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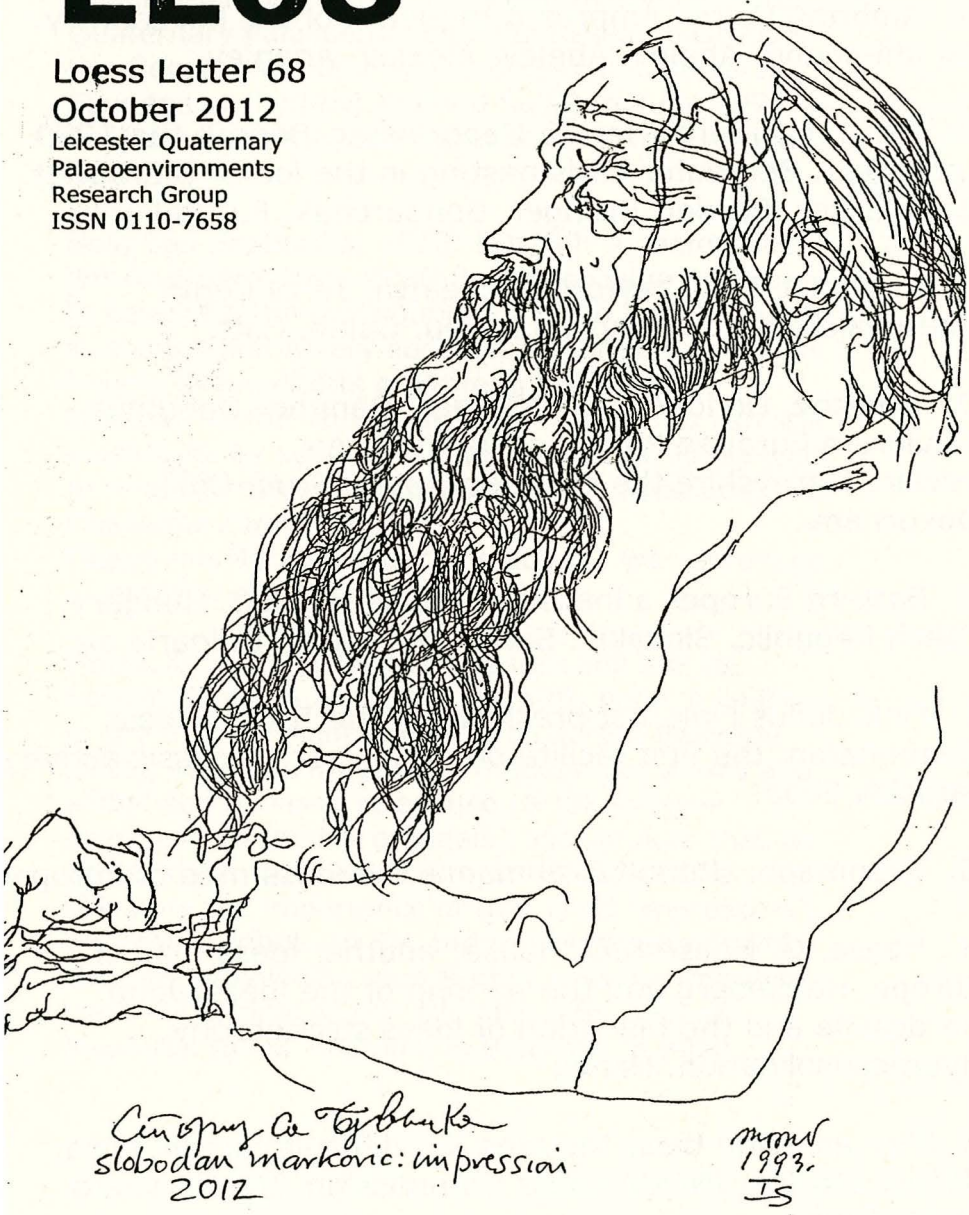

summer monsoon strength. This Pliocene climate changes in East Asia are therefore unlikely to be a response to Plateau uplift. On the contrary, our results give support to the view that ongoing global cooling could have weakened the summer monsoon in East Asia.

LATE QUATERNARY LOESS RECORDS IN EASTERN KAZAKHSTAN

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The Kazakhstan loess represents a significant, although still little known source of terrestrial palaeoclimate proxies in the continental Eurasia linking the East European, Chinese and Central Asian loess provinces. Aeolian (silty and sandy) deposits in the lowland areas along the Southern Altai and the Rudno Altai Foothills of East Kazakhstan (the Bukhtarma Basin) document major Pleistocene (interglacial / glacial and interstadial / stadial) climatic shifts with stages of massive sediment accumulations interspersed by stages of former surface stabilization with formation of variably developed palaeosols. The regional diversity of the Quaternary atmospheric circulation dynamics and the related near-surface clastic sediment flows is significantly pre-disposed by the local topography, with spectacular, up to 300 m-high sand dune fields in the adjacent Zaisan Basin contrasting the relatively minor silty blanket over the NW part of the study area. Thickness of the regional loess cover reaches 5-20 m what is significantly less then on the northern side of the (Russian) Altai with up to 150 m of loess deposits. A spatial discontinuity and local loess preservation in East Kazakhstan illustrates a complex Quaternary geological history with intensive past and present erosional processes.

The presently most continuous reference loess section Izkutty on the northern slopes of the Kalbinskiy Range (1380 m) shows the cyclic and well-sorted aeolian sediment deposition with several horizons of buried chernozemic and brunisolic palaeosols (the MIS 5 and 3 PKs) corresponding to open parkland-steppe and mixed taiga forest, respectively. The fossil soils bear signs of some cryogenic distortions, which are less prominent than those observed in the northern Altai loess formations, suggesting reduced Pleistocene permafrost activities than in southern Siberia. A progressive sediment accumulation indicates a pronounced aridization and an increased areal aeolian activity along the SW margin of the Altai during the Last Glacial. Contextual magnetic and non-magnetic proxy data correlate well with the northern Altai Late Pleistocene loess stratigraphic sequences and the enclosed pedocomplexes matched by the global climate records encompassing MIS 5-1 (i.e., the time interval of the last 130 ka). In spite of the close geographic distance from the principal loess area of SW Siberia (centred on the North Altai Plains and the Ob River Plateau), the East Kazakhstan loess deposits evidently represent a separate geological entity governed by the regional climate regime and wind-direction patterns within the transitional zone affected by the Siberian, Central Asian and NW Chinese atmospheric circulation. The local loess records illustrate a diversity of formation and pedogenic modification of air-born silty deposits also documented by the "Chinese" magnetic susceptibility trends with enhanced MS in soils in contrast to the Siberian loess-palaeosol sequences on the northern side of the Altai Mountains with uniform peaks of LF MS in loess units. Partly "mixed" MS signals found in accretional pedogenic horizons make the situation more complex. Differenees in the specific parent material mineralogy in conjunction with the regional Quaternary climate regimes and specific sediment weathering processes are assumed to be the principal factors beyond the MS variations. Further investigations are in progress.

HUMIDITY CHANGE IN QUATERNARY OF NORTHERN ASIA

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The great amount of paleoclimate data collected through the recent decade shows that the loess-soil sequences in southern West Siberia, the structure of Late Glacial and Late Holocene eolian sands, the level change of closed lakes offer the most complete records of Quaternary humidity changes in Northern Asia. The Siberian loess-soil sequence stores record of long- and short-period changes of paleoclimates. The structure of pedocomplexes in the West Siberian loess-soil sequence well reflect the structure of global odd warm stages consisting of closely spaced warm events interfered with brief cold intervals. Pleistocene warm and wet periods corresponded to soil formation in conditions of weak air circulation. Cold times were associated with climate drying and more intense air transport of dust. The loess deposition in the Siberia was accompanied by the formation of large deflation surfaces and closed deflation basins in an environment of cold deserts. Spectral analysis of frequency-dependent magnetic susceptibility time series revealed a periodicity corresponding to the orbital cycles of eccentricity (100-kyr cycles), obliquity (40-kyr cycles), and precession (23-kyr cycles). Interregional correlation of climatostratigraphic horizon of the full Pleistocene loess-soil sequence of Siberia with coeval units loess regions of Asia was established synchronism of arid and humid stages both in zone of west-to-east motion of the atmosphere and in the monsoon circulation zone. Short-period

climate variations were investigated in sedimentary sections of closed lakes and in sediments of Late Glacial and Late Holocene eolian landforms in West Siberia. The Late Holocene dunes are composed of eolian sands with buried soils and are overlain by an immature modern soil. They are localized along the eastern sides of lakes and reach 10 m high. The dry and cold intervals were associated with eolian processes, fall of lake levels, deflation, and accumulation of dunes, while the relatively wet and warm stages were the times of soil formation. Radiocarbon ages and correlation with tree-ring data indicate that the subaerial deposition represents a 200-300 year quasi-periodicity of dry and cold cycles alternating with periods of wet climate at air temperatures about those at present.

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CHINA: MATERIALS FOR A LOESS LANDSCAPE

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For various reasons it was thought that material for the great Chinese loess deposits originated in the deserts of the north- and the idea of a 'desert' origin was widely accepted.

But Butler, in Australia in 1956, cast doubt on the actual existence of desert loess and this led to considerable discussion. One facet of the argument (advocated by Smalley & Vita-Finzi in 1968) proposed that there were no desert specific mechanisms which could produce the large amounts of loess material observed. Applying this idea to Chinese loess was particularly appropriate because of the huge extent and thickness of the deposits. How was this vast amount of loess material produced?

Smalley & Krinsley in 1978 proposed a sequence of events that led to the formation of the Chinese loess. This required that the loess be mountain loess (eventually defined by Smalley & Derbyshire 1990) - the material was made in the mountains to the west; and the Yellow River had a role to play in bringing it to the loess deposit region; and that loess material in desert regions was in a state of transit.

The 1978 model has been proved to be true by a whole sequence of ingenious and intricate experiments. In particular the analysis of zircons has produced data allowing particle sources to be identified. The zircon particle proves to be a key component of the loess landscape; but the mode particle remains the silt-sized quartz particle.

The problem running in parallel with the 'how did the material form?' question is the puzzle of why loess material has such a restricted size range. What controls operate on the formation of loess material? In the quartz particles it appears that

18

TIME SCALE AND ASTRONOMICAL IMPRINT OF SERBIAN LOESS DEPOSITS

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Long continuous terrestrial sequences have been used to construct time scales in order to study paleoclimate trends and evolution. In order to construct reliable time scale it is necessary to have undisturbed and continuous record. Time scales of loess paleosol sequences were constructed for deposits on Chinese Loess Plateau using different approaches and were mainly used to study the evolution of East Asian Monsoon. Sequences that are as complete and as continuous as the ones on Chinese Loess Plateau are rare in Europe. On the other hand, loess in Vojvodina region (Northern Serbia) is regarded as one of the thickest and most complete in Europe. Recent study (Marković et al., 2011) showed that loess in Vojvodina spans the last million years.

Based on the interprofile correlation between two most important loess paleosol sequences, Stari Slankamen and Titel Loess Plateau synthetic profile was formed. Newly developed time scale was obtained by tuning the magnetic susceptibility record to insolation values (Berger and Loutre, 1991). The resulting magnetic susceptibility time scale shows a close similarity to the sequences on Chinese Loess Plateau and to the orbital tuned δO^{18}.

The time scale indicates much older age for the Bruhnes Matuyama boundary, recorded in loess unit V-L9, which is in good agreement with the recent results obtained during paleomagnetic measurements (Marković et al., 2011). The lock in effect is much greater than in Chinese loess sequences, which is probably due to the strong root channels, which penetrate several meters down through V-S8 into V-L9 and probably influence the magnetic properties of the sediments.

Spectral and wavelet analysis of tuned magnetic susceptibility record reveal the presence of typical orbital frequencies, corresponding to eccentricity, obliquity and precession. Eccentricity frequencies of solar irradiance are dominant, while relatively short time orbital cycles of obliquity and precession are week. This can be attributed to the time frame of the investigated profile, since the lower part of the sequence can be assigned to the so called 41 ky world. Wavelet analysis reveals the presence of Mid Pleistocene Transition, indicating that the eccentricity parameter becomes dominant from 650 ky.

19