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Tracing the Mediterranean climate influence over the central Balkans (southeast Europe) during the past 350 ka

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Knowledge of past climate variability based on the study of paleoclimate archives may help in better understanding the forcing mechanisms and extent of any future climate change. In some regions, such as Eastern Europe, loess-paleosol sequences (LPS) are one of the most important terrestrial archives of Quaternary paleoclimate and its spatial and temporal dynamics. Studies of LPS from the Middle and Lower Danube basins fundamentally improved understanding of the European Quaternary climate and environmental evolution.
The central Balkans (central Serbia) is situated in a transition zone between the temperate-continental climate zone to the north and Mediterranean climate to the south. Up to now this area has been poorly investigated concerning the paleoclimate evolution on a longer term, albeit this region is considered more sensitive to the relative influence associated to the Mediterranean climate influence than the Carpathian basin further north. To fill this gap we conducted a high-resolution multiproxy investigation on the Stalać LPS in the central Balkan (Serbia). Located at the southern limits of European loess distribution and within the Mediterranean climate influence, the Stalać section has potential for better understanding of past regional climate dynamics. We discuss grain-size (granulometric fractions, U-ratio), environmental magnetic (χ, χfd), geochemical (major and trace elements) and colour (L*, a*, b* values) data from the Stalać section in terms of switching sediment provenance sources modulated by past environmental conditions. We can show that the Carpathian Basin and central Balkans were influenced by different environmental conditions during past $\sim$350 ka. A general higher continentality of the climate during the late Pleistocene can be observed over the Stalać section and the Carpathian Basin, indicating that this trend is more than a regional feature. Our results indicate warmer and/or more humid last glacial cycles compared to previous. We argue that the observed trend can be the consequence of substantial melting of Greenland ice-sheets during MIS 5e (not suggested for the previous two interglacials), which led to overall climate change especially in winter precipitation causing a remarkable reduction of glaciated areas. Smaller ice sheets may intensify penetration of cyclones into the interior of the Balkans and thus precipitation. A better assessment of the central Balkan past climate and environmental dynamics demands a refined understanding of connections between the formation of the Stalać site and other paleoclimate archives from adjacent regions such as Carpathian Basin and long-lake records from the Balkans.