An origin and the source of extreme high intensity of natural remanent magnetization (NRM) of oxidized titano-magnetite bearing basaltic and andesitic rocks

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A b s t r a c t: The Late Miocene to Quaternary basalts from central and southern Slovakia, the Eocene to Miocene basalts from České Středohoří Mts., the Cretaceous and the Neogene basalts from Syrian Arab Republic, the Cretaceous, Jurassic nepheline basanites and the Quaternary basalts from Nigeria, the basalts from recent Etna and Kilauea volcanoes were studied. The high intensities of natural remanent magnetization (NRM) of volcanic rocks are mostly linked with the presence of the time-variable secondary inversion low-temperature magnetic phase in the rocks. The high NRM is of the chemico-viscous or the thermoviscous origin. An origin of this phase in volcanics is due to low-temperature oxidation (in the range 25 to above around of 350° C) of original Ti-rich titanomagnetites (Ti-Mt-es), which were in the superparamagnetic (SP) state. The successive creation of more oxidized Ti-Mt phase with the nucleation of the thermodynamically stable domains takes place. A magnetostatic interactions among a portion of the original SP state magnetic particles of Ti-Mt-es and those gradually originated oxidized (Ti-Mt-es - titanomaghemites - Ti-Mgh-es) is actual in this system. Due to these interactions a highly viscous and very easily excitable phase has arisen in this system. This phase is able to acquire a thermoviscous or chemico-viscous remanent magnetization having been exposed to the external magnetic field. This is quite new phenomenon. The importance of this knowledge has resulted in its application to the interpretation of geomagnetic anomalies. The high intensities of NRM contribute to the total magnetization of volcanic body and so, they can generate intensive geomagnetic anomalies with respect to the volume of the volcanic body. These anomalies do reflect the presence of only high intensities of NRM, but not the sources of the high Fe concentration of deposits.

Key words: basalts, Fe-Ti inversion low-temperature phase the source of intensive NRM (thermo-viscous or chemico-viscous origin) of rocks

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