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# A rapid inversion of magnetic microscope data by the Subtractive Optimally Localized Averages method

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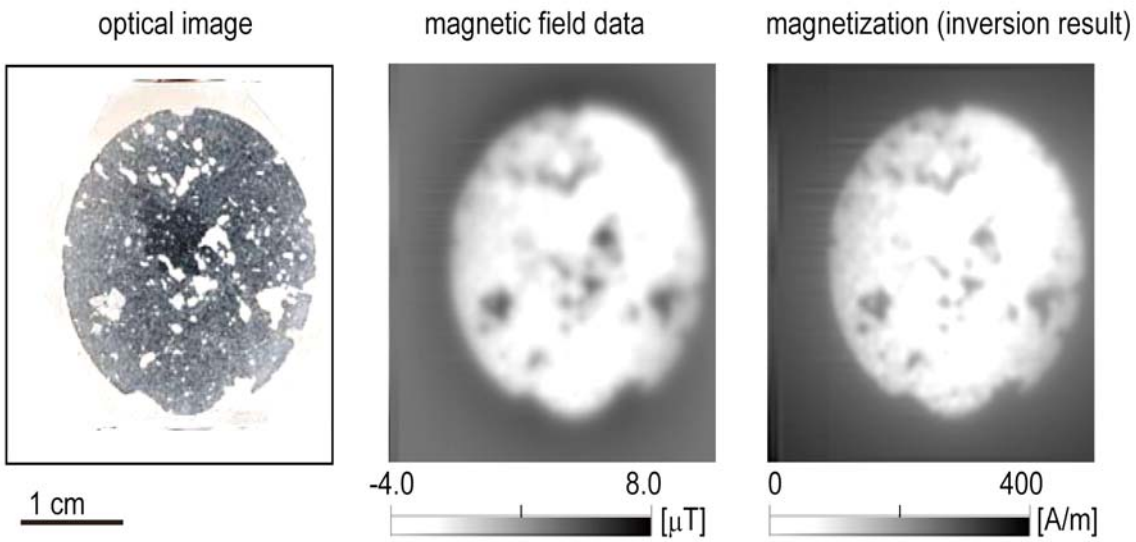
**Figure: An inversion example for a basaltic thin section.**




Modern scanning magnetic microscopes have achieved spatial magnetic field resolution of the order of 100 um, so they have potential for fine-scale magnetic investigations of rocks. Observation at such high spatial resolution observations produce large volumes of data, and the interpretation of these data is a nontrivial task. We present an efficient magnetic inversion technique that explicitly constructs the localized Backus-Gilbert averaging kernel independent of data. Our approach, using the Subtractive Optimally Localized Averages (SOLA) method (Pijpers & Thompson, 1992) yields a unidirectional magnetization, and is suitable for a point-to-point comparison among multiple data. Moreover, the excellent control on observation conditions in the scanning magnetic microscopy offers the periodic boundary approximation, which speeds up the SOLA inversion calculation by orders of magnitude. Inversion examples for numerical magnetization patterns demonstrate feature of the inversion method.
Data obtained by our new Magneto-Impedance (MI) magnetic microscope are used to further demonstrate the performance of the SOLA method. The new MI magnetic microscope achieved sensitivity high enough to observe thin section samples. Basalt and peridotite data are successfully inverted. Interpretation of inversion result will be presented.

Keywords: magnetic microscopy, inversion, rock magnetism, paleomagnetism