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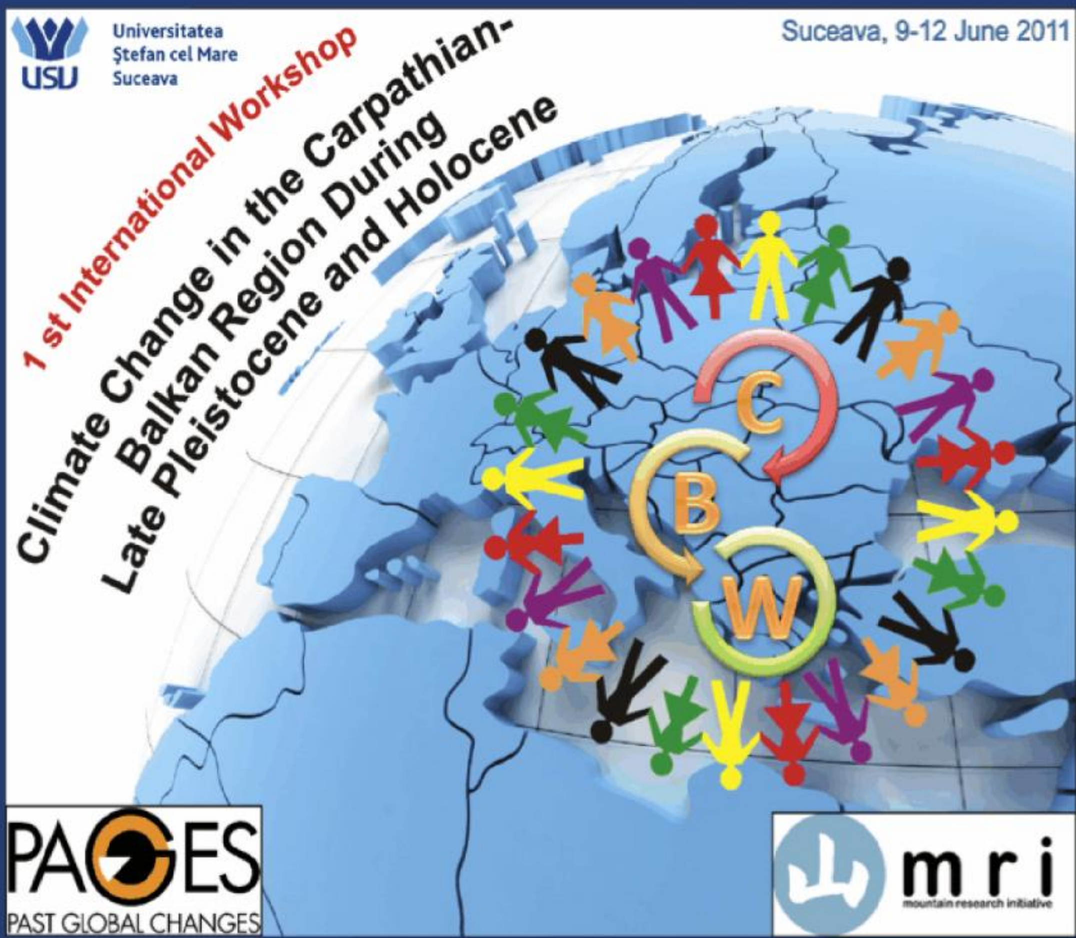

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Paleoclimatic signal of the Dobrogea loess-paleosol sections (Romania)

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The investigated area is located in Dobrogea (SE Romania). One site is near the village of Mircea Vodă; the section is ~26 m thick; it comprises six well-developed palaeosols and intercalated loess layers. The second studied site is near Costinesti village, on the Black Sea coast; the section is 12.7 m thick; it comprises five well-developed palaeosols and intercalated loess layers. Samples were collected at 5-10 cm interval. For each sample granulometry was measured with a Horiba laser instrument (LA950) and magnetic susceptibility was measured on a MS2B Bartington susceptibility meter. Throughout the entire sections, the airborne dust (silt and fine sand above 16 μm) is present in large amount (generally over 50%). The pedogenic processes which involve hydrolysis of silicate minerals leading to formation of new clay-sized minerals (< 5 μm) can also be seen throughout the entire section with values always above 10% in the loess layers and values above 20% in the paleosol layers, suggesting that even during loess deposition, weak pedogenesis was present. Fine silt, coarse silt and fine sand material are present in substantial amount in the loess layers (above 10%, above 30% and above 10% respectively). This shows that the wind transportation competency was quite high at the time of loess deposition. Most of the grain-size distributions in the loess layers are bi-modal or even three-modal distribution, reflecting multiple sources of the clastic material. The studied loess sections are of Chinese loess type with a significant enhancement of magnetic susceptibility in paleosol horizons and low values in loess units. The new results from the Costiști section confirm change in the climate during the last two interglaciar stages (paleosols S1 and S2) with respect to the previous ones (paleosols S3, S4 and S5). This transition toward a dryer interglacial is reflected both in the amplitude of the magnetic susceptibility and the type of the paleosols.

Introduction. Most of the Romanian Plains and low hilly areas outside the Carpathian arc are covered with loess and loess-like deposits. The most complete and the thickest loess – paleosol sections can be found in the Danubian Plain and in the Dobrogea Plateau. Two sections (Fig. 1) have been studied in detail up to now: the Mostistea lake section situated in the eastern part of the Danubian plain (Panaiotu et al., 2001; Balescu et al., 2010; Vasiliniuc et al., 2010) and the Mircea Voda section situated the Dobrogea (Dobrudja) Plateau, at about 15 km from the Danube river (Buggle et al., 2009; Timar et al., 2010; Timar-Gabor et al., 2010; Balescu et al., 2010). The Romanian loess is of Chinese loess type with a significant enhancement of magnetic susceptibility in paleosol horizons and low values in loess units (Panaiotu et al., 2001, Buggle et al., 2009). Recent results using Infrared Stimulated Luminescence (IRSL) dating (Balescu et al., 2010) have proved without a doubt that the first three loess units both at the Mostistea section and the Mircea Voda section are deposited during MIS2-4, MIS6 and MIS 7. Detailed Optical Stimulated Luminescence (OSL) ages both for the Mircea Voda section (Timar et al., 2010) and the Mostistea section (Vasiliniuc et al., 2011) have shown that the deposition of L1 loess unit took place during Marine isotope stages 2-4. In this paper we present new results from two loess section from Dobrogea: Costinești and Mircea Voda (Fig. 1).

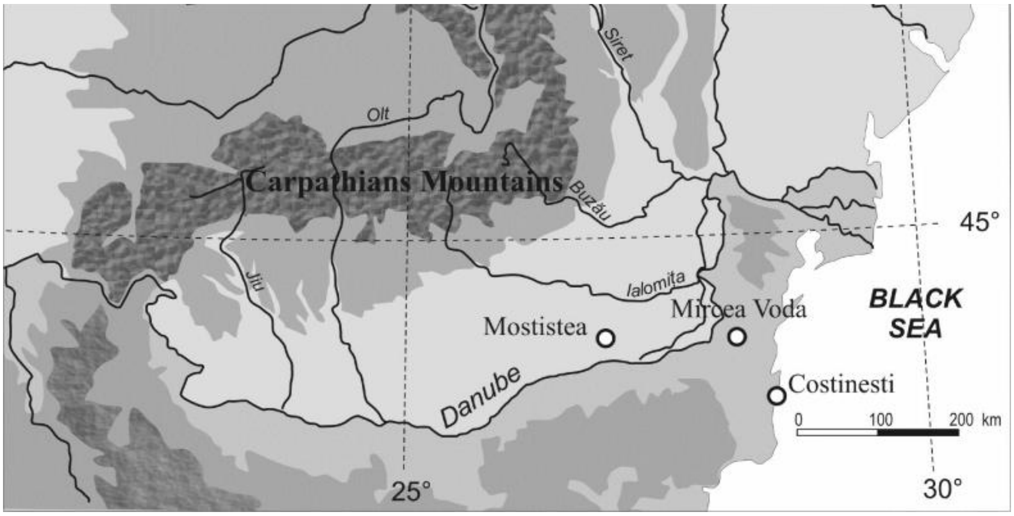

Fig. 1 Location of the studied loess sections.

Sampling and laboratory methods. The Costinesti loess section consists of 5 paleosols and intercalated loess layers. The total length of the section is around 12 m. The section was sampled at 5 cm interval. Mircea Voda loess section is approximately 26 m thick and consist of six well-developed palaeosols (S0-S5, with S0 representing the Holocene soil) and intercalated loess layers (L1-L5), with no apparent evidence of remarkable hiatuses. It was sampled at 10 cm interval. In laboratory we measured for each sample both the granulometry and the magnetic susceptibility. The treated samples (with H_2O for removal of organic matter; with HCl at pH 4 for removal of carbonates and dispersed with hexametaphosphate) were measured for grain size distributions with a Horiba laser instrument model LA950. Magnetic susceptibility was measured using a MS2B Bartington susceptibility meter. All measurements were performed at the University of Bucharest.

Results. Variations in the magnetic susceptibility are equivalent to the alternations of loess and palaeosol layers, with high magnetic susceptibility corresponding to weathered palaeosol layers and low magnetic susceptibility corresponding to the loess layers. The grain-size distribution is very consistent with the magnetic susceptibility variations – the pedogenic fraction (<5 μm) is concentrated in the layers exhibiting high magnetic susceptibility and the airborne fraction (>16 μm) is concentrated in the layers with lower susceptibility values (Fig. 2).
Throughout the entire section, the airborne dust (silt and fine sand above 16 μm) is present in large amount (generally over 50%). The pedogenic processes which involve hydrolysis of silicate minerals leading to formation of new clay-sized minerals (< 5 μm) can also be seen throughout the entire section with values always above 10% in the loess layers and values above 20% in the paleosol layers, suggesting that even during loess deposition, weak pedogenesis was present. Larger amount of clay-sized material was observed in lower part of the section. Fine silt, coarse silt and fine sand material are present in substantial amount in the loess layers (above 10%, above 30% and above 10% respectively). This shows that the wind transportation competency was quite high at the time of loess deposition. Most of the

grain-size distributions in the loess layers are bi-modal or even three-modal distribution, reflecting multiple sources of the clastic material.

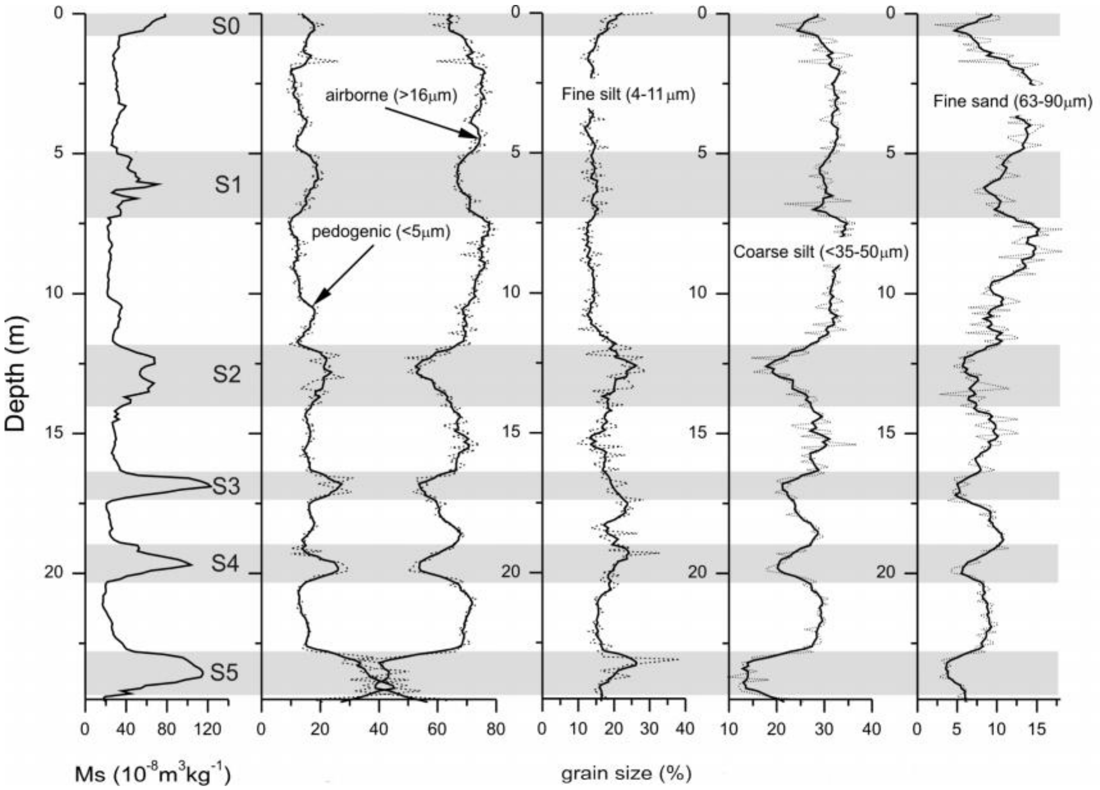

Fig. 2 Magnetic susceptibility (Ms) and granulometry for the Mircea Voda loess section. Paleosol are marked with gray boxes.

The coarse silt and fine sand material could have proximal source, while the fine and medium silt could have a distant source. Such bimodal sources have been also suggested by recent geochemical investigations on the loess section from Mircea Vodă (Buggle et al, 2008). They discussed about a local sedimentary source from the sand dunes fields along the lower Danube alluvium and a second source from the Ukrainian glaciofluvial deposits. We cannot confirm whether that the fine silt fraction originated from Ukrainian deposit, but certainly from a distal source where from was transported by long term suspension.

In figure 3 we present the correlation of studied Romanian loess section based on the magnetic susceptibility variations. The new results from the Costişti section confirm change in the climate during the last two interglaciar stages (paleosols S1 and S2) with respect to the previous ones (paleosols S3, S4 and S5). This transition toward a dryer interglacial is reflected both in the amplitude of the magnetic susceptibility and the type of the paleosols.

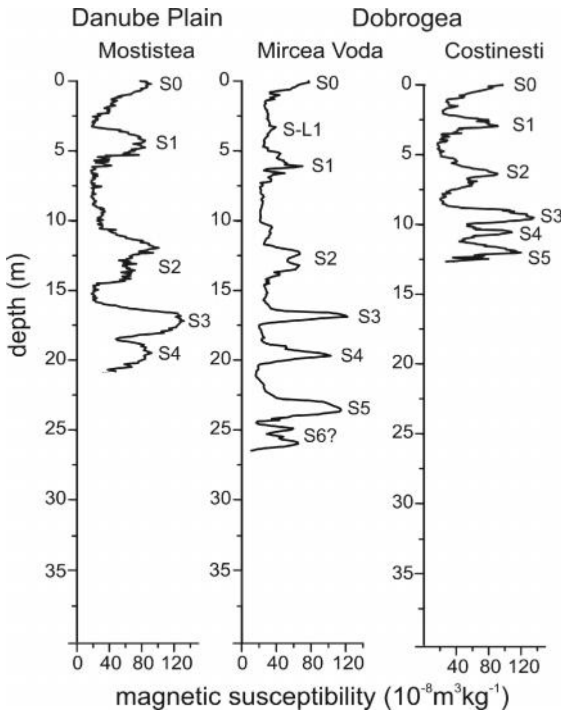

Fig. 3 Corelation of Romanian loess section based on magnetic susceptibility. Paleosols are marked with S (1-5) and S0 is the recent soil.

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