Belianske Tatry Mts: a story of burial and tectonic strain

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The geological evolution of the Tatra Mts (Carpathian range) is very complex. It involves many different episodes/steps: Late Cretaceous thrusting of nappes, Paleocene uplift, Oligocene burial, and final Miocene exhumation of the metamorphic crystalline basement coupled with tilt of the whole massif. Although Tatra Mts are a relatively small mountain range, the intensity of processes affecting them is not uniform throughout the range's extent. The main goal of our study is to investigate the petromagnetic properties, magnetic fabrics, and paleotemperatures that affected Cretaceous marly limestones, a member of the Mesozoic thrust nappe, and post-thrusting Oligocene black shales in the easternmost part of the Tatra massif: the Belianskie Tatry Mts. In-phase magnetic susceptibility (ipMS) is rather consistent in the black shales and points to a significant contribution of paramagnetic minerals. The most common ferromagnetic mineral, as derived from Isothermal Remanent Magnetization analyses, is magnetite with a minor contribution of hematite and goethite. The marly limestones are characterized by high ferromagnetics to paramagnetics ratio and the presence of superparamagnetic magnetite which can be linked with thermal alteration. Their ipMS is strongly site-dependent. Magnetic fabrics documented in the Belianske Tatry show a complex, multifaceted evolution that was affected by the elevated burial temperatures. In-phase Anisotropy of Magnetic Susceptibility (ipAMS) lineation in Oligocene shales records the uplift-related Early Miocene shortening. Ferromagnetic fabrics as out-of-phase AMS (opAMS) and Anisotropy of Anhysteretic Remanent Magnetization show mixed sedimentary-tectonic features which may be linked with the Oligocene extension of the sedimentary basin. In Cretaceous marly limestones, magnetic fabrics documented by different methods (ipAMS, opAMS, AARM) for each site are consistent which suggests that the orientation of ferromagnetic minerals controls each anisotropy. The origin of magnetic lineation in these rocks is ambiguous and may be linked either with nappe emplacement or later compressional uplift.