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Paleomagnetism of the Permian and the Jurassic rocks of the Velebit Mt. and its implication for tectonic history of the Karst Dinarides (Croatia)

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We present results of paleomagnetic studies on the Lower Permian clastic deposits and the Jurassic carbonates from Velebit Mt (Karst Dinarides, Croatia), aiming at the better understanding of a tectonic evolution of this part of the Karst Dinarides. The area of the Velebit Mt. represented a NE margin of the Gondwana during the Carboniferous and Permian. Deposition of clastic rocks during the Carboniferous and Early Permian was followed by thick sequence of predominantly carbonate rocks deposited on the Adria Microplate, ranging in age from Mid-Permian to Eocene/Oligocene.

Thin sections analyses shows Fe-oxides infilling interstitial spaces in the Permian redbeds, while magnetic extracts from the Jurassic carbonates revealed grains of magnetite of detrital origin.

In Permian deposits rock-magnetic studies (hysteresis and SIRM(T)) revealed that magnetic susceptibility is mostly carried by the paramagnetic matrix and main carriers of remanence are hematite in redbeds with increasing contribution of SP/SD magnetite in younger subsections and in some conglomerates. In Jurassic carbonates SIRM(T) experiments revealed low temperature (Tub<400°C) Ti poor magnetite and some hematite phase in fresh samples. Magnetic susceptibility of diamagnetic carbonates is not affected by heating up to 400-500°C.

Rocks under study acquired secondary magnetization (Lewandowski et al., 2010; Werner et al., 2015), based on paleomagnetic analyses of independently oriented specimens (cores), taken from the Permian redbeds of the Košna and Crne Grede successions (160 cores) and the Jurassic carbonates of the Mali Halan section (102 cores). Clasts of the underlying Košna conglomerate were also investigated for conglomerate test. Hematite was a main magnetic carrier in these sections.

Overall characteristic mean for stable NRM components (ChRM) for both Permian and Jurassic rocks do not fit paleomagnetic directions expected for the sampling places from the apparent polar wander path either for Africa or European continents. However, during stepwise untilting of the beds, ChRM reorients along small circle trends from their original positions (NNW, shallow inclinations) toward NWW declinations and steeper inclinations. Eventually, untilted by ca. 70^{o} for Permian rocks and ca. 50^{o} for the Jurassic rocks, corresponding ChRMs are crossing the path of expected paleomagnetic directions close to its Cretaceous sector.

We conclude, therefore, that studied rocks were remagnetized during the early stages of the Alpine tectonics. The origin of the remagnetization is under discussion, but tentatively it may be related to burial and uplift processes, as indicated by mineralogical and geochemical studies on clay minerals.

References:

[1] Lewandowski et al. (2010) Geologia Croatica, v. 42, no. 1, p. 45-61
[2] Werner et al. (2015) Tectonophysics, v.651-652, p. 199-215