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‘Combined reflectance stratigraphy’ - subdivision of loess successions by diffuse reflectance spectrometry (DRS)

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The different varieties of loess (and intercalated paleosol layers) together constitute one of the most widespread terrestrial sediments, which was deposited, altered, and redeposited in the course of the changing climatic conditions of the Pleistocene. To reveal more information about Pleistocene climate cycles and/or environments the detailed lithostratigraphical subdivision and classification of the loess variations and paleosols are necessary. Beside the numerous method such as various field measurements, semi-quantitative tests and laboratory investigations, diffuse reflectance spectroscopy (DRS) is one of the well applied method on loess/paleosol sequences.

Generally, DRS has been used to separate the detrital and pedogenic mineral component of the loess sections by the hematite/goethite ratio. DRS also has been applied as a joint method of various environmental magnetic investigations such as magnetic susceptibility- and isothermal remanent magnetization measurements. In our study the so-called “combined reflectance stratigraphy method” were developed.

At First, complex mathematical method was applied to compare the results of the spectral reflectance measurements. One of the most preferred multivariate methods is cluster analysis. Its scope is to group and compare the loess variations and paleosol based on the similarity and common properties of their reflectance curves.

In the Second, beside the basic subdivision of the profiles by the different reflectance curves of the layers, the most characteristic wavelength section of the reflectance curve was determined. This sections played the most important role during the classification of the different materials of the section.

The reflectance value of individual samples, belonged to the characteristic wavelength were depicted in the function of depth and well correlated with other proxies like grain size distribution and magnetic susceptibility data.

The results of the correlation showed the significance of the “combined reflectance stratigraphy” as a stratigraphical method and as an environmental proxy also.

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