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Paleoclimate and dust source imprints on the geochemistry and mineral magnetic properties of late Pleistocene loess – paleosol sequences from lower Danube area

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Terrestrial records of Quaternary glacial history are represented by widespread sedimentary loess- paleosol sequences (LPSs) at mid latitudes. Many studies were devoted to disentangling past environmental changes by using variabilities of geochemical or magnetic signatures along loess – paleosol profiles from different loess provinces. However, distinct separation of source – specific from climate – related components in both approaches is challenging. In this contribution we aim to compare the outputs of paleoclimate reconstructions using mineral magnetic and geochemical proxies for a collection of loess and paleosol samples from Lower Danube area in Bulgaria, covering the last 800 kyrs. Using regional compilation of pedogenic magnetic susceptibility of Holocene soils developed on loess as a function of present day mean annual precipitation and mean annual temperature, we obtained estimates for paleoclimate parameters related to glacials MIS4–MIS18 and interglacials MIS 5 – MIS 17 in SE Europe. The estimates suggest systematically lower MAP values for loess units, formed during glacial periods, varying in the range 260–350 mm, while the estimates for interglacial climates suggest MAP values close to the modern observations (550 – 780mm). MAP estimates based on the empirically obtained linear regression between weathering index ba3 [$(K_2O+Na_2O+MgO)/Al_2O_3$] and climate parameters for topsoils from the loess area in Bulgaria show much higher MAP estimates for weathered loess units, reaching values typical for interglacial soils. This discrepancy is further evaluated by integrated analysis of geochemical and magnetic properties of the studied collection of loess and paleosol samples. It is found that higher degree of loess weathering, expressed by high CIA values in loess is reversely related to the calculated background magnetic susceptibility (Xbg). This finding indicates that weathered loess material is characterized by primary (detrital) magnetic minerals with higher content of fine magnetically stable single domain magnetites. The latter can originate from distant dust sources as compared to the non-weathered loess material from the alluvial sediments of the Danube river. Further relationships between geochemical and magnetic properties of the studied sediments will be discussed, which shed more light on the complex interplay among factors, determining the magnetic and geochemical signals of loess-paleosol sequences.