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SQUID Magnetometer Calibration and Data Analysis

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The SQUID (Superconducting Quantum Interference Device) is a very sensitive magnetometer that measures magnetic flux using flux quantization and Josephson tunnelling. Compared to traditional fluxgate magnetometers, SQUIDs could detect and measure flux to a femtotesla. SQUIDs are prospective instruments for the use of monitoring geomagnetic storms and predicting space weather due to their sensitivity and accuracy for measuring the Earth's magnetic field. Assessments have shown that this is the case for when SQUIDs are unshielded. Here at SANSA, in South Africa, there are two magnetometers: a Magnetic Observatory fluxgate magnetometer and an unshielded SQUID magnetometer. The magnetometers are co-located in an area that is magnetically quiet as to not interfere with data collected by the magnetometers. In this project, the collected data from the SQUID magnetometer will be compared to the data from the fluxgate magnetometer. The SQUID is a relative instrument and not an absolute instrument, so calibration is required in terms of amplitude of the SQUID data as well as orientation of the SQUID axes. Currently, the main objective of the project is to calibrate the data from the SQUID so that it best matches the data from the fluxgate. Once that is accomplished, the next focus is to attenuate the environmental noise by creating an off the grid SQUID magnetometer. An off the grid SQUID magnetometer entails the use of a battery or a portable power source for the observation of the Earth's magnetic field.

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Primary author: JOHN, Dominique (University of Michigan, USA)

Co-authors: SAUNDERSON, Elda (SANSA); Dr MOLDWIN, Mark (University of Michigan, USA)

Presenter: JOHN, Dominique (University of Michigan, USA)

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