Geomorphology and (paleo) loess landscapes in Europe during the last glacial cycle at different spatial and temporal scales

F. Lehmkuhl[1], J. Bösken[1], P. Antoine[2], B. Boemke[1], J. Hošek[3], Z. Jary[4], S. B. Marković[5], I. Obreht[1], S. Pötter[1], T. Sprafke[6], D. Veres[7], J. Viehweger[1], L. Wacha[8], A. Zerboni[9], U. Hambach[10]

[1]Department of Geography, RWTH Aachen University, Germany; [2]UMR 8591 CNRS-Université Paris I, Laboratoire de Géographie Physique, Environnements quaternaires et actuels, Meudon, France; [3]Czech Geological Survey, Prague, Czech Republic; [4]University of Wroclaw, Institute of Geography and Regional Development, Wrocław, Poland; [5]Department of Physical Geography, University of Novi Sad,Serbia; [6]Institute of Geography, University of Bern, Switzerland; [7]Institute of Speleology, Romanian Academy, Cluj-Napoca, Romania; [8]Croatian Geological Survey, Zagreb, Croatia; [9]Dipartimento di Scienze della Terra "A. Desio", Università degli Studi di Milano, Italy;[10]BayCEER & Chair of Geomorphology, University of Bayreuth, Germany

DOI: 10.18154/RWTH-2019-10493

Loess is widely distributed in Europe. It spreads from the southern limits of the Pleistocene Scandinavian ice sheet to the Mediterranean region and from southern England in Western Europe, through northern France and Poland to the Eastern European Plain. The intermontane basins of the central European low mountain ranges, the valleys of large river systems such as Rhine and Danube and the lowlands of the Middle and Lower Danube Basins and the region north of the Black Sea are equally important loess areas.

Throughout Europe, the thickness of loess deposits varies between some decimeters to several tens of meters. These variations/differences are the results of a complex interplay of geomorphology and paleoenvironmental conditions, controlling accumulation, preservation, pedogenesis, and consequent erosional events. For example, the northern European loess belt preserved the most diversified pedo-sedimentary records, nevertheless these sequences were strongly influenced by periglacial environments and thus have a complex stratigraphy including erosional unconformities. However, loess in southeastern Europe is mainly distributed on broad loess plateaus, in particular in the Middle and Lower Danube Basins and north of the Black Sea. Due the absence of periglacial features and their plateau setting, these loess-paleosol sequences have a simpler stratigraphy and are some of the thickest and most complete terrestrial archives of Quaternary paleoclimate in Europe.

Finally, a new map of the distribution of loess in Europe is presented. Spatial data of the geology, geomorphology and the soil properties from 20 different countries were assembled in order to create a seamless map. Additionally, we discuss the depositional settings throughout the European continent, regarding the topography, the distance to potential source areas as well as (paleo-) climatic patterns. Therefore, we also included the fluvial deposits of large rivers from the last glacial cycle as potential dust sources; this area covers about 700.000 km². Further, we examine the influence of (local) topography on sediment deposition using the intersection of loess distribution and elevation data as well as on exemplary loess-paleosol sequences from the Lower Danube using marker horizons such as the Campanian Ignimbrite tephra.