Geophysical Research Abstracts
Vol. 12, EGU2010-14248, 2010
EGU General Assembly 2010

The rock magnetic characteristics of last glacial cycle loess from the island of Susak (Adriatic Sea, Croatia)

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Loess is by far the most important terrestrial archive that provides detailed palaeoclimatic information for the whole Quaternary. Loess covers wide areas in Asia and Southeast Europe where continental and sub-continental climates predominate. In Mediterranean climate settings, however, loess deposits are almost absent and the few existing sites provide invaluable palaeoclimatic information.

Heller & Liu (1984) were the first who used magnetic susceptibility variations in Chinese loess to correlate the loess deposits to marine records. The susceptibility variations in the loess-palaeosol couplets resemble the pattern of the global ice volume record with higher values in palaeosols (interglacials) and lower values in loess (glacials). In most parts of the Eurasian loess belt, the intensity of pedogenesis leads to enhancement of magnetic minerals in soils. However, in other parts of the world under different climatic conditions, even depletion of the magnetic fraction could be observed. Furthermore, the wind strength during dust transport and loess deposition also seems to control the magnetic mineralogy. With stronger winds, minerals with higher density such as iron oxides are enriched during aeolian transport.

Here we report on first results from a detailed rock magnetic investigation of a loess sequence from the Adriatic coast of Croatia. The Pjeskokop site is located on the island of Susak in the northern Dalmatian archipelago. On Susak, aeolian sands, sandy loess and loess have been deposited on Cretaceous marine limestones and form an up to 20 metres thick Pleistocene sediment blanket (Cremaschi 1990).

At the Pjeskokop site, non-oriented samples were collected with narrow spacing ($\sim$2 cm) from a more than 11 metres high section. All samples were subjected to standard rock laboratory procedures. Detailed petrographical and grain size studies on parallel samples are in progress. A strongly rubified pedo-complex forms the base of the sequence. Weakly developed palaeosols occur at 3 and 5.5 metre depth and two macroscopically visible volcanic tephra layers are intercalated in the upper part of the section. At present, we assume that the sequence represents the entire last glacial cycle (11-130 kyr).

The concentration dependent magnetic parameters (e.g. magnetic low field susceptibility, SIRM) do not at all resemble the lithology. Volume susceptibility in unaltered loess exceeds even 1*10-3 SI which is at least 3 times higher compared to loess from the middle Danube basin only a few hundreds of kilometres to the East (Markovic et al. 2009). Grain size dependent magnetic parameters (e.g. frequency dependent magnetic susceptibility, S-ratio, etc.) reveal the relative enhancement of superparamagnetic particles and the formation of high-coercivity minerals in the pedogenetically altered horizons. However, in general the magnetic signal seems to be controlled by the primarily detrital minerals and climatically governed relatively weak alterations occur only in the macroscopically visible pedohorizons.

During the last glacial cycle, the sea level of the Adriatic Sea was lowered by several decametres at least. As a consequence, the alluvial plain of the Po River extended far to the Southeast and provided the sand and silt which were blown to the shallow mountain ranges forming today the islands of the Dalmatian archipelago (Cremaschi 1990). Pleistocene and recent floodplain deposits of the Po River in North Italy contain large amounts of heavy minerals from the metamorphic series of the Central Alps. This detritus may control the magnetic properties of the aeolian deposits on the island of Susak. Further petrographical and mineral magnetic studies are necessary to prove our hypothesis.