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Editorial

Loess2M - Modelling and Mapping

The idea for this special issue arose from the international conference entitled "Loess 2M - Modelling and Mapping", held during the period from 26th to 29th of August 2016 in Novi Sad, Serbia. It was organized by the Serbian Academy of Sciences and Arts and the INQUA Loess and Pedostratigraphy Focus Group. The two days of presentations ended with a session of "Loess mapping and modeling", in which several important issues about loess mapping and modeling, including methodological points, were discussed.

A loess map bears a wealth of information of environmental changes and geomorphological evolution, because the formation of loess requires a sustained source of dust, adequate wind energy to transport the material, and a suitable accumulation site with favorable vegetation- and geomorphological conditions (e.g. Pye, 1995). As the loess deposits are covering approximately 10% of the Earth's surface, loess maps also provide important constraints on investigating the past dust cycles. Up to now, regional and global loess maps have been created at various scales, among which the most complete ones are those of China, Europe and North America (Liu, 1985; Elias, 2007). Recent developments include the introduction of GIS technique in loess mapping (Haase et al., 2007; Lindner et al., 2017; Lehmkuhl et al., 2018). Also the inclusion of dababases as the Land Use and Cover Area frame Statistical survey (LUCAS) database on topsoil properties in Europe, is valuable to refine the loess map in western Europe (Bertran et al., 2016). As topsoil databases are available in many countries, this approach may provide a rapid way to improve the present loess maps. Different from many other sediments, spatial changes of physicochemical properties of loess provide rich paleoclimatic information, such as dominant dust-transporting winds (Liu, 1985), moisture transport directions (Hao and Guo, 2005) among others. One future field may be the mapping of the proxy changes of loess. This requires accumulation of data (chronology and proxy) from numerous studies of individual loess sections in a structured and open manner.

Loess modelling remains a challenging task. As one of the most important terrestrial paleoclimate archives distributed in various climate regimes, loess bears unique regional and global information (e.g. Hao et al., 2015). The introduction of model simulations in loess study would be crucial to test the empirically-based climate interpretations. A full loess model should include the climate processes, dust cycles (dust emission, transportation and deposition) and post-deposition pedogenic processes. Various regional and global dust models could possibly be incorporated in loess modelling. However, the present regional dust models have mostly been developed for the purpose of providing operational dust forecasts and are suited for simulation of individual dust storm events, and the global ones are usually used to investigate the role of the dust in the climate system (Tegen and Schulz, 2014). It has been also recognized that a major difficulty is that atmospheric models are often unable to reproduce the small-scale wind events that are responsible for a large part of dust emission events (Tegen and Schulz, 2014). An important step has been made to use the climate and dust emission modeling to investigate the link of dust emission induced by North Atlantic millennial-scale climate variations and changes in East European loess deposits of marine oxygen isotope stage (MIS) 3 (Sima et al., 2013; Rousseau et al., 2017). For the first time, a soil formation model together with a climate model were used to identify the main factors that control the formation of paleosols interbedded in loess (Finke et al., 2017). It may be expected there is still a long way to develop a fully coupled climate-dust-soil model.

In this special issue, sixteen original papers of loess studies are presented. The scope of these papers includes chronology, proxy interpretation, paleoenviromental reconstructions, archaeological remains in loess and also review papers, mainly reporting new progress in the study of the Eurasian loess belt. Since the first special issue about loess research was edited by Cremaschi (1990), many prominent loess themed special volumes have been published in Quaternary International (Pécsi and Lóczy, 1990; Derbyshire et al., 2001; Velichko et al., 2006; Zöller and Faust, 2009; Marković et al., 2009, 2011, 2014. 2015; Frechen, 2011; Jary et al., 2013, 2016; Horváth and Frechen, 2014, Yang et al., 2018). This special issue is a new contribution of the INQUA loess community to the official scientific journal of the INQUA.

Methodological studies of optically stimulated luminescence (OSL) and its application to dating loess and loess derivates are presented in four papers. The OSL age of coarse (90–125 μm) and medium (45–63 μm) quartz grain size fractions, and post-IR IR290 for polymineral fine grains (4–11 μm) of a typical loess-paleosol section at Biały Kościół in SW Poland, is examined by Moska et al. (2019a). The results show that there are no differences in (obtained) age between coarse and medium fractions for the samples younger than 30-40 ka. For the older samples, significant differences appear among different gain-size fractions /methods. The time scale of the section of the last 100 kyr is developed based on the OSL age of the medium quartz fraction. Luminescence dating of the Strzyżów loess profile in SE Poland by Moska et al. (2019b), complemented by radiocarbon dating, shows a hiatus between Last Glacial Maximum loess and MIS 5 soil, confirming field observations. The two aforementioned studies reveal high dust sedimentation rates (DSR) in Poland during the Last Glacial Maximum. The luminescence dating study by Perić et al. (2019) shows general similar DSR patterns of loess in the central Chinese Loess Plateau and Serbia during late Quaternary, with peak DSR in late last glacial (ca. 13–25 ka). One common conclusion of three aforementioned papers is that the quartz OSL technique is only capable of accurate age determination up to accumulated doses of ca. 150 Gy (ca. 30–40 ka) due to approaching field saturation of the quartz OSL signal. A case study by Poręba et al. (2019) shows that the OSL method is an important tool in investigating loess erosion induced by human activity. Their results show a strong

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