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New insights into the atmospheric dust dynamics in the Carpathian and Wallachian Basin during MIS 1-MIS 2

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Fine-grained windblown deposits, known as loess, in which fossil soils (palaeosols) are preserved, serve as excellent records of past climate. However, paleoclimate reconstruction studies on loess-palaeosol sequences (LPS) in Southeastern Europe have primarily focused on climate changes during the last one or two glacial-interglacial cycles. Surprisingly, little attention has been given to the climate of the current interglacial, the Holocene. This oversight may be attributed to the prevailing notion that, based on ice core and marine isotope records, the Holocene is considered a climatically stable period. Additionally, the scarcity of LPS with well-preserved Holocene loess has contributed to this lack of attention until now. Three recently discovered loess-palaeosol sequences in the Eastern Carpathian and the Wallachian Basins present fully preserved loess covering MIS 1-MIS 2 offering the potential to unveil new and detailed information about Holocene climate. In this study, we present initial results from two of these LPS: Kisiljevo (44°44'0'' N and 21°25'0'' E) in the Carpathian Basin, and Velika Vrbica (44°35'1.70"N, 22°43'15.97"E) in the Wallachian Basin. For both sequences, detailed optically stimulated luminescence (OSL) chronologies using 63-90 μm quartz have been constructed. Age models based on the OSL ages were constructed using the r.bacon software (Blaauw & Christen, 2011), following which dust accumulation rates (MAR) for the last approximately 30,000 years were calculated. The initial results from Kisiljevo reveal a significant loess accumulation during the Holocene, amounting to approximately 120 cm. The highest MARs were observed between 10 and 12 ka (10,000-8,000 BC) with a mean value of 148 g m^2 a^{-1}. A similar trend is evident at the Velika Vrbica LPS, where the average calculated MARs during the early Holocene (8 – 11.7 ka) were 189 g m^2 a^{-1}, showing a decreasing trend toward the later part of this period (3.1 – 8 ka) with average values reaching 132.1 m^2 a^{-1}. Interestingly, at this site, the mean MARs during Marine Isotope Stage 1 (MIS) were higher than during the cold, stadial MIS 2, where the recorded values averaged 177 g m^2 a^{-1}. These initial results suggest that the Holocene dust dynamics in this region was more variable than what generally accepted models suggest.

References: Blaauw & Christen (2011). Flexible paleoclimate age-depth models using an autoregressive gamma process. Bayesian Analysis, 6(3), 457–474.