Synfolding remagnetization of Permian redbeds and synfolding magnetization of Jurassic limestones and tectonic reconstructions in Permian and Jurassic rocks in Dinarides (Croatia)

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Abstract: The studied area of Velebit Mts, a part of the Adria Microplate, belonged to a NE margin of Gondwana during the Carboniferous and Permian. While Permian is characterised by clastics, post-Permian sedimentation is dominated by a thick sequence of carbonate rocks. The mid-Permian deposits of the core part of the Velebit Mt. at Košna and Crne Grede localities were investigated using paleomagnetic and rock magnetic measurements. The main carriers of remanence were recognized as hematite with increasing contribution of SP/SD magnetite in younger subsections. The uniform AMS fabric developed during progressive deformation with low anisotropy ratio (1–3%) is strongly oblate at Košna and weakly prolate at Crne Grede, reflecting differences in the contribution of magnetic phases.

A significant remagnetization of the Permian rocks (proved by results of conglomerate test), probably caused by combination of elevated temperature and fluids migration, may be assigned to a burial-related processes that affected the rocks before the final uplift of the Dinarides. Characteristic remanent magnetization recorded in hematite is apparently similar to the Permian direction for Gondwana (shallow inclination with NNW declination), expected for Velebit Mt. coordinates. Paradoxically, this orientation is observed within the almost vertically dipping beds, i.e. before a correction for the tilt. We explain this coincidence assuming syn-folding, Cretaceous–Paleogene remagnetization of the rocks at their subhorizontal position (ca. 30°S) followed by tilting, understood as a rotation of the beds along the horizontal, E–W trending axis to almost vertical, present-day position. A final geometry of the rocks under study was attained probably at the wane of the main uplift phase in Oligocene/Early Miocene.

In post-Permian thick (in places more than 10,000 m thick) sequence of carbonate rocks, representing a stratigraphic range from Carboniferous to Recent, the Early to

Late Jurrasic limestones along the transect in Mali Halan in the southern part of the Velebit Mt. were studied using palaeomagnetic and rock magnetic measurements. Strata in the whole transect dips moderately to SW. Magnetic susceptibility of diamagnetic carbonates is not affected by heating up to 400-500°C. SIRM(T) experiments revealed low temperature (Tub<400°C) Ti poor magnetite and some hematite phase in fresh samples. Heating in air results in excessive growth of new magnetite phase above 600°C. Thermal and AF treatment were performed and were more successful for the Lower Jurassic sites with stronger NRM. It resulted in separation of two ChRM components: “L” with Tub up to 200-250°C and “M” with Tub up to 400-475°C or two coercivity spectra (very soft and harder) in most successfully demagnetized samples. In some samples only soft/LT component was recorded. “M” component for the Lower and Middle Jurassic sites (345/30 in situ) correlates well with results of Marton et al.(2010) for Early Jurassic grainstones in the same area. The tilt corrected data for “M” component fall close to Middle Jurassic segment for APWP for Africa. However site means for “ M” component are distributed along the small circle with subhorizontal WNW trending axis. That may be interpreted as pre- to syntectonic remenance recorded during the regional folding. Such mechanism is consistent with paleomagnetic results for remagnetized Permian clastic sediments in Velebit Mt. (Crne Grede and Košna localities, Lewandowski et al., 2012, AGU Fall Meeting, GP21A-1136). “L” component (of lower accuracy) for Lower/Middle Jurassic sites (in situ) falls close to the Tertiary segment of APWP for Africa as well indicating its post-tectonic secondary origin. For Upper Jurassic sites with lower NRM intensity “L” component seems to be post-tectonic but results for “M” component need to be yet discussed.

Keywords: Karst Dinarides; Permian; Adria; Redbeds; Remagnetization

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