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The comparison of anisotropy of magnetic remanence with the anisotropy of magnetic susceptibility of the Dukla nappe from the Outer Western Carpathians

Dániel Kiss[1,2], Emő Márton[2], Antek K. Tokarski[3]

[1] Eötvös Loránd University, Department of Geophysics and Space Science, Hungary, dan.kiss.91@gmail.com

[2] Geological and Geophysical Institute of Hungary, Paleomagnetic Laboratory, Hungary, paleo@mfgi.hu

[3] Institute of Geological Sciences, Polish Academy of Sciences, Research Centre in Kraków, Poland, ndtokars@cyf-kr.edu.pl

The Carpathians belong to the European Alpine system, which was formed during the convergence and collision of the European and African plates. The Polish segment of the Western Outer Carpathians is a north-verging thrust-and-fold belt composed largely of Lower Cretaceous to lower Miocene flysch. The belt comprises five rootless nappes: Skole, Subsilesian, Silesian, Dukla and Magura nappes. This paper presents the results of anisotropy of magnetic susceptibility (AMS), anisotropy of magnetic remanence (Anisotropy of Anhysteric Remanent Magnetization, AARM) and isothermal remanent magnetization (IRM) studies performed both in Oligocene turbidite sequences in the frontal part of the Dukla nappe and in olistostrome complex of the Lipowica quarry, topping the Silesian nappe in front of the Dukla nappe (Figure 1).

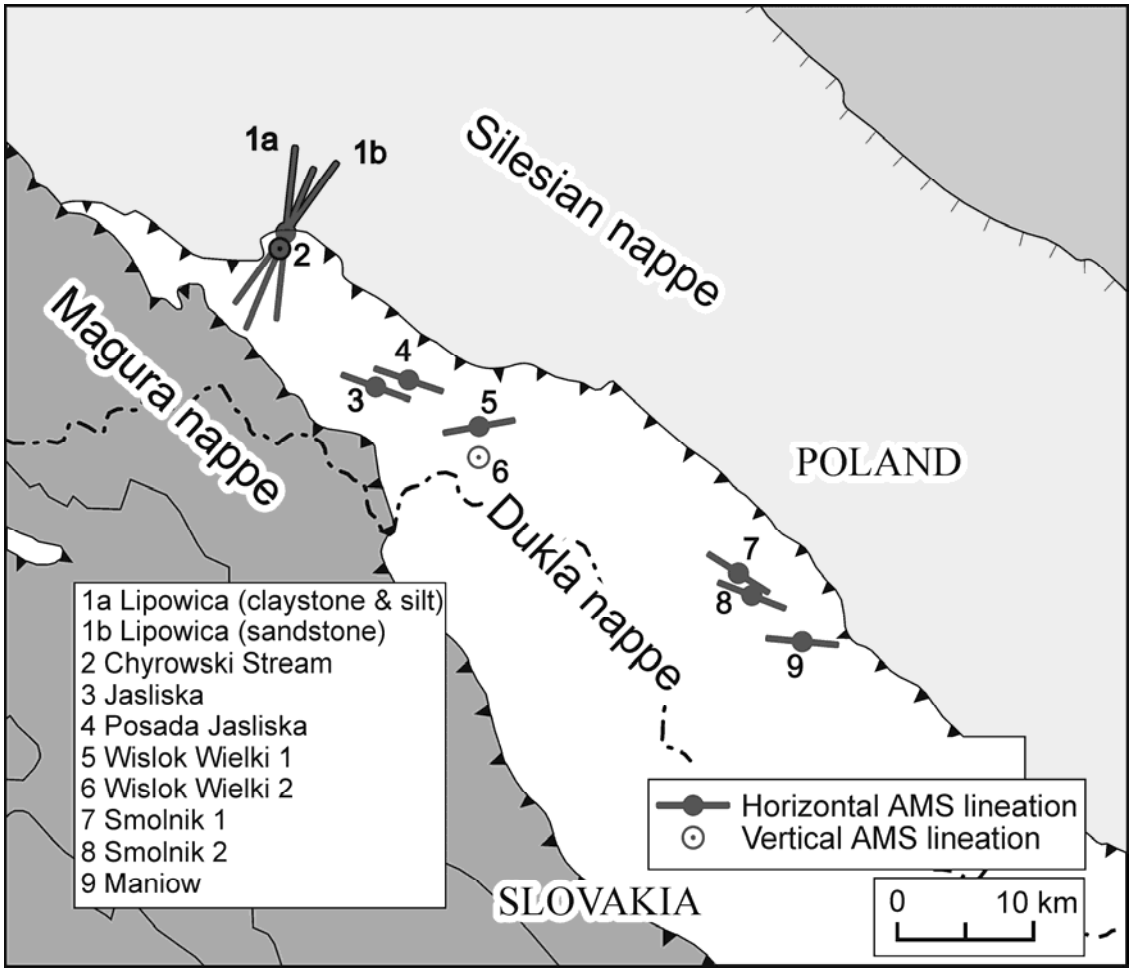

Figure 1: The AMS lineations measured in the Dukla unit

For the study 102 individually oriented cores were drilled at nine geographically distributed localities (Figure 1). At each locality claystones were sampled, except Lipowica quarry, where silt and sandstone were also drilled. The AMS measurements showed that, the magnetic fabrics were dominantly foliated, with a weak but in the most cases well defined lineations, which correlate to the local strikes. At four localities the AMS lineations are aligned with the general (NW-SE) tectonic trend of the unit. The samples from Lipowica quarry and three other localities exhibit different, but still horizontal AMS lineations. At locality 6, the AMS lineation is vertical. In this case the question was if this peculiarity is due to strong deformation or mineralogical reasons.

Because of the relatively low susceptibilities ($1\text{-}3*10^{-4}$ SI), paramagnetic minerals can be important contributors to the AMS fabric. In order to study the magnetic fabric of the ferromagnetic mineral, which, according to the IRM measurements, most probably magnetite, AARM measurements were carried out so far on the samples from three localities and compared with the AMS fabric. We observed that, the difference between the AMS and AARM lineations at locality 8 is small. At locality 6 the AARM fabric is "normal" and parallel to the main tectonic trend of the Dukla nappe, and so becomes the AMS fabric after thermal demagnetization at 460°C. We interpret these phenomena as related to the presence of siderite in the rock, which is a paramagnetic mineral, known for its ability of creating inverse fabric in sediments. Concerning locality 1, the directions of the AMS and AARM lineations are quite different in all three rock types studied, but none of them are aligned with the main tectonic trend of the Dukla nappe.

The above results outline a really complicated picture of the deformation history of the Dukla nappe, where the documented or suspected presence of the olistoliths may explain the often occurring local anomalies. Further AARM measurements are planned in the near future in order to understand better the tectonics of the Dukla nappe.

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