R004-20
Zoom meeting A ：11/4 PM2 (15:45-18:15)
16:30〜16:45

超伝導岩石磁力計のセンサー感度曲線：古地磁気個別試料の形状による誤差の評価

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Sensor response of superconducting rock magnetometer: Evaluation of errors of discrete paleomagnetic samples with various shapes

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Superconducting rock magnetometers (SRMs) are fundamental to paleomagnetism research as they enable rapid and precise measurement of remanence preserved in geological and archaeological archives. However, SRM measurements are smoothed and distorted due to convolution effect of the SRM's sensor response, and deconvolution is necessary to restore high resolution and more accurate remanence signal (see Oda and Xuan, 2014; Xuan and Oda, 2015; Oda et al., 2016). Successful deconvolution relies on accurate estimate of SRM's sensor response. We developed a software URESPONSE to facilitate accurate estimate of SRM sensor response based on repeated measurements of a magnetic point source (see Xuan and Oda, 2019). We demonstrate the difference in sensor response between an old liquid-helium-cooled SRM and a new liquid-helium-free SRM at the University of Southampton. We show that normalization of measurement data using a nine-element "effective-length" matrix calculated from sensor response estimate reduces differences in measurement data, and deconvolution using accurate sensor response estimates yields highly consistent and high-resolution results for data from the two SRMs.

In addition, we measured a thin section sample both on an SRM and on a scanning SQUID microscope (SSM) at the Geological Survey of Japan (Pastore et al., 2021). URESPONSE was used to calculate average magnetization and magnetic moment of the thin section for SRM measurements. We show that magnetic moment calculated using the SRM data is consistent with the sum of estimated magnetic moments of individual magnetic grains within the thin section (Pastore et al., 2021) only if accurate estimate of SRM sensor response (including all cross terms) are used. Development is ongoing to integrate SRM sensor response over the volume of a discrete sample with various shapes to restore accurate magnetic signal preserved in the samples. Evaluation will be done to see differences with corrections using sensor responses calculated for discrete sample volumes with various shapes.

References

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