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New advances in magneto-optical imaging applied to rock magnetism and paleomagnetism

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We present new results of the magneto-optical imaging technique applied to rock samples. This technique measures the magnetic flux threading a magneto-optically active film, which rotates the polarization direction of transmitted light (Faraday rotation), directly placed on the sample. Through the analyzer of a reflected light microscope, the vertical component of surface magnetic field of the sample is observed and can be quantified through a specific calibration procedure.

We will present images obtained on geological samples and meteorite. Owing to the thin magneto-optically active film (5 μm) and the small sample-to-film distance (1 μm), stray fields produced by magnetic grains in rocks carrying saturation isothermal remanent magnetization are successfully imaged with a spatial resolution of 10 μm . Also, we can image the surface field distribution of rocks carrying natural remanent magnetizations by modulating the analyzer angle. In addition to its high spatial resolution, this technique offers a direct comparison between magnetic and reflected light images. Therefore, this new technique appears as a powerful tool to map and identify the carriers of magnetic remanence in rock samples.

Keywords: magnertic microscopy, magneto-optical imaging, meteorite, remanent magnetization