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The role of Polar Front dynamics in formation of the Serbian Loess

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Recent investigations of loess-paleosol sequences in Serbia provide detailed evidence of climatic and environmental changes during the last million years. The relative completeness and the pattern of preserved paleoclimatic signals indicates that these loess-paleosol sequences can be directly correlated across the Eurasian loess belt to the east Asian loess records. This comparison emphasizes the antiquity of the loess-paleosol sequences in Serbia and demonstrates the significance of the detailed and relatively complete palaeoclimatic record they contain, as well as the nature of the differences and similarities between these two records. This is crucial for the development of understanding long-term climatic and environmental evolution over the entirety of Eurasia.
Besides important information about general Eurasian continental climate and environmental variations, Serbian loess record can be regarded as a missing link for better understanding of Pleistocene paleoclimatic connections between European sub-polar and sub-tropical regions. Surprisingly, we discovered that our loess-paleosol sequences preserved unique information about the dynamics of distant North European and Alpine glaciers. The advance of European glaciers and loess formation is also controlled by Milanković's orbital forcing. The most important issue to a better understanding of loess provenance in this region could be the confirmation of whether specific undulations of the Polar Front and the corresponding circulation in Northern Serbia, such as prevailing winds from the second and fourth quadrants, may have led to its accumulation, similar to monsoons in Asia. Previously published models, which focused on the glacial-interglacial reciprocity of the Prevailing Westerlies and high pressure oscillations associated with changes in North European ice caps, were overly simplified and should be modified to include the greater influence of the Polar Front. Modern synoptical atmospheric circulation patterns as well as paleoclimatic records in Central and Western Mediterranean support our hypothesis that the observed dynamics reflects the long-term migration, seasonal duration and permanency of the Polar Front on a glacial-interglacial scale.