Publications of the Institute of Geophysics, Polish Academy of Sciences
Geophysical Data Bases, Processing and Instrumentation
vol. 423 (C-112), 2018, pp. 109-110
DOI: 10.25171/InstGeoph_PAS_Publs-2018-056
16th Castle Meeting New Trends on Paleo, Rock and Environmental Magnetism, Chęciny, Poland, 2018

The Anisotropy of Magnetic Susceptibility of Loess from Poland and Ukraine

Jerzy NAWROCKI[1,5], Andriy BOGUCKI[2], Petro GOZHIK[3], Maryna KOMAR[4], Maria ŁANCZONT[5], Magdalena PAŃCZYK[1], and Olga ROSOWIECKA[1]

[1]Polish Geological Institute – NRI, Warszawa, Poland

[2]Department of Geomorphology and Palaeogeography, Ivan Franko National University of Lviv, Lviv, Ukraine

[3]Institute of Geological Sciences, National Academy of Sciences of Ukraine, Kyiv, Ukraine

[4]National Museum of Natural History, National Academy of Sciences of Ukraine, Kyiv, Ukraine

[5]Faculty of Earth Sciences and Spatial Management, Maria Curie-Skłodowska University, Lublin, Poland

✉ jerzy.nawrocki@pgi.gov.pl

A b s t r a c t

Measurements of the anisotropy of whole-rock magnetic susceptibility (AMS) have been conducted to define the palaeowind strength and directions. For the AMS studies more than 1000 geographically oriented cylindrical samples were taken from 22 loess sections located in the area between the Vistula and Dnipr rivers, and the Black Sea. In order to define sources of dust and to verify directions of wind obtained from the AMS studies the U-Pb ages of detrital zircons extracted from 20 loess horizons have been also estimated. An oblate magnetic fabric is prevalent in all the horizons of loess studied. Such a feature is characteristic of loess sediments. The value of anisotropy P is proportional to the foliation parameter F, indicating a subordinate role of lineation. There is an inverse relationship between half-angular uncertainty in the direction of maximum susceptibility (ε_{12}) and the magnetic lineation parameter L, and between half-angular uncertainty in the direction of minimum susceptibility (ε_{23}) and the magnetic foliation parameter F caused by increased measurement errors for weak lineations (foliations). On the other hand, the absence of correlation between ε_{12} and foliation indicates that the lineation and foliation sub fabric are probably defined by the orientation distribution of separate minerals. Only part of the samples had statistically significant magnetic lineations, with $F12 > 4$ and $\varepsilon_{12} < 22.5^{o}$. The AMS of the loess from the Black Sea region is very weak, i.e., almost 5 times weaker than noted in the periglacial loess of Western Ukraine and Poland, and comparable to that noted in the Chinese loess. The im-

brication of Kmin axes is not so distinct in the older loess horizons, probably because of compaction. Nevertheless in this case also, the distribution of magnetic susceptibility axes allows to define prevailing wind directions. Migration of the Kmax axes due to variable wind strength limit their usefulness for the determination of aeolian transport directions. They may not be used alone for this purpose, but may support the information obtained from the imbrication directions of the Kmin axes.

Keywords: magnetic susceptibility, anisotropy, loess, wind directions.