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THE NORTHERN CALCAREOUS ALPS AS A PART OF THE ADRIATIC MICROPLATE: NEW PALEOMAGNETIC DATA AND INTERPRETATIONS

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Permotriassic sedimentation in the area of present days Northern Calcareous Alps (NCA) took place on the continental margin neighbouring the Tethys ocean. In the Jurassic, Penninic rifting led to formation of a new ocean, and to separation of the Northern Calcareus Alps (and the Adriatic microplate) from the European plate. The majority of paleomagnetic data from Mesozoic sediments in the NCA data contradicted this hypothesis, as they indicate clockwise rotation, in contrast to the generally counterclockwise rotated Southern Alps and Adriatic microplate (e.g. Mauritsch and Becke, 1987). An ocean was introduced to separate the Southern Alps, which are part of the Adriatic microplate (e.g. Channell, 1996) from the Eastern Alps (e.g. Channell et al., 1990, 1992).

New paleomagnetic data from the Northern Calcareous Alps call for a reinterpretation of existing data. We sampled every lithologic unit in several stratigraphic sections between the Late Triassic and the Early Cretaceous with at least one site (sections Lehnbach, Ampelsbach, Kohlstatt and Unken are presented here; for location see Fig. 1). Declinations and inclinations of the ChRM should change through time, as both the European and the African plate performed partly joined vertical axis rotations and drift movements. We compare the data from the stratigraphic sections to the expected paleodeclinations and inclinations for the African and the European plate derived from the apparent polar wanderpath (Besse and Courtillot, 2002) calculated for the city of Salzburg, assuming Salzburg to be located on the African or the European plate, respectively (Fig. 2).

The data can be divided into two groups:

1) The inclinations in the sampled section follow the path of the expected paleoinclination of Africa and Europe through time. If fold tests are positive and reversals are recorded, these data are regarded to be primary magnetisations, aquired soon after sedimentation (see a and b of Fig. 2).
2) The inclinations in the sampled section are not related to the expected paleoinclination of Africa and Europe and remain constant through time. These data are interpreted to be related to secondary magnetisations (see c and d of Fig. 2).

The first group can be used to interpret the measured paleodeclinations for Jurassic paleography. In these sections, the paleodeclinations follow a path, which is parallel to the African path, and different from the European path (Kohlstatt section, Fig. 2a). Therefore we conclude that the NCA were part of the Adriatic microplate from the Jurassic onwards.

Secondary magnetisations show clockwise rotated declinations (Fig. 2c and d), which are not related to the expected paleodeclinations of Africa and Europe. Therefore we propose that the existing data indicating clockwise rotations in the NCA are secondary magnetisations, as already concluded by Gallet et al. (1998) and Schätz et al. (2001). Secondary magnetisations carry important information about the rotational history of an area, but the timing of remagnetisation must be established before the data are interpreted. In the NCA, the problem of clockwise rotation is shifted to the Cenozoic (see contribution Thöny et al., this volume).

One reason for the erroneus interpretation of secondary magnetisations as primary was the presence of positive fold tests. If folding occured late in orogenic history, there is sufficient time for magnetic overprint predating folding, thus creating a prefolding overprint magnetisation. We propose a new „section test“ in stratigraphic sections based on the changing inclinations through time, for a more reliable identification of secondary magnetisations.

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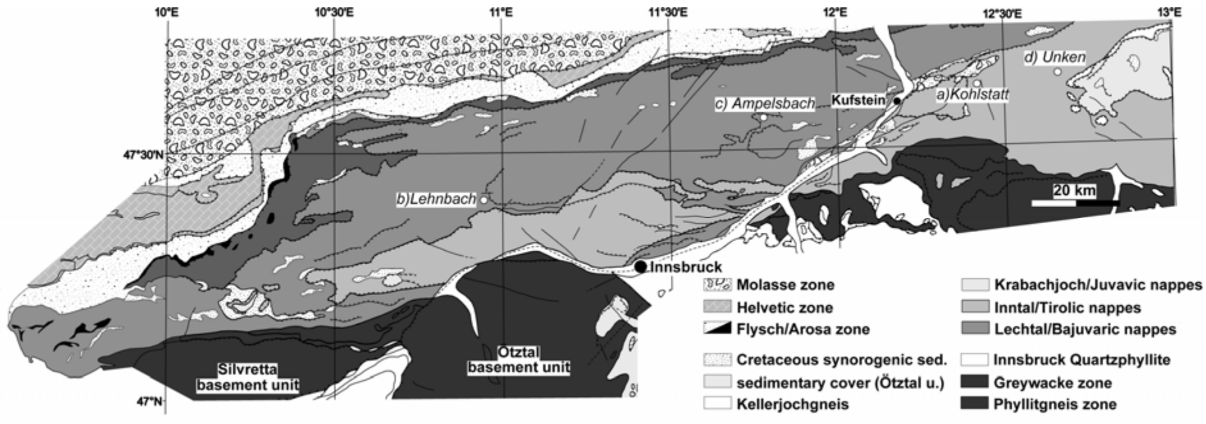

Fig. 1: Geologic sketch of the Northern Calcareous Alps with the positions of the investigated sections presented here.

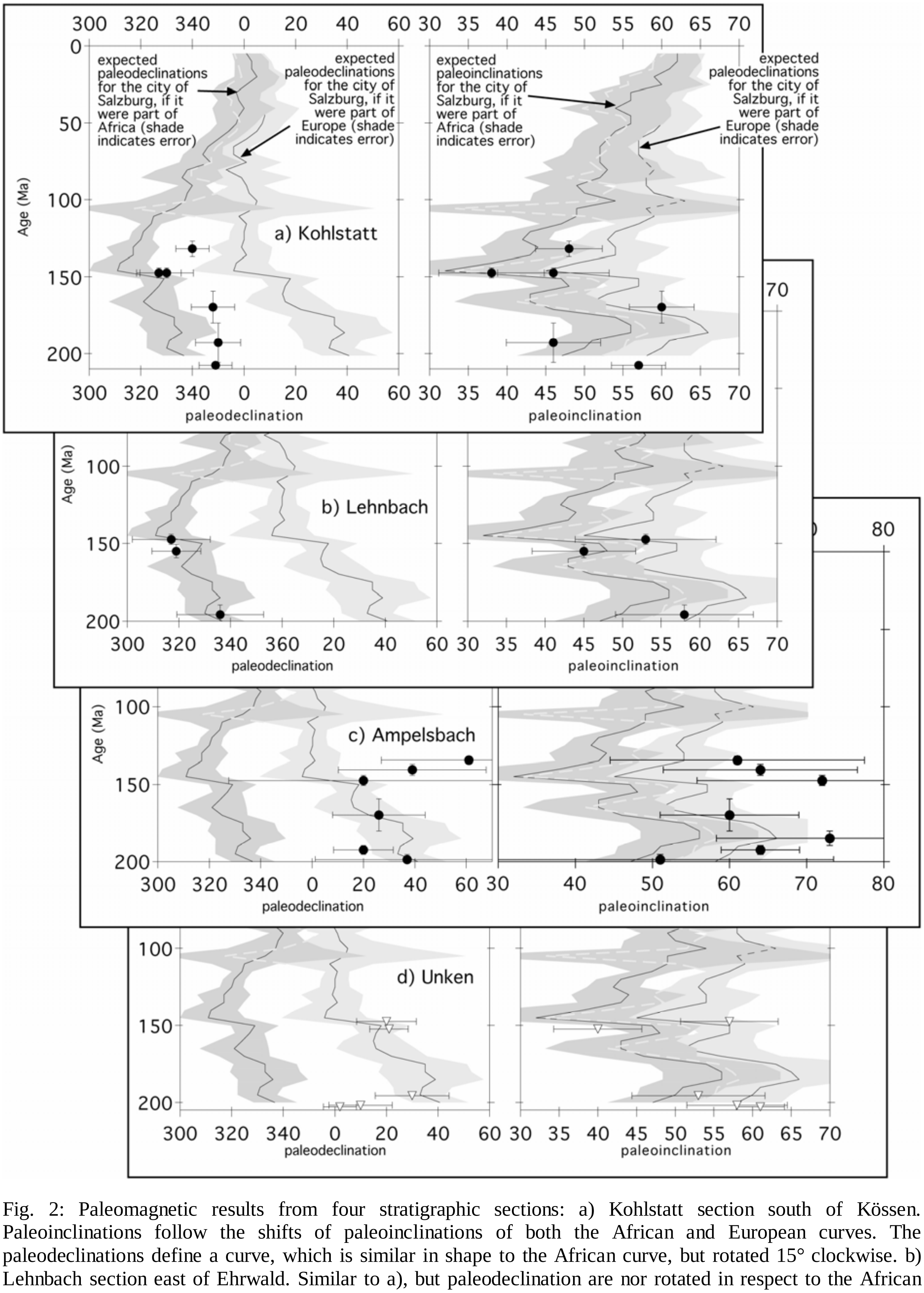

Fig. 2: Paleomagnetic results from four stratigraphic sections: a) Kohlstatt section south of Kössen. Paleoinclinations follow the shifts of paleoinclinations of both the African and European curves. The paleodeclinations define a curve, which is similar in shape to the African curve, but rotated 15° clockwise. b) Lehnbach section east of Ehrwald. Similar to a), but paleodeclination are nor rotated in respect to the African curve. c) Ampelsbach section east of Achenkirch: Neither paleodeclinations nor paleroinclinations are not related to the shifts of paleoinclinations of both the African and European curves, but remain scatter in the same range through time. d) Unken section: Similar to c). Sections Kohlstatt and Lehnbach have primary magnetisations, Ampelsbach and Unken secondary magnetisations.