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Magnetostratigraphic and palaeomagnetic analysis from the Early Miocene (Karpatian) deposits Teiritzberg and Obergänserndorf (Korneuburg Basin, Lower Austria)

von

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Methods

Oriented samples were taken for magnetostratigraphic and paleomagnetic analyses by using nonmagnetic plastic cylinders with 25 mm diameter and 22 mm length, which were penetrated into the sediment surface. All samples were progressively demagnetized with alternating magnetic fields in order to study the stability of different components of the natural remanent magnetization (NRM). Thermal cleaning technique could not be applied, since thermal treatment caused disintegration of the samples. Saturation behaviour (IRM) and anisotropy of magnetic suszeptibility (AMS) were studied on selected samples. All measurements were carried out in the Paleomagnetic Laboratory of the University of Leoben using a 2G three-axis cryogenic magnetometer (measuring limit: 0.01 mA/m) and a KLY-2 magnetic suszeptibility bridge. Characteristic remanent magnetization directions for single samples were determined using principle component analyses (KIRSCHVINK, 1980) and mean vectors were calculated following FISHER (1953).

Teiritzberg waste disposal site

Nearby the entrance to the Teiritzberg waste disposal site a section of 4 metres thickness across the fossil rich layers was excavated mechanically for paleomagnetic sampling. 33 oriented samples were taken from the cut face using plastic cylinders, and processed in the laboratory as described earlier in this paper.

Low field magnetic suszeptibility showed bulk values of 10^{-4} SI units with well defined magnetic foliation planes dipping 20 degrees towards the West, almost parallel to the sedimentary bedding plane. Stepwise acquisition of isothermal remanent magnetization (IRM) and successional stepwise demagnetization with alternating fields established magnetite as the dominant magnetic phase, except for samples from the coarse grained sediments (sand) in the hanging wall of the fossil-rich layers with a significant contribution from a higher coercive mineral. The presence of a higher coercive magnetic phase gave rise to chemical alteration of the sand samples, which were therefore excluded from further interpretation.

Natural remanent magnetization intensities were typically below 0.6 mA/m. The fine grained sediments showed homogeneous magnetic behaviour during demagnetization with alternating fields. The characteristic magnetization direction was assigned to the magnetite component with a stable demagnetization path towards the origin in the range between 2 mT and 20 mT. All results showed normal polarity (Fig. 1) with a significant mean direction, indicating a counterclockwise rotation of 20 degrees with respect to present magnetic North direction since the deposition of the sediments.

Obergänserndorf sandpit

In the Obergänserndorf sandpit two parallel profiles of 6 metres thickness across the fossil rich layers and an overlapping section towards the hanging wall were excavated mechanically. In all, 123 oriented samples were collected from the cut faces for paleomagnetic analyses. Low field magnetic suszeptibility was typically below $1.5*10^{-4}$ SI units with magnetic foliation planes oriented parallel to the almost horizontal sedimentary bedding plane. The magnetic mineralogy was similar to the sediments from the Teiritzberg waste disposal, as found by stepwise acquisition of isothermal remanent magnetization (IRM) and successional stepwise demagnetization with alternating fields. Coarse grained sediments showed a significant contribution from a higher coercive mineral, most probably haematite, which could not be completely removed with alternating fields of 140 mT. Magnetite was the dominant magnetic phase in the remaining samples, which established successful demagnetization behaviour in the range between 2 mT and 20 mT.

On top of this, the influence of mechanical excavation on magnetic fabric and magnetization directions of the sediments was investigated by means of comparison of samples which were taken from the cut face with samples from undisturbed sediments after a manually cleaning of the cut face. While there was no difference observed for the magnetic fabric of the two groups, certain samples from

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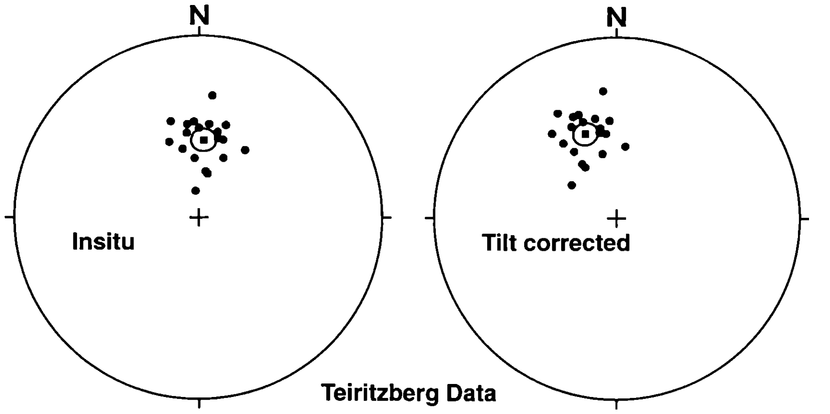

Fig. 1: Characteristic remanence directions of samples from the Teiritzberg waste disposal site before (left) and after (right) tilt correction. Equal area projection with full symbols for lower hemisphere. Squares represent mean values with α_{95} confidence circles.

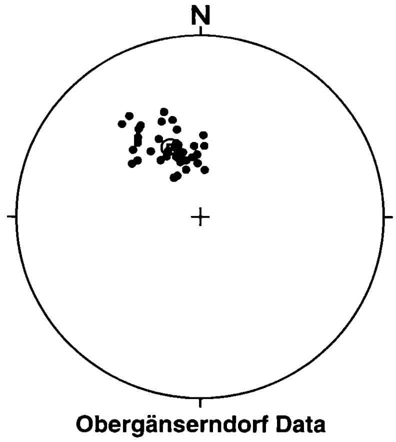

Fig. 2: Characteristic remanence directions of samples from the Obergänserndorf sandpit. No tilt correction because of horizontal bedding. Equal area projection with full symbols for lower hemisphere. Square represents mean value with α_{95} confidence circle.

Tab. 1: Mean paleomagnetic directions

Locality	Polarity	N	D / I_{bc}	α_{95}	K	D / I_{ac}	α_{95}	K
Teiritzberg	normal	19	3 / 55	5.6	36.9	340 / 49	5.6	36.9
Obergänserndorf	normal	39	336 / 56	3.7	39.8	336 / 56	3.7	39.8

N: number of samples.
D / I_{bc}: characteristic remanence direction before tilt correction.
D / I_{ac}: after tilt correction.
α_{95}: semi-angle of 95% cone of confidence.

the immediate cut face turned out to be strongly affected by a secondary magnetization direction which could be assigned to the excavator shovel. The vector components of the magnetic overprint, removable with alternating fields of 10 mT, were aligned parallel to the digging direction with shallow negative inclinations.

For the remaining samples, characteristic magnetization directions were assigned to the magnetite component with a stable demagnetization path towards the origin in the range between 2 mT and 20 mT. All results showed normal polarity (Fig. 2). Evidence for the primary origin of the paleomagnetic information came from the comparison of the mean direction with the direction observed in the Teiritzberg waste disposal site before and after tilt correction (Tab. 1). The overall mean magnetization direction for the Teiritzberg and Obergänserndorf sites (N = 58; D_{ac} = 338°; I_{ac} = 53°; α_{95} = 3.1°; K = 37.0) showed a counterclockwise rotation of 22 degrees for the Korneuburg basin with respect to the present magnetic North direction and a paleolatitude of 34 degrees at the time of deposition.

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