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PERVASIVE REMAGNETIZATIONS IN THE NORTHERN CALCAREOUS ALPS: PRELIMINARY EVIDENCES AND IMPLICATIONS IN THE SALZACH REGION

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The Northern Calcareous Alps (NCA) have been the subject of paleomagnetic investigations since the end of the 1950´s until nowadays (e.g. HARGRAVES & FISCHER, 1959; for a reference compilation and review see HAUBOLD et al., 1999). Paleomagnetic data from the NCA are, almost, indispensable to discriminate three different kinds of problems: 1) Paleogeographical reconstructions of the Mesozoic platforms in this margin of the Tethys. 2) Vertical-axis rotations related with the Upper Austroalpine nappes and thrust sheet's configuration. 3) Large-scale orogenic processes like large displacements, lateral extrusion, oroclinal bending, ... Considering the complexity of the problem an intensive paleomagnetic research focus on specific structural units with well-exposed stratigraphical profiles would be the key to differentiate among the above exposed implications. In this sense, more than 60 new sites have been added to 20 previous sites in the Salzach region. These sites are located in two main nappe complexes: a lower unit with Tirolic affinity (Stauffen-Höllengebirge, for convenience is subdivided in North, Central and Southern sectors), and an upper one with Juvavic affinity (Göll-Lammer and Berchtesgaden units). Sampling inside every unit was focused to obtain several fold tests. Stratigraphic position spans from Lower Triassic to Lower Cretaceous.

New paleomagnetic results: Low coercitivity minerals carry the magnetization in most of the samples. Orthogonal demagnetization diagrams from thermal demagnetization procedures reveal the occurrence of two main magnetic components: J1) a pervasive secondary direction which unblocks until 350°C, always displays normal polarity and is present, almost, in any kind of rocks. J2) A higher temperature direction is defined between 350° to 550°C, and it yields two polarities in a few cases. Six successfully significant fold tests have been obtained to constrain the age of J1 and J2 (table 1). Three others also show clear tendencies. These fold tests let clear, with good statistical parameters, a systematic postfolding acquisition for most of the directions except for two high-temperature cases (NSH and CSH) in where two polarities are also present. Accordingly J1 and J2 directions from the three units have been interpreted before any structural corrections ("in situ") except for the above mentioned cases.

Implications: 1) The age of the magnetization can be accurately constrained only in two cases that show evidences of a primary acquisition (NSH & CSH; upper Triassic and Lower Jurassic respectively). In the other cases (postfolding) the age is, as much, equal than the age of the main episode of thrusting and folding of the Juvavic nappes in the area (D2, mid-Cretaceous; SCHWEIGL & NEUBAUER, 1997) but considering the observed inclinations (52° and 53° in average) and the expected ones, from the European or African apparent polar wander paths, they could be easily as young as Lower Eocene. On top of that, the inclination is even more controversial because the remagnetization could have been acquired when the beds where dipped to the North, if so, they would be much younger and would show an apparent shallowing. 2) All cases display the systematic clock-

Unit	Aff	Referenc.	Long	Lat	Tub	s / S	n / N	Pol.	α95	K	Fold test	SIG	%	D&I (fold t.)	
B	J	this work	13,094	47,675	300°C	3 / 3	8 / 8	N	5	183	neg	yes	0%	**89,63**	R
		this work			500°C	2 / 3	6 / 6	N	23	118	?	no	0%	**107,59**	R
GL	J	this work	13,298	47,587	300°C	2 / 2	12 / 12	N	6	68	neg	no	0%	**46,48**	R
		this work			500°C	4 / 5	28 / 28	N	14	47	neg	no	0%	**81,47**	R
NSH	T	this work	13,189	47,723	300°C	5 / 6	38 / 40	N	9	75	neg	yes	0%	**49,58**	R
		this work			500°C	4 / 5	34 / 37	N+R	23	17	pos	no	100%	**81,43**	P
CSH	T	this work	13,271	47,668	300°C	4 / 4	18 / 19	N	8	27	neg	yes	0%	**45,37**	R
		M, H, Ch			500°C	19 / 19	- / -	N+R	6	30	pos	yes	100%	**61,55**	P
SSH	T	this work	13,233	47,549	300°C	9 / 9	55 / 56	N	8	49	neg	yes	0%	**69,53**	R
		this work			500°C	10 / 10	63 / 66	N	5	74	neg	yes	0%	**87,60**	R

Table 1: Preliminary results in the Central sector of the Northern Calcareous Alps (Salzach Region): **Unit**: Structural unit; **B**: Berchtesgaden, **GL**: Göll-Lammer, **CSH**: Central sector of Staufen-Höllengebirge, **NSH**; Northern **SSH**; Southern. **Aff**: affinity; **J**: Juvavic and **T**: Tirolic. **References**; **M**: MAURITSCH & FRISCH (1978); **Ch**: CHANNELL et al, (1992) and **H**: HEER (1982) Longitude and Latitude (in average). **Tub**: unblocking temperature (aprox). **s/S**: sites considered /sites analyzed. **n/N**: samples considered/samples analyzed. **Pol**: polarity observed **N**: normal, **R**: reverse. **a95 & K**: FISHER (1953) statistical parameters. **Fold test**: negative (postfolding; 0%) or positive (prefolding; 100%). **SIG**: statistical significance. **%**: percentage of unfolding for the fold test best fit and the **D&I**: declination and inclination of the paleomagnetic vector that has been interpreted (R: remagnetization, P: supposedly primary).

wise rotation previously reported (see references in table1). If contrasting with a North direction this rotation reaches up to 107° (B). 3) However it is clear that differential rotations exist between the different units and they are higher in the Juvavic ones as well as the northern part of the Höllengebirge unit. 4) The lower temperature components display a systematic smaller value of rotation that reflects the main episode of clockwise rotation in the NCA (45° and 89°, depending upon the structural location). This event succeeds after a pervasive event of remagnetization. The difference in the rotation among the low and high temperature components is quite constant about 20° and would be related with the Upper Austroalpine thrust sheet internal configuration. 5) Surviving primary components (adequately described) have been only found in the northern and central sectors of the Höllengebirge unit. Considering the homogeneity of the magnetic mineralogy this reveals a patent S-N gradient of remagnetization that agrees with the former southernmost situation of the Juvavic nappes as well as the location of possible remagnetization sources.

The exposed results indicate the existence of a pervasive and well-characterised remagnetization component, with important structural and geodynamic implications, that should be adequately dated in the future. This remagnetization could be misinterpreted as prefolding in part of the previous paleomagnetic studies in the NCA.

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