Problems of Loess Chronology

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ABSTRACT: Loess as a typically subaerial, loess deposit has long been regarded a Pleistocene sediment and its date of formation has been put to ca 600 ka BP. Recently, the beginning of the Pleistocene is identified in the official concord reached – at 1.6 Ma BP, while not infrequently others propose 2.4 Ma BP. Until the fifties the whole loess (loess-paleosol-sand) sequence could be referred into the ‘shorter Pleistocene’ period, which – according to the climatic calendar by Milankovitch – consisted of nine cold and eight warm intervals. Some supporters of the ‘longer Pleistocene’ chronology hold that the beginning of loess formation can be put as far back as 1.6 –2.4 Ma BP. Loess formation intervals are usually correlated with the cold stages (nos 2, 4, 6 etc.) of the Emiliani oxygen isotope timescale, while soil formation is believed to correspond to the warm stages (nos 1, 3, 5, 7 etc.). The typical loess, i.e. loess proper, are not older than stage no 23 (Jaramillo event – 0.96 Ma BP). Previous to this date climatic conditions had not generally favoured loess formation and paleosols formed one above the other with clay, loam or carbonate intercalations.

Introduction

One of the pioneers in applying the Pleistocene chronological scheme by Milankovitch to make chronostratigraphic subdivisions of loess profiles were E. Scherf (1936) and Gy. Bacsák (1942), who presented this on the example of the Paks brickyard. Scherf identified 10 buried soils and at least two eroded and truncated soils at Paks (Fig 1). He referred loess horizons into glacials and soil horizons – in accordance with their genetic types – to interglacials. He regarded Milankovitch’s scheme suitable for correlating the paleosols and loess pockets with the sequence of ‘cold’ and ‘warm’ stages (Fig 1).

According to Bacsák (1942), over the last 600,000 years climates favouring soil formation occurred on nine occasions; two of them allowed forest-steppe or dry steppe soil formation and seven forest soil formations in Central Europe (Tab 1). His calculations were supported by the field observations of those times (made chiefly in the Paks profile). Then only the most striking paleosols of the loess profiles were recognized.

The application of the Pleistocene climatic calendar elaborated in detail by Milankovitch (1941) and then by Bacsák (1942) for the chronological study of loess – after some pioneering work (Ádám et al. 1954; Kriván 1953; Miháltzy 1953) – was pushed into the background since the second half of the fifties.

The International Union for Quaternary Research (INQUA) formed a committee at its 1961 Warsaw congress from a wide circle of experts in loess stratigraphy to establish a chronology of European loess and this objective was broadened in 1969 to include the stratigraphic correlation of loess regions all over the world.

During the two decades of the sixties and seventies the Committee has studied many key profiles in the major loess regions of Europe, North-America and New Zealand and evaluated them with help from local experts.

However, world-wide exchange of experience has only become possible since the early eighties, when the opportunity opened up to study the widest-spread and thickest loess mantles of the Earth on the spot in Soviet
Tab 1  Provisional correlation between Pleistocene climatic chronology, isotope stages and loess stratigraphy (compiled by Pécsi, M.)