

### Detail description of applied rock magnetic and palaeomagnetic procedures

The rock magnetic and palaeomagnetic investigations were conducted at the Laboratory of Palaeomagnetism, Institute of Geophysics Polish Academy of Sciences (IGF PAS). From each of 70 oriented palaeomagnetic samples up to 5 cylindrical cores 2.4 cm in diameter and 2.2 cm in length were drilled for AMS and demagnetization experiments. From each site additional cylindrical cores 0.6 cm in diameter and 0.8 cm in length were drilled for vibrating magnetometer VSM rock magnetic investigations:

Ferromagnetic carriers were identified using following procedures:

1. The Isothermal Remanent Magnetization (IRM) curves were obtained and hysteresis loops parameters were defined using Molspin Ltd, UK vibrating magnetometer VSM in maximum field 1 T.
3. The precise identification of the maximum unblocking temperatures ( $T_{ub\ max}$ ) related to the ferromagnetic grains characterized by different coercivity spectra was conducted by a three component IRM analysis (Lowrie 1990). Specimens of 2.4 x 2.2 cm sizes (a minimum of 2 specimens from each site) were magnetized in 3 perpendicular axes in fields of 3T, 0.4T and 0.12 T using MPM -10 (magnetic measurements pulse magnetizer). The specimens were then subjected to a gradual stepwise demagnetization up to 680°C in a field free magnetic furnace MMTD1 (Magnetic Measurements Thermal Demagnetizer, Great Britain). After each of the demagnetization steps magnetic signal of the specimens were measured using a Superconducting Quantum Interface Device (SQUID, 2G Enterprise model 755, US).

The magnetic susceptibility and AMS were measured on the AGICO MFK1-FA, susceptibility bridge. Specimens were subjected to Alternating Field (AF) and thermal demagnetization procedures. Thermal demagnetization appeared to be the most effective method of extracting Characteristic Remanent Magnetization (ChRM) components. Specimens were thermally demagnetized in steps up to 680°C in MMTD1 furnace and after each heating step their residual magnetic field was measured using SQUID. In the course of the demagnetization process the susceptibility of the specimens was controlled to note changes in the magnetic mineralogy of the samples during heating. A total number of 205 2.4 x 2.2 cm specimens were subjected to AMS and demagnetization experiments.

AMS ellipsoids were calculated using ANISOFT 42 software (Chadima & Jelinek 2009). Palaeomagnetic components and mean site directions were calculated using REMASOFT 3.0 software (Chadima & Hrouda 2009), which employs principal component analysis (PCA) after Kirschvink (1980) and Fisher (1953) statistics. The palaeomagnetic components were calculated on the orthogonal Zijderveld diagrams as a direction of best fit line to a minimum of three points, with maximum Angular Standard Deviation (ASD) of 10°. This should be stressed however that majority components were calculated with higher precision (metadolerites: 60% of directions was defined with max. ASD = 6°, 80% - max. ASD = 8°; metavolcanics: 80% of directions was defined with max. ASD = 6°, 90% - max. ASD = 8°). Additional great circles procedures (Halls 1976; McFadden & McElhinny 1988) were applied to samples from three of the metavolcanic sites. Mean site directions which did not pass criteria of Van der Voo (1993) –  $\kappa > 10$ ,  $\alpha_{95} < 16^\circ$ , were rejected from further considerations. Tectonic corrections of the obtained palaeomagnetic components were tested using SPHERISTAT 3.2.1. software. Palaeogeographic simulations were performed using GMAP 2012 software. The reference palaeopole paths of Baltica and Laurentia were derived from integral libraries of GMAP 2012.

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