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Geochemical characterisation of a loess-like palaeosol sequences in Baikal Region

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Understanding the paleoenvironmental change is critical for testing the mechanisms of global and regional environmental change. Palaeosols and loess-like sediments are valuable archives for the reconstruction of the palaeoenvironment and the palaeoclimate. Numerous studies provided new insight in the Late Quaternary history of Eastern Siberia in recent years, but this region is still lacking a long-term and continuous archive to represent palaeoenvironmental changes. So far, long-term terrestrial archive has not been described in details for Baikal Region, as key region of Eastern Siberia. The majority of the paleoecological studies focus on sediments of Lake Baikal as well as small lake sediments and peat sections. The lacustrine and peat sediments have been studied intensively and at high resolution in the last decades.

The study is aimed to examine the loess-like palaeosol sequences of Baikal Region, in order to evaluate the potential of these sediments to contribute to the reconstruction of the Quaternary environmental and climatic history of the region. We specifically address to geochemical composition and grain size distribution. The geochemistry of loess from different regions can be highly variable, reflecting diverse dust sources. Moreover, selective removal of elements during weathering and pedogenesis changes the original input signal and thus allows estimating weathering intensity.

Loessial deposits in the region are the product of periglacial lithogenesis type. They are presented by the proluvial, deluvial, and alluvial geological-genetic complexes. The loess-like sediments are the sandy loams and loams, characterized by the great range of variations in geochemical composition and grain size distribution.

The relative concentrations of 25 elements were determined by using the standard laboratory procedures. Various analyses confirm and refine the basic stratigraphy established during field work. Almost all elements show distinct variations in their depth profiles, indicating changes in provenance and/or mineral weathering intensity (enrichment or depletion). We used the molar ratios of these elements to assess the weathering intensity of the minerals in the loess-like palaeosol sequences by calculating the CIA, which is a frequently used index for estimating the transformation of feldspars to clay minerals. Elemental indices or their ratios (e.g. K/Na, K/Ca, Ca/Sr or Ti/Zr) have been established and used successfully to assess changes in provenance and weathering. Geochemical results provide proxies for weathering intensity and changes in provenance. We conclude that the geochemical composition of the studied palaeosols reflects the "cold-warm" and "arid-humid" stratigraphy. Concerning future field trips and research in Baikal Region, further numeric dating control for the loess-like palaeosol sequences is highly aspired.