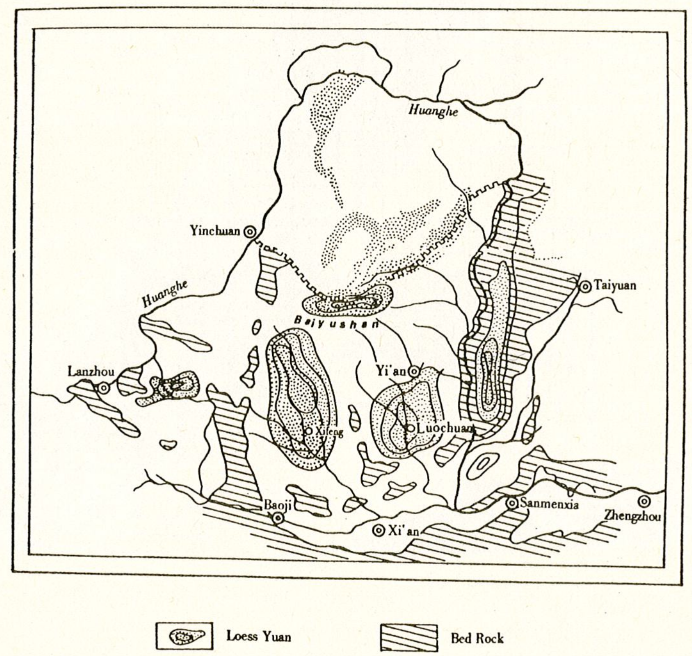


Figure 1. Distribution of loess yuans in the middle Huanghe Valley

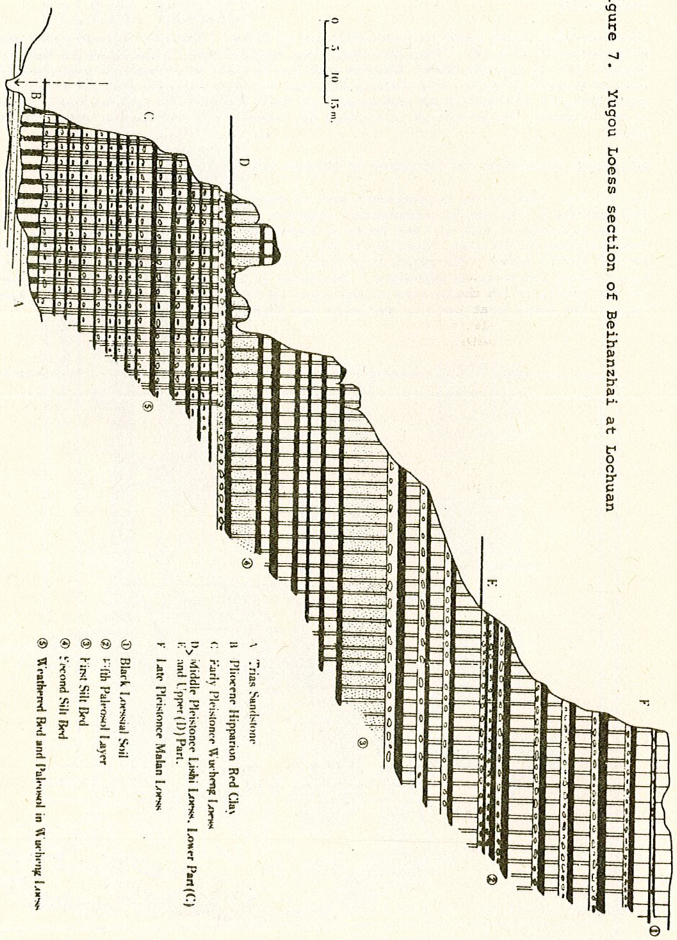


Figure 7. Yugou Loess section of Beihanzhai at Lochuan

A PRELIMINARY STUDY OF SOIL STRATIGRAPHY IN THE LOCHUAN LOESS SECTION

An Zhi-sheng, Lu Yan-chou, Wei Lan-ying

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On the loess plateau in North China, large numbers of palaeosols are developed within loess sections (Thorp, 1935). The possible origins of palaeosols in the Chinese loess, and their geological implications, have been expounded by Liu Tung-sheng and Zhu Xian-mo many times, and they hold that the palaeosol buried within the middle Pleistocene Lishi loess is a forest drab soil (Liu Tung-sheng, 1957; Liu Tung-sheng, et alia, 1964; Zhu Xianmo, 1965).

Well developed on the loess plateau are quite a few large-scale loess deposit basins, forming loess 'Yuans' (flat highlands). Among them, the 'Yuan' at Lochuan is a typical example. At the Heimugou section at Lochuan, where loess and palaeosols occur alternatively, the loess strata may be subdivided (from oldest to youngest) into early Pleistocene Wucheng Loess, middle Pleistocene Lishi Loess and late Pleistocene Malan loess (Liu Tung-sheng, et alia, 1966). The boundary between Wucheng loess and Lishi loess is approximately at the Brunhes-Matuyama boundary (An Zhi-sheng, et alia, 1977). Thirteen reddish-drab palaeosols, and one grey-black palaeosol situated on the top of Malan loess, were all preserved within the Brunhes loess strata (Fig. 1,2).

LOESS AND PALAEOSOLS - GEOLOGIC RECORDS OF BIOCLIMATIC ENVIRONMENTS

Palaeosols in loess contain a leached horizon(A) which changes upwards to loess, a well-developed argillic horizon (B_m or B_t) and carbonate illuvium (B_{ca}) as well as loess parent materials(C). The average grain size(Md), $CaCO_3$ content and FeO/Fe_2O_3 in the argillic horizons of the palaeosols are lower than in unaltered loess. The illite contains more montmorillonite layers and vermiculite content is relatively high in the argillic horizon by comparison with the loess. (Han Jia-mao, et alia, 1979)(Table 1). At the top of each palaeosol, and at the base of the overlying loess, there are Metondontia snail assemblages reflecting a relatively warm and humid habitat (Chen De-niu, et alia, 1979). Within the palaeosols, broadleaf tree pollens dominate followed by coniferous tree pollens, and the herbaceous pollen is dominated by Artemisia. Apparently, the palaeosols were formed beneath warm-humid forests or forest-steppe areas with weakly acid to weakly alkaline conditions.

The composition and structure of the loess are rather homogeneous. Mammalian fossils found in loess indicate a prevalence of dry-steppe fauna during deposition. Herbaceous pollen dominates in the loess. Cathaica snail assemblage, appearing mostly in loess layers, reflects an ecological environment of dry and cold desert steppe. All the evidence from the carbonate-rich loess shows that it accumulated in a rather dry-cold steppe environment under weakly alkaline pedogenic conditions (Liu Tung-sheng, et alia, 1978).

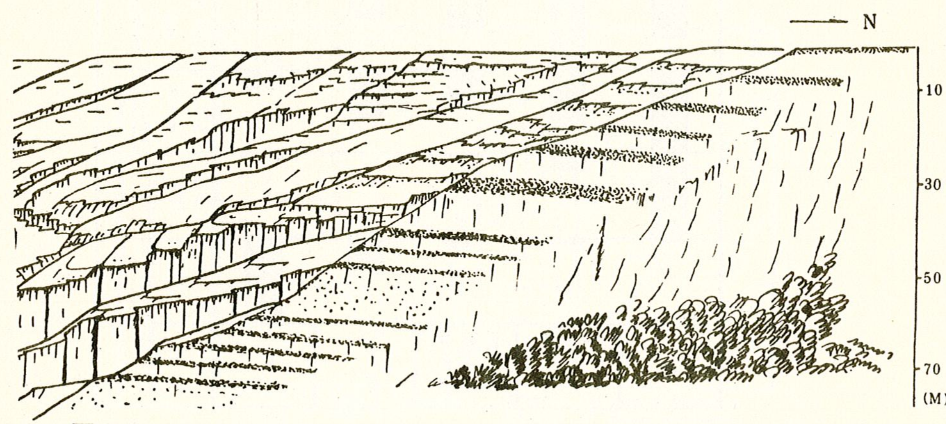

Figure 1. A diagrammatic Loess-Palaeosol section of the Xiangiao, Lochuan County

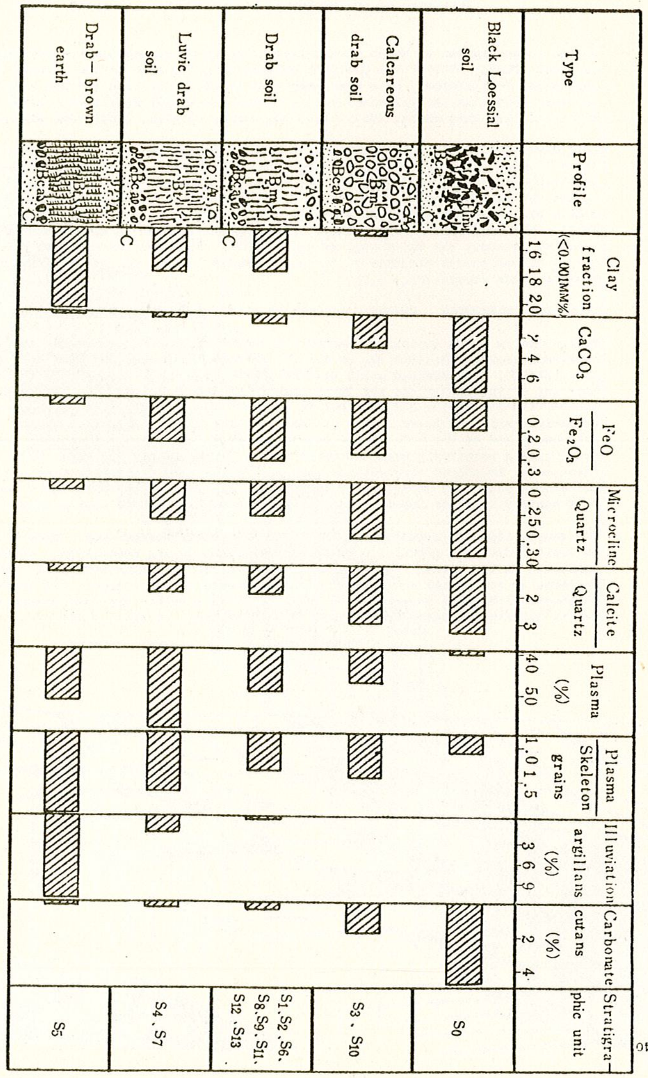

Figure [illegible]. The identification of different types of palaeosol

QUATERNARY VERTEBRATES AND THEIR LIFE ENVIRONMENT IN LOESS REGIONS OF CHINA

Liu Tung-sheng, Yuan Bao-yin, Gao Fu-qing, Sun Fu-qing

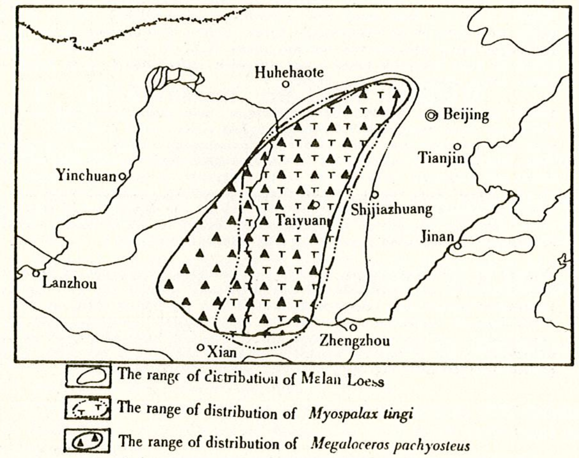

Figure 8. The distribution of Lishi Loess and Myospalax tingi and Megaloceros pachyosteus in Lishi Loess

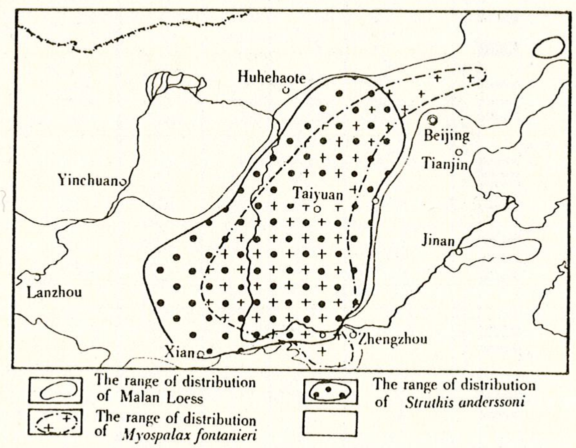

Figure 9. The distribution of Malan Loess and Myospalax fontanieri and Struthis anderssoni in Malan Loess

CLAY MINERALS IN THE LOESS OF CHINA AND THEIR CHARACTERISTICS IN THE LOCHUAN AND LONGXI SECTIONS

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INTRODUCTION

A loess section is commonly composed of interbedded loess and palaeosols. Stratigraphic studies of loess have shown that a complete loess section can be divided in descending order into late Malan Pleistocene Loess, middle Pleistocene Lishi (upper part and lower part) and early Pleistocene Wucheng loess (Liu, et alia, 1965). Recent studies have revealed that Holocene loess lies, somewhat sporadically, over Malan loess (Qiao, et alia, 1980; Zheng, et alia, 1979).

Almost no fossils, especially vertebrates, have been discovered in loess sections, making effective biostratigraphic subdivision and correlation difficult. Furthermore, although some advances have been made in loess-chronological study with palaeomagnetic data (An, et alia, 1977; Li, et alia, 1974) and radiocarbon dates calculated for the palaeosols in the Malan and Holocene loess, it is still difficult to carry out chrono-stratigraphic division of the loess using these limited data. Therefore, subdivision of the loess for climatic reconstructions relies upon investigations of the depositional environment of loess, its weathering and diagenetic development reflected in its mineral composition, and mineralogical features based upon clay mineralogy.

Studies of loess have shown that it is essentially composed of silt quartz and variable proportions of clay particles which in general account for 15 - 25% of the total. Palaeosols within the loess contain more clay particles (Liu, et alia, 1965). Geological conditions at different stages of the loess depositing cycle, such as depositional environment, weathering processes and diagenetic development, may be recorded in clay minerals. Studies of clay minerals in loess and buried soils may illuminate Quaternary palaeo-environments and much of their evolutionary history.

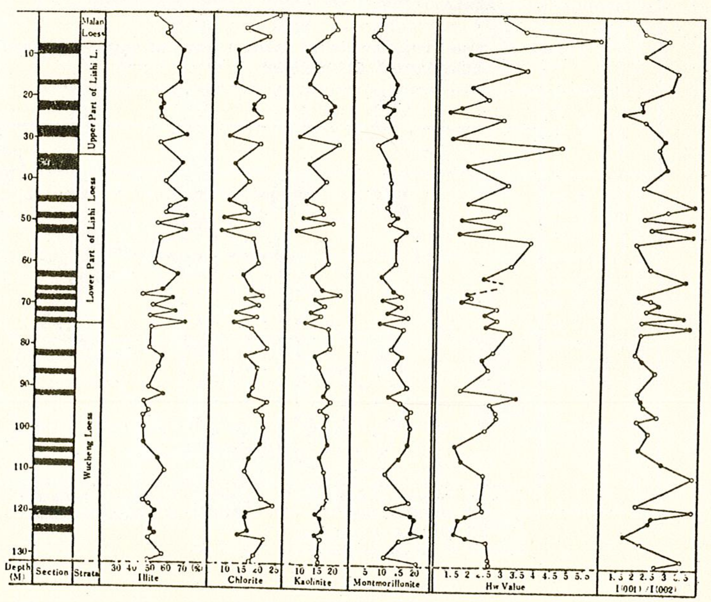

Figure 3. Relative amounts of main clay mineral species and Illite Index in Lochuan Section, Shenxi Province

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GÉOLOGIE
Geologie du génie civil

THE NATURE OF THE LOESS STRENGTH

Al. Alexiev

(Submitted by Corresponding Member B. Kamenov on February 6, 1969)

The strength behaviour of a Bulgarian typical silty loess was tested in an air-pressured triaxial cell and was explained on the basis of a new soil strength concept, exposed elsewhere and applied several times [1,2]. This concept is founded on an approach to soil strength (incl. loess strength) in accordance with the proposed principle of increasing local differences between phase pressures as a result of unequal unit pore-volume changes during the deformation stage.

Prior to the testing, the natural water content of the soil was considerably lowered (up to 4.20 per cent) so as to minimize the influence of local pore-water pressures and rubber-membrane effects.

The samples were tested with or without (two series) rubber-membrane covers, in both cases with lubricated ends. The tests were performed quickly, in undrained conditions.

The test results obtained are presented in the Figure.

The remarkable non-coincidence between the strength behaviour of the loess in the case of membrane-covered samples and the loess resistance in the case of samples tested without a rubber membrane (in the same stress conditions) is attributed to the existence of differences between the applied and the entrapped-air-pressures within the non-covered samples. On this basis, the following explanation of the tested loess behaviour is proposed.

1. P r i o r t o t e s t i n g. In consequence of the low water content, the negative pore-water pressures in the loess studied must be considerably high, and the entrapped-air-pressures will be lower than the open-pore-air pressure. Therefore, the boundary particles between an open pore and an including entrapped air pore are pressed towards the interior of the „closed" pore.

2. D u r i n g t e s t i n g. If the sample is covered with a rubber membrane, the changes of the open-pore-air pressure caused by the overall volume change of the sample tested will be negligible, and the strength behaviour of the loess (in the range of stresses applied) is as indicated by curve *A* in the Figure; but if the loess sample is tested without any membrane, the open-pore-air pressure value will be close to that of the applied cell-air pressure, and the growth of the difference between open-pore-air pressure and entrapped-air pressures will act as a displacing boundary-particles force. As may be seen (curve *B* in the Figure), this action is particulary marked in the case under review.

3. D u r i n g r e p e a t e d t e s t i n g. A specific feature of the loess tested was unexpected great plastic deformations demonstrated by such a brittle

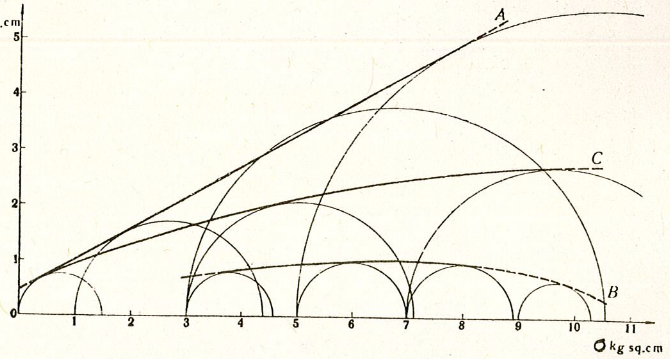

Fig. 1

cohesive material (if tested without a rubber-membrane cover) in cases of testing with a rubber-membrane cover. Some of the samples showed axial deformations up to 50 per cent of the height of the sample without an ultimate destruction. Tested again, but without a rubber membrane, these deformed samples demonstrated a substantially greater strength (curve *C* in Fig. 1) than that of non-covered samples tested in the same conditions (curve *B* in the Figure).

In the light of these test data, the strength of the loess studied can not be explained by the presence of any particular bonding material, but may be due to thè above mentioned interaction between the plate-shaped solid particles and the liquid and gaseous phases of the loess.

The test results presented herein form a part of an research programe on the possibilities of a new soil-strength concept.

Geological Institute of Bulgarian Academy of Sciences and Committee of Geology, Sofia, 13

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Velasquez, C., 1981. Loess et géotechnique: étude de quatre cas de sinistres immobiliers. Bull. Soc. geol. France 23, No. 2, 149-151.

La loi nº 7812 du 4 janvier 1978, relative à la responsabilité et à l'assurance dans le domaine de la construction, donne une nouvelle définition de l'article 1792 du Code civil. Elle stipule : « Tout constructeur d'un ouvrage est responsable de plein droit, envers le maître ou l'acquéreur de l'ouvrage, des dommages *même résultant d'un vice du sol* qui compromettent la solidité de l'ouvrage ou qui, l'affectant dans un de ses éléments constitutifs ou l'un de ses éléments d'équipement, le rendent impropre à sa destination. Une telle responsabilité n'a point lieu si le constructeur prouve que les dommages proviennent d'une cause étrangère ».

→

Cette mise au point fut imposée entre autres raisons, par la multiplication des sinistres immobiliers dont le sol était indûment rendu responsable. Elle a aussi le mérite de définir clairement les buts d'une expertise géotechnique de routine, provoquée par un sinistre. L'architecte, le géomètre-expert, parfois le géologue, chargé d'une mission d'expertise est donc confronté à deux tâches :

— il doit évaluer les « vices » du sol, donc estimer les limites des propriétés mécaniques, reconnues significatives par la pratique quotidienne du chantier, en fonction des caractéristiques de l'ouvrage projeté ou réalisé ;

— il doit connaître les principes généraux de fonctionnement du milieu naturel, soit pour prédire l'évolution du site de construction, soit pour faire la part de la cause étrangère qui, modifiant les caractéristiques du sol, exonèrent du même coup la responsabilité du constructeur.

Ainsi les liens entre la géotechnique et le Quaternaire — pris par le biais de son héritage morphologique et sédimentaire — se nouent dans l'atmosphère de conflits entre des intérêts financiers antagonistes.

L'expérience fondée sur l'analyse de nombreux sinistres immobiliers, responsables de dégâts matériels dispendieux et de nuisances permanentes permet d'examiner quatre situations types dans lesquelles une formation quaternaire caractéristique, le lœss, est directement impliquée.

Son origine éolienne lui vaut une granulométrie fine (50 %, en poids, des particules ont une taille comprise entre 10 et 50 microns), une forte perméabilité (2 à 7. 10^{-2} cm/min.), liée à une porosité importante (30 à 50 %). Facile à mettre en œuvre, le lœss sec oppose une bonne résistance au poinçonnement (sup. à 3 bars), associée à un angle de frottement interne de 35° et plus. Isotrope, il garantit un tassement faible et des réactions homogènes aux surcharges. Matière première ou sol « sain », il suffit pourtant d'un simple excédent d'eau pour que ses aptitudes soient mises en défaut.

A Liévin (62), en janvier 1977, un cratère de 3 m de diamètre, profond d'un mètre, aux bords subverticaux, s'ouvre sous une maison dont les murs se fissurent. Les Houillères du Bassin du Nord et du Pas-de-Calais indemnisent partiellement le propriétaire au titre des « dégâts » miniers, fréquents dans ce secteur. L'enquête d'expertise montre que le sinistre a une origine différente. La maison repose sur une couche de 2 m de lœss couvrant un niveau sableux, en périphérie d'une haute terrasse sableuse de la Souchez. En 1975, le quartier a été doté de l'eau courante, mais faute d'un réseau d'égouts, les eaux usées sont directement rejetées dans la rue. Par souci de salubrité, le propriétaire les envoie dans un fosse septique dont l'effluent, mal conçu, aboutit en souterrain contre les fondations de la maison.

Les eaux agressives, chargées de détergents, détrempent continuellement le lœss. Son ciment calcitique est détruit. L'état électrique des micro-agrégats est modifié. En décembre, des rejets excessifs saturent le lœss. Sa cohésion est rompue. Il se tasse, mettant à nu la conduite d'adduction d'eau. En janvier, elle gèle et se rompt. En quelques heures, 30 m³ d'eau jaillissent sous pression. Un vaste panneau de terre est détrempé, mais c'est le cône de lœss humecté en permanence qui cède. Pour ce matériau encore en place la pression de cisaillement est à peine de 0,2 bar. Le lœss a littéralement « fondu » sur place. Les sables sous-jacents drainèrent l'excédent d'eau, mais les fondations, suspendues dans le vide cédèrent en se désolidarisant des murs porteurs. Coût : 50 000 F.

A Saint-Aubin-sur-Mer (76), en septembre 1976, les propriétaires d'une résidence secondaire oublient de couper l'eau d'une rampe d'arrosage, installée sur la pelouse d'un jardinet en cour. L'eau coule pendant une semaine. Le samedi suivant, on découvre une mare qui se vidange brutalement en ouvrant une fosse de 90 m³. Un mur mitoyen de clôture, haut de 3 m, large de 45 cm, fondé dans une tranchée profonde de 50 cm reste suspendu dans le vide, sur une portée de 4 m, avant de s'effondrer en même temps qu'un bâtiment annexe.

Le lœss épais de 5 m repose sur la craie couverte d'argile à silex. Sa porosité est de 27 %. Les 35 m³ d'eau échappés régulièrement avaient détrempé une masse de terre, bien circonscrite, d'un volume approximatif de 144 m³. Dans ces conditions la perte de volume occasionnée par le tassement dû à la fonte de la structure du lœss ne pouvait guère dépasser plus de 40 m³. Il manquait donc une cinquantaine de mètres cubes.

L'examen des lieux révèle qu'à proximité du mur mitoyen, on avait installé les sanitaires d'un terrain de stationnement permanent de caravanes. Leurs eaux usées et les eaux pluviales recueillies par la vaste toiture de la villa voisine venaient aboutir par un collecteur unique dans un puisard creusé dans le lœss, au ras du mur. Il semble que la fourniture régulière et abondante d'eau, en un point d'émergence restreint favorisa le creusement d'une cavité, là où le drainage fissural de la craie permettait le soutirage d'éléments fins. Les limons firent pont au-desus de la cavité. Dans un premier temps le lœss, arrosé régulièrement pendant une semaine, se tassa.

Une mare se creusa. Puis la voûte céda, provoquant la vidange instantanée de la mare et ouvrant une fosse très spectaculaire. Coût : 30 000 F.

Dans ces deux cas, seule la mauvaise gestion des eaux domestiques est responsable des dégâts. Ces sinistres n'auraient qu'une signification anecdotique s'ils n'illustraient pertinemment la totale méconnaissance des données physiques du sol dont font preuve bon nombre de responsables de chantier.

Une fois sa structure oblitérée ou détruite, le lœss continue à se comporter comme un matériau particulier. Sa distribution topographique originelle se calque sur les aspérités du relief. Pendant les périodes de froid aride, les limons éoliens recouvrirent temporairement tout le paysage, versants raides compris, du moins à proximité des sources abondantes de limons. Le ruissellement en déblaya ultérieurement une partie, ou bien ils s'incorporèrent à la matrice fine des formations superficielles mises en mouvement par la solifluxion. Ces limons en étendant la distribution granulométrique au-delà de la fraction argileuse abondamment libérée par l'altération des marnes, contribuent à augmenter l'indice de plasticité de la formation superficielle. Celle-ci constitue alors souvent un masque étanche qu'il est dangereux d'entamer.

A Marlenheim (67), en 1979, la fouille d'une maison ouvre une excavation haute de 3,50 m au tiers inférieur d'un versant en pente raide (15°). Elle entame une formation argilo-limoneuse, jaune-rouge, composée d'un lœss remanié mélangé à des marnes altérées du Muschelkalk. Ce matériau stable couvre le versant cachant une coulée de solifluxion à blocs calcaires, épaisse d'un mètre qui ravine les marnes dolomitiques du Muschelkalk inférieur. Celles-ci forment le substratum de la base du versant et constituent la couche d'assise de la partie arrière de la maison dont l'avant repose sur la formation superficielle meuble.

Dans la semaine qui suit le décapage du masque de lœss, les marnes décompriment. A l'air libre, elles se délitent verticalement et horizontalement. Un réseau fissural se développe rapidement. La nappe qui baigne la partie supérieure des marnes du Muschelkalk, vient à l'affleurement. Une source pérenne donnant jusqu'à 500 l/h, jaillit sous la maison. Les eaux baignent les fondations. La résistance au cisaillement de la formation superficielle chute de 1,7 bar à 0,3 bar. Les marnes sont transformées en boue. Coût estimé : 250 000 F.

A Londinières (76), on construit en 1973 — année sèche — une maison sur cave. Elle s'enterre à demi dans une banquette large de 20 m qui suit la profonde et large vallée de l'Eaulne, en Pays de Bray. Ce replat topographique, au pied d'un long versant crayeux est constitué d'un important placage limoneux. Épais de 3 m, il masque des formations de pentes de la craie marneuse, solifluées. Sa granulométrie se caractérise par la présence de sables fins (inf. à 100 microns) pour 35 % et de limons pour 43 %. La médiane est à 80 microns. La porosité est élevée (35 %), mais elle est le fait de pores fermés très abondants. Les pores tubulaires sont beaucoup plus rares et revêtus d'argile qui les étanchéifient. A l'état sec, ce matériau lœssique est rigide.

La partie basse de la maison est encavée d'un mètre cinquante, sans qu'il ait été prévu d'exutoire pour les rampes d'accès au sous-sol. A l'automne 1973, l'eau sourd au contact entre les murs de la cave et la paroi limoneuse. Un orage provoque l'inondation de toute la partie en creux en avant de la construction. L'eau sature peu à peu les limons qui deviennent plastiques. Il est alors nécessaire d'empierrer les accès pour éviter l'enlisement. En janvier, l'eau jaillit en bouillonnant. Le lœss fond, les fondations cèdent et s'enfoncent de 0,40 m. Un mur latéral de soutènement casse, plonge verticalement, puis remonte lentement, flottant littéralement dans la boue liquide. Les murs solidement chaînés résistent bien. La maison est faiblement endommagée, mais les travaux de reprises en sous-œuvre et de drainage coûteront 200 000 F, sans apporter de remède définitif aux inondations par les eaux de la nappe de la Craie mises à l'air libre par la disparition du masque lœssique.

Dans ces deux cas, l'étude préalable de la géomorphologie et de la géologie des sites de construction, même fondée sur une connaissance parfaite du Quaternaire, n'aurait pas permis de déceler les « vices » du sol. Seule la connaissance du régime hydraulique de la nappe aurait peut-être permis de déceler un danger potentiel. Cela supposait la mise en place de piézomètres et des observations poursuivies pendant une longue période pour être enfin exploitées par un spécialiste donnant des conclusions péremptoires. . . .

. . . La solution serait-elle d'établir des documents de synthèse au 1/50 000 ? On peut en douter. L'expérience montre que la carte géologique au 1/50 000, largement diffusée et qui fournit des renseignements irremplaçables, reste inutilisée, sinon inconnue. La pratique réglementaire montre qu'au mieux, dans des programmes importants, l'administration est capable de formuler des réserves sur le comportement géotechnique qui tiennent en quatre lignes. Finalement, il semble que la procédure légale qui oblige à s'assurer soit, dans le contexte économique actuel, la seule solution cohérente. Elle n'offre qu'une limite, les victimes ne peuvent être ressuscitées !

La solution idéale existe pourtant : la confection de plans d'occupation des sols qui réalisée à l'échelle du plan cadastral tienne compte des aptitudes du milieu, donc de son histoire telle que le Quaternaire l'a fait. Mais hélas, là encore, on cherche vainement — trop souvent — le substrat géologique. Le coût croissant de la réparation des erreurs d'aménagement devrait pourtant inciter à prendre en compte le sol.

The Literature of Loess (Part 1)

Die Literatur über der Löss ist ungeheuer - Paul Woldstedt 1961.

There is a large literature devoted to the loess deposits of the world, and it provokes varied responses from comtemporary loess investigators. A range of views can be seen in the Woldstedt quotation above - it all depends on how you translate that key word 'ungeheuer' - it could simply be 'enormous' and the sentence becomes a simple, judgement-free statement of the situation. Or it could be 'monstrous' - which would express a widely held view that we are about to be overwhelmed.

Actually the major problem with the loess literature is not its great bulk but its incredible diversity; and its a many faceted diversity. To start with, and most obviously, there are the linguistic problems; there is a major loess literature in English - but there is an even larger one in Russian, and there are highly significant collections in German, French and Chinese; to say nothing of the material in Spanish, Polish, Bulgarian, Hungarian and other European languages. A number of papers in Italian and you have run the linguistic gamut, and the size of the problem is clearly revealed. Given this revelation we can assess the problem carefully and see where the major linguistic impediments to information flow occur.

For the sake of argument, and as a great simplification, we can group the loess languages into six packages. They are arranged in order of estimated bulk of publication:

1) Russian, and similar
2) English
3) German
4) French
5) Chinese
6) Other European languages

The major outstanding problem appears to be (still) lack of communication between groups 1 and 2 - and this is where there will have to be determined action by the communications group of the Loess Commission. The two major publishing language groups are acting independently - there is little interaction - due to several factors. From the English side it would be useful if publications in Russian were made readily available, and if Russian papers could carry a substantial English abstract. In the reverse direction writers in English should make more effort to know the Russian literature, and to cite actual papers. There is a great tendency to writers to cite literature in their own language but responsible scholarship requires a knowledge of relevant work in every language. We have gone backwards in this respect: Tutkovskii, writing in 1899 (in Russian) was able to cite and discuss material in English, German and French; and he quoted, with great effect, the statement by J. Geikie:

"Löss is certainly one of the most remarkable accumulations of the Pleistocene age". J. Geikie, 1898.

Another aspect of the diversity of the loess literature is the splitting into different subject areas and the loss of material of general interest because it is buried in some specialized topic. Where is the current action on the loess front? There is certainly action in the engineering region and there is a large output of Russian engineering papers - they form a significant fraction of current loess publications. We can make a subject grouping as we did for languages:

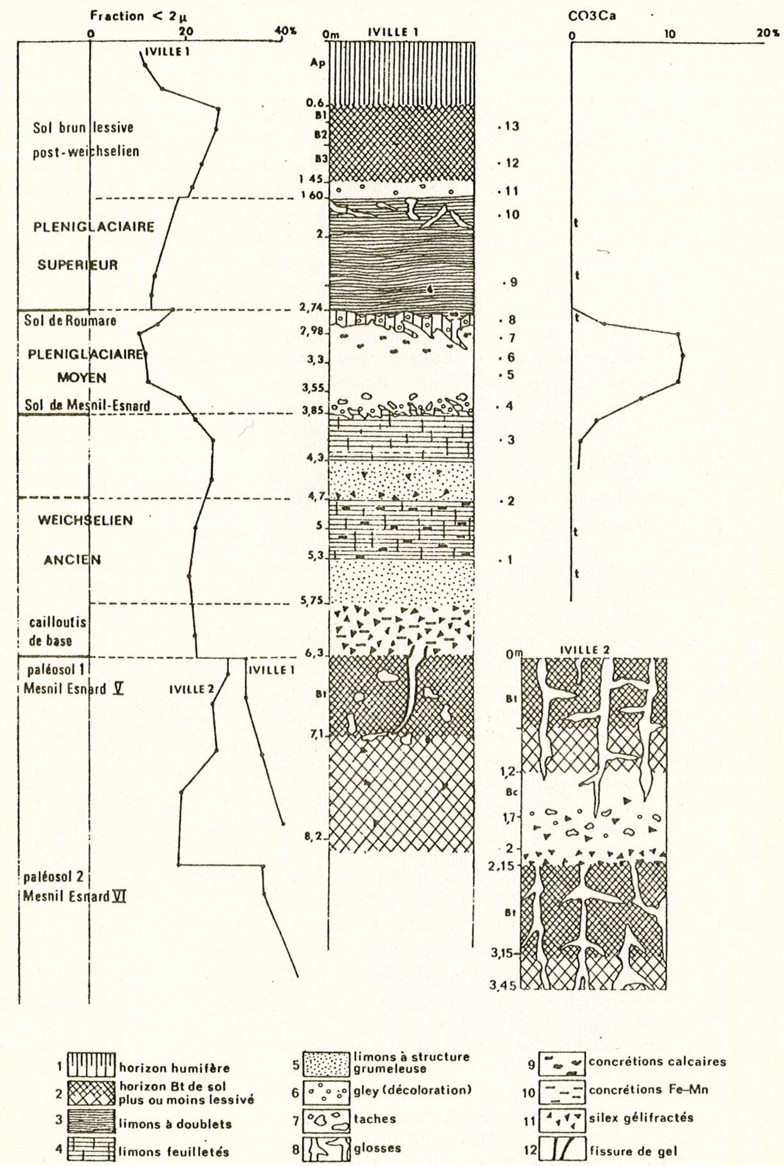
1) Engineering, mostly subsidence problems, soil stabilization, slopes.
2) Agriculture, soil conservation, irrigation.
3) Stratigraphy.
4) Loess material, mineralogy, particle production.
5) Mapping, local studies.
6) Geomorphology and distribution.
7) Archaeology, anthropology, history.

Where does all this material get published, and - perhaps more importantly - where does it get abstracted? Geotechnical Abstracts (see LL6) does a remarkably good job of abstracting the technical loess literature - in all languages. Agricultural Abstracts is effective for material with an agricultural bias or application (see LL7). Both Geotechnical and Agricultural Abstracts are available by computer access techniques, and both are good across the language range. For subjects falling within the very general heading of geology, the Bibliography and Index of Geology, published by the American Geological Institute, gives excellent coverage: loess appears in the subject index under the major heading 'sediments' and the minor heading 'sediments - clastic sediments' - a sub heading of which is loess. The BIG is complemented by Geo Abstracts, particularly part E which has a section 'Recent Aeolian Environments'. (to be continued........)

Les Loess d'Iville (Eure): Facièe régional de transition entre deux provinces loessiques majeures du Bassin de Paris. Y. DeWolf, M. Helluin, J.P. Lautridou and M. Vazart. Bull. Assoc. franc. Etude du Quaternaire 1981, No. 3-4, 159-172.

L'étude des séquences loessiques constitue, en dépit de hiatus indiscutables, le meilleur moyen d'investigation et donc de compréhension d'une période froide. Elle permet ainsi de discerner les changements dynamiques et climatiques tant sur le plan géographique que chronologique.

IVILLE
(feuille Elbeuf)



1. humic horizon 2. Bt horizon (brown forest soil) 3. limons à doublets 4. platy loam 5. clotted
7. spots 8. glosses 9. calcareous concretions 10. concretions Fe-Mn 11. gelifracted flints
6. gley
12. frost fissure

Fig. 2. –

III – CONCLUSIONS

L'étude de la séquence loessique d'Iville et sa comparaison avec les grandes coupes du Nord-Ouest et de l'Ouest du Bassin de Paris met en évidence l'existence d'une région de transition entre les deux paléo-provinces normande et séquanienne. Cette zone, qui s'incurve du Pays d'Ouche au Vexin, ne s'interrompt qu'au voisinage de la Seine.

L'étude micromorphologique montre l'importance de la dynamique froide pressentie sur le terrain : la quasi permanence des structures indique la présence d'eau ou de glace témoignant d'un paléoenvironnement qui n'est jamais très continental. Au cours du Weichsélien ancien, les mouvements de reptation perturbent l'agrégation pourtant typique d'un gel profond, permettant ainsi de mettre en doute l'existence d'un pergélisol. Pour l'un d'entre nous (M.V.), la présence de pergélisol n'est pas démontrée à Iville. Nous n'avons pas retrouvé les grandes fentes en coin existant au Nord à Mesnil-Esnard (au niveau du Sol éponyme), et à Glos (au Sud-Ouest) : base du Sol de Roumare (Lautridou *et al.*, 1981 b). En raison de la découverte de ces fentes de glace dans ces carrières, la proximité d'un pergélisol (peut-être discontinu) paraît cependant probable à l'un d'entre nous (J.P.L.). Enfin, on peut préciser l'évolution hydromorphe des limons « interstadiaires ». P. Haesaerts et B. Van Vliet (1981) ont décrit sur la coupe d'Harmignies (Belgique) des pseudogleys de toundra qui présentent des caractères communs. Mais la formation de ces sols, en relation avec un engorgement temporaire résultant du gel saisonnier, est également liée à la présence de matière organique. Ils signalent qu'ils s'observent préférentiellement dans la partie supérieure des dépôts ou d'horizons humifères, absents à Iville, mais présents à Mesnil-Esnard et à Glos.

Au point de vue stratigraphique, outre la confirmation d'une belle séquence weichsélienne, il faut insister sur l'importance des paléosols rougeâtres de base dont nous pouvons montrer dans la région rouennaise et elbeuvienne l'âge très ancien (début Pléistocène moyen). Vers le Centre et l'Est du Bassin Parisien, ils sont parfois très proches de la surface (comme au Tillet) et difficilement datables : les données d'Iville, complétant celles de Mesnil-Esnard et de Saint-Pierre, permettent d'intégrer ces paléosols isolés dans une belle séquence pédostratigraphique.

ABSTRACT

THE LOESS FROM IVILLE (EURE). TRANSITIONAL FACIES BETWEEN TWO MAJOR LOESSIC PROVINCES OF THE PARIS BASIN.

The loess section of Iville (Eure-Normandy) proves the existence of a transitional zone during the Weichselian, between the norman loessic province characterized by the "limons à doublets" and the sequanian loessic province with calcareous loess. In this zone of transition, the facies indicating an oceanic climate, cold and rather wet, fades progessively, and, inversely the characteristics of a cold and dry region appear.

Loess and Quaternary Geology 1976-80. Wang Yong-yan and the Loess Research Section, Department of Geology, Northwest University, Xian, China. pp.137 plus 39 plates.

This report of five years of loess research covers a wide range of topics; the papers are in Chinese but there are adequate abstracts in English. The 39 plates include some interesting SEM pictures - which will be featured in LL10; here we concentrate on vertebrate palaeontology - with a little stratigraphy to suit the chronological theme of LL9.

图版 XXI

洛川大角鹿 *Megaloceros lochuanensis* (sp. nov.) 头骨带完整左角及右角眉枝（62 LM 015）

1a. 前视 约×1/7 1b. 左侧视 约×1/8 1c. 头骨腹面视 约×1/3.5

记洛川大角鹿（新种）

MEGALOCEROS LOCHUANENSIS (SP. NOV.)

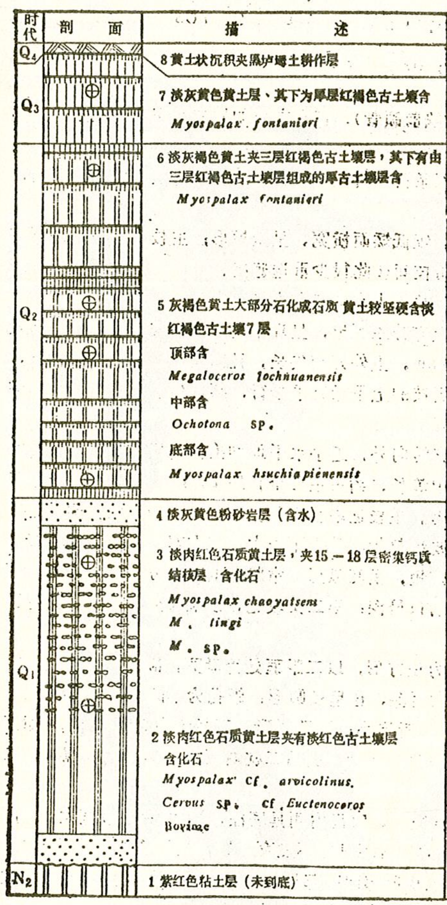


图 8—1 陕西洛川黑木沟黄土剖面化石层位示意图

附：陕西洛川黑木沟黄土剖面中其他哺乳类化石

提 要

陕西洛川黑木沟有发育完好的黄土剖面。各黄土层中几乎都产有哺乳类化石，找到者以鼢鼠为主。中更新统中部的洛川大角鹿（*Megaloceros lochuanensis*）是一新种，其主要构造特征介于扁角大角鹿及河套大角鹿之间。

西北大学地质系黄土科研组，1962年夏在陕西洛川县城郊黑木沟工作时，曾在该沟内发育相当完好的黄土剖面中，找到一些哺乳类化石。其名称如下，化石层位见插图（图 8—1）。

Myospalax cf. *arvicolinus* Nehring

M. tingi Young

M. chaoyatseni Teilhard et Young

M. hsuchiapineniss T. et Y.

M. fontanieri Milne-Edwards

Ochotona sp.

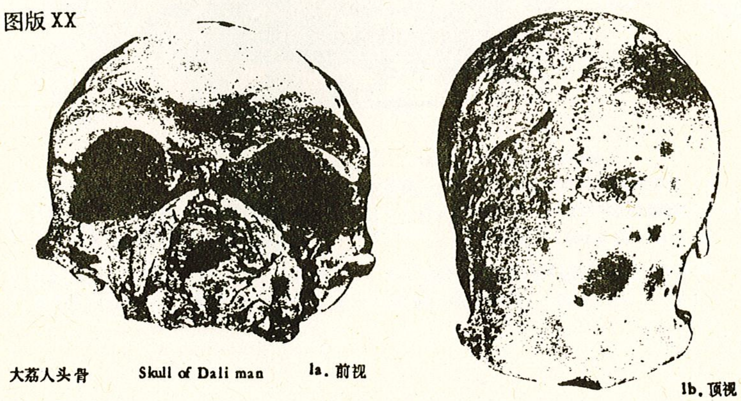
PRELIMINARY STUDY ON PALEOMAGNETIC STRATIGRPHY OF LOESS IN THE MIDDLE REACHES OF THE YELLOW REVER

(Abstract)

On the basis of paleomagnetic measurement of loess in the middle reaches of the Yellow River we obtained the following geological times and ages which are given only for discussion and refrence.

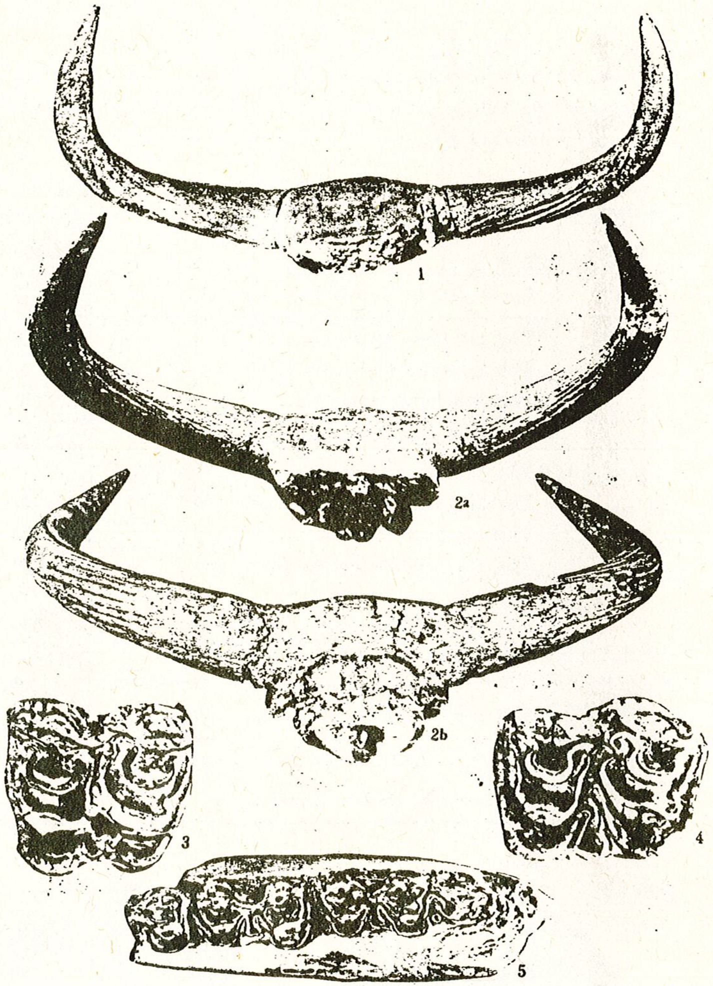
Geological time	Strata	Ages (1,000 yrs.)
Q_4	Loess deposit and black loam beneath it	0—6
Q_3	The 1st loess stratum	8—35
	The 1st reddish brown fossil soil	30—60
	The 2nd loess stratum	60—100
Q_2	The 2nd reddish brown fossil soil	100-110
	The 3rd loess stratum	110-131
	The 3rd reddish brown fossil soil	131-140
	The 4th loess stratum	140-165
	The 4th reddish brown fossil soil	165-174
	The 5th loess stratum	174-197
	The 5th reddish brown fossil soil	180-210
	The top of loess stratum beneath the 7th reddish brown fossil soil	400
	The top of the lowest loessial silt	700
Q_1	Well cemented reddish loessial strata cotaining Jaramillo normal event	700-1,200(?)

图版 XX



大荔人头骨 Skull of Dali man 1a. 前视 1b. 顶视

图版 XXXVI



原始牛 *Bos primigenius*

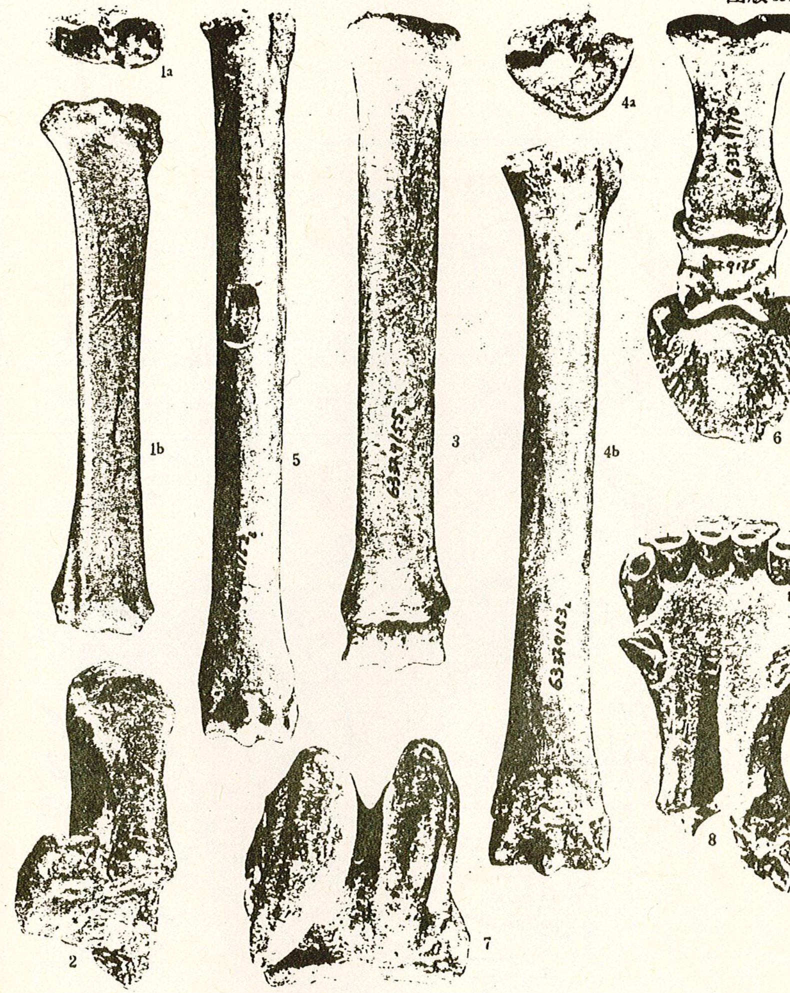
1．带顶骨的完整牛角角心（63环101）前视 ×1／10

2．带顶骨的完整牛角角心（63环103）×1／10　　2a 前视　　2b 后视

3．左M^2（63环146）冠面视 ×1　　4．左M^2（63环148）冠面视 ×1

5．左M_{1-3}（63环141）冠面视 ×1／1.5

图版 XXV



野马 *Equus przewalskyi*

1．右桡骨（63环9201）．×1／3　　1a．近端关节面视　　1b．前视

2．左跟骨（63环9152）前内侧视 略<×1／2　　3．右第三掌骨（63环9155）前视 ×1／2

4．左第三蹠骨（63环9153）×1／2　　4a．近端关节面　　4b．前视

野驴 *E. hemionus*

5．左第三蹠骨（63环8179）前视 ×1／2　　6．第1－3指(趾)骨 前视 ×1／2

7．右距骨（63环8180）前视 约×1　　8．下颌骨前段（63环1861）上面视 约×1／1.5

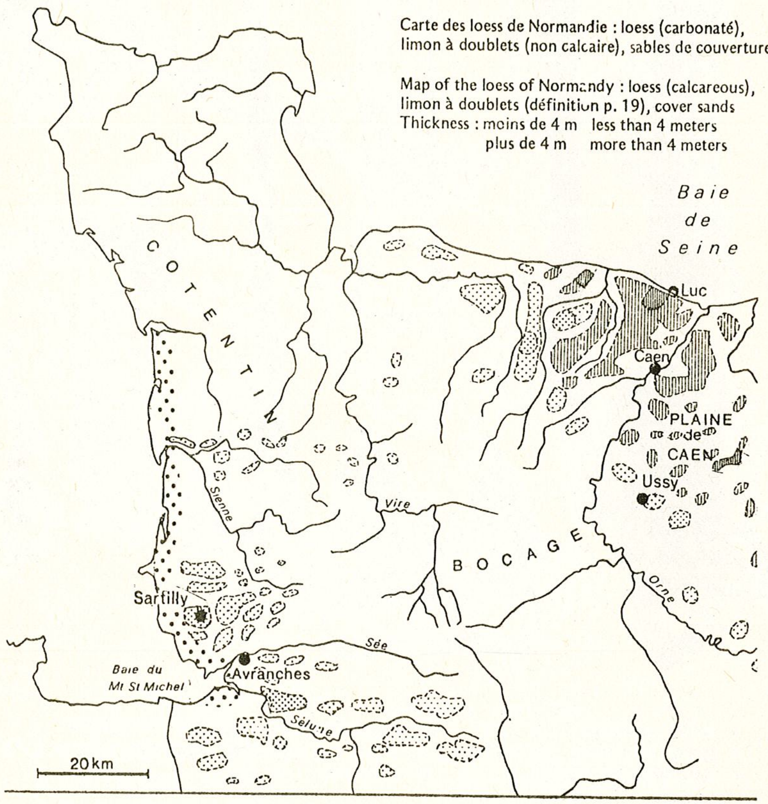
The Quaternary of Normandy. J.P. Lautridou and 35 others. Guide-book of the QRA Normandy meeting (May, 1982) and the IGCP 24 Normandy meeting (September, 1982). CNRS Centre de Geomorphologie Caen Bulletin 26 pp.88, 1982.

d'après COUTARD, DEWOLF, HELLUIN

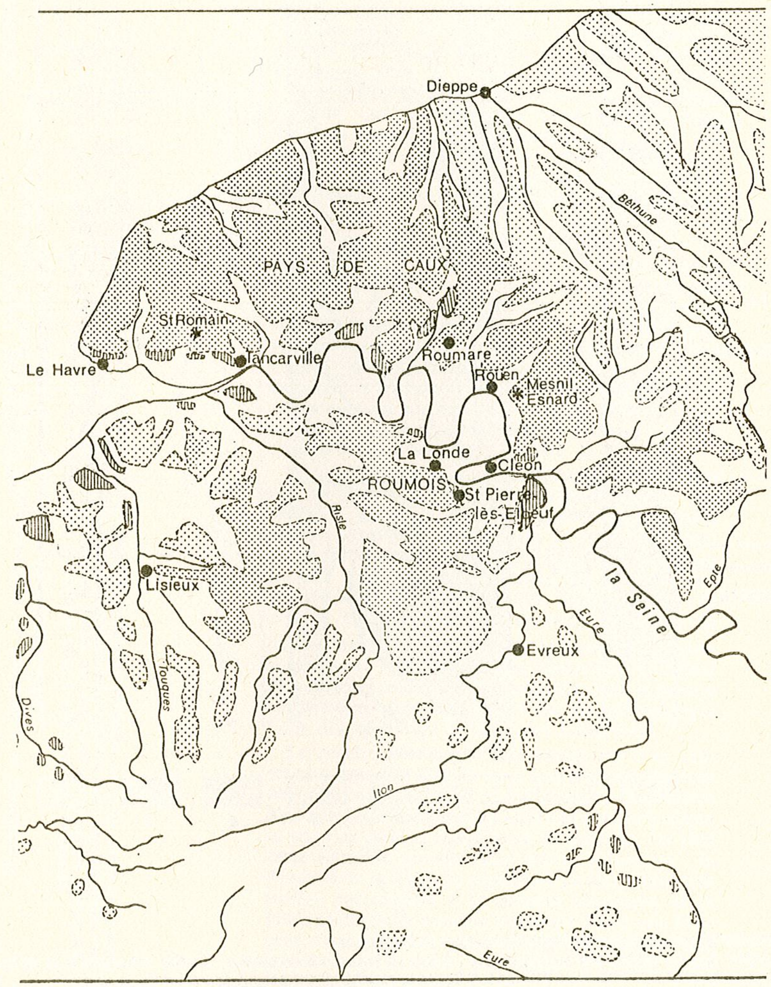
LAUTRIDOU, OZOUF, PELLERIN

Carte des loess de Normandie : loess (carbonaté), limon à doublets (non calcaire), sables de couverture.

Map of the loess of Normandy : loess (calcareous), limon à doublets (définition p. 19), cover sands
Thickness : moins de 4 m less than 4 meters
plus de 4 m more than 4 meters

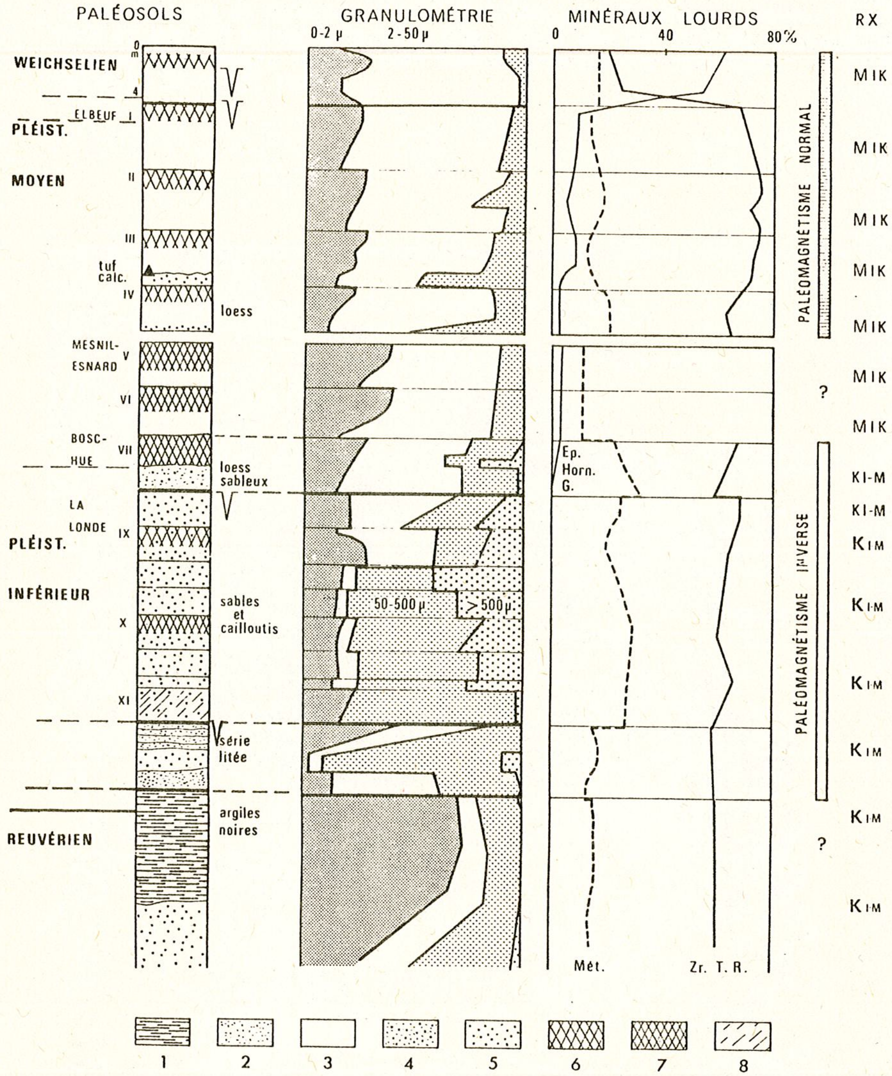


Loess | moins de 4m
| plus de 4m



Limon à doublets | moins de 4m
| plus de 4m

Sable éolien | moins de 4m



Lithostratigraphie et chronostratigraphie des loess de Normandie :
1 - argile lacustre reuvérienne et prétiglienne - 2 Silt - 3 loess - 4 loess sableux - 5 sable - 6 horizon B de sol brun lessivé ou lessivé (Elbeuf IV) - 7 horizon B de sol très lessivé et rubéfié - 8 Sol de couleur violacé (lie-de-vin).

Lithostratigraphy and chronostratigraphy of the norman loess.
1 lacustrine-clay : Reuverian and Pre-Tiglian - 2 Silt - 3 Loess - 4 Sandy loess - 5 Sand - 6 Bt horizon of brow forest soil («brun lessivé») or of a leached soil («lessivé») - 7 B horizon of intensivly leached and rubefied soil - 8 «Violet» soil.

J.P.L, 1981

Préliminaire à une synthèse sur les variations sédimentologiques des loess de la France du Nord-Ouest dans leur cadre stratigraphique et paléogéographique. M. Jamagne, J.P. Lautridou and J. Somme. Bull. Soc. géol. France 1981, 23, No. 2, 143-147.

Preliminary to a synthesis on sedimentological changes of loess in North-Western France with reference to stratigraphy and palaeogeography

Abstract. — The loess have a large extension in North-Western France. Their homogeneous sedimentological features are particularly related to the grain size and induce relatively constant geotechnical characters. Nevertheless exist detailed variations as a result from the facies changes of the loess and paleosoils. That changes must be considered in taking account of local and regional lateral variations which are explained by palaeogeographical and stratigraphical conditions of the Middle and Upper Pleistocene.

Parmi les types de lœss, le *lœss typique* est à distinguer nettement. Il se définit comme un limon pur caractérisé par une texture dominée par la fraction 30-63 microns, une structure finement poreuse, sans litage apparent, une couleur jaunâtre à brun-jaunâtre, la présence fréquente de $CaCO_3$ à l'état diffus. Ce dernier caractère permet d'ailleurs d'établir une subdivision à l'intérieur des lœss, l'absence de carbonate étant originelle ou due à une décalcification postérieure au dépôt ; cette subdivision peut avoir une signification géographique (ex : Normandie) ou au contraire être aléatoire (ex : Nord).

Les lœss non typiques se distinguent selon les variations de la texture et de la structure. Dans le groupe des lœss lités se place notamment le type non carbonaté des *limons à doublets*, caractérisé par la fine alternance de lits brunâtres et jaunâtres plus ou moins argileux. Les formations limoneuses litées peuvent incorporer des éléments de substrat (sables, silex, débris rocheux). La teneur en argile (moins de 2 microns) est un important critère distinctif pour la définition des paléosols (Bt) et des lœss argileux dont la teneur en argile dépasse 25 %.

Si les types de lœss se différencient en fonction des variations de la composition texturale, des éléments grossiers qui leur sont éventuellement associés stratigraphiquement et de leurs caractères structuraux sédimentaires et pédologiques, le faciès de leur courbe granulométrique, qui présente des caractéristiques générales très constantes sur de longues distances, est déjà un critère distinctif de reconnaissance. Cette donnée, apparue dès l'après-guerre, mais précisée par les recherches détaillées plus récentes, doit aussi être rappelée dans la mesure où l'analyse granulométrique est en géotechnique l'une des approches initiales des formations.

La courbe granulométrique cumulative d'un lœss est une sigmoïde (fig. 2) avec une branche médiane très redressée entre 10 et 50 microns, indicatrice d'un très bon classement du sédiment dont la médiane se situe en général entre 20 et 30 microns. De plus cette sigmoïde possède deux autres caractères : la dissymétrie, la branche supérieure (sables) étant très limitée par rapport à la branche inférieure, et la faible pente de la branche inférieure due à une forte proportion (parfois plus de 50 %) d'argile fine (moins de 0,2 microns) par rapport à l'argile totale [Lautridou, 1979].

LL9: April 1983 : Contents

lc.左侧视

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