ABSTRACT

Chernozem became the crucial soil for the beginnings of soil science through the work of Dokuchaev from 1883. Since then the genesis of chernozems in Central Europe has raised many questions among soil scientists, botanists and paleo-environmentalists. While in Eastern Europe chernozems have been described as zonal soils, that are typical for continental steppe and forest-steppe areas, there are areas in Central Europe which are predisposed by their climatic characteristics to the presence of woodlands. The goal of this dissertation is to enrich the discussion about the genesis of chernozems by restoring the environmental conditions that were prevalent during the formation of chernozem soils in Central Europe.

Chernozems are usually developed on loess with a very thick and dark organic surface which passes directly to a calcareous horizon. The organic matter underwent a polymerization in dependence on climate contrasts. However, in Central Europe, the climatic characteristics of the areas of chernozems are a bit different. These chernozems are supposed to have been formed under the climatic conditions that dominated Central Europe during the Late Glacial and the Early Holocene.

The climatic nuances may contribute to the explanation of the differences in distribution of chernozems ("drier") and luvisols ("more humide") at a regional level, but they are no help at a local level with the same environmental conditions where the boundaries between chernozems and luvisols are very sharp. There is a theory about their persistence that considers the agriculture since the Neolithic being the reason for the fact that their progression to other types of soil was blocked. This theory would explain their distribution in the form of mosaic, alternating with luvisols and phaeozems.

This study is focused on questioning of the memory of soils and especially of their organic matter. Some soil organic matter has the ability to persist in soils for thousands of years. Such organic matter has a purely local origin. That is why it is possible to reconstruct the vegetation from the period of time of the formation of soils. There is qualitative near infrared spectroscopy (NIRS) applied for the analysis of the soil organic matter. This method is an innovative approach to the studying of the paleoenvironments of chernozems. This approach is accompanied by a anthracological study of some paleosols and of a micromorphological analysis of a catena chernozem - luvisol on a very local scale (300 m).

The NIRS analysis has proved that some chernozems developed under grassland. Other chernozems have a recent forest history, but they had also existed under grassland vegetation before. There were found some chernozems with a source of heterogeneous organic material. The charcoals studies of paleochernozems of the Pleistocene and of the Holocene have revealed the presence of woods. The micromorphological analysis of a catena between chernozem and luvisol has shown a chernozem which developed from a luvisol. That contrasts with the usual models of the degradation of chernozems into luvisols.

This dissertation confirms that the vegetation cover of chernozems can be both: grassland or woodland. Certainly, chernozems also developed under forest during a period of time. This result is inconsistent with the prevailing hypothesis that claims chernozems develop and preserve exclusively under steppe.

Keywords: chernozem, buried soils, paleoenvironment, near-infrared spectroscopy (NIRS), Central Europe, soil memory, pedogenesis, luvisol