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Correlation between SQUID data and ionospheric and/or seismic events

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Abstract content
   (Max 300 words)

The Superconducting QUantum Interference Devices (SQUIDs), are fairly recent types of magnetometers, that use flux quantization combined with Josephson tunneling to detect very faint (˜fT) magnetic fields. Recent studies have shown that these highly sensitive magnetometers
located in an ultra-low-noise environment, are capable of observing Earth-ionosphere couplings, such as: P waves emitted during earthquakes or magnetic storms in the upper atmosphere; S and T breathing modes of the Earth during quiet magnetic & seismic periods. Since SQUIDs are much more sensitive compared to conventional magnetometers, they are arguably the best tool for understanding space weather and natural hazards, whether they are produced from space,
within the ionosphere by magnetic storms for instance, or natural disturbances, including magnetic disturbances produced by earthquakes or as a result of the dynamics of the Earth's core. A study was conducted at SANSA Space Science in Hermanus (WC), to find the correlation between SQUID and Fluxgate data sets, with the aim of validating the use of SQUID as reliable instrument for Space Weather observations. In this study, SQUID data, obtained
from the Low Noise Laboratory (LSBB) in France was compared to fluxgate data sets from three closest observatories to LSBB, namely; Chambon la Foret (France), Ebro (Spain) and Furstenfeldbruck (Germany), all further than 500 km from LSBB. As a follow-up study, our aim is to correlate SQUID data at Hermanus with ionospheric and other
magnetic data available on-site.In the previous study, the three-axis SQUID used comprises of three
low−Tc devices operated in liquid helium in an underground, magnetically
clean environment shielded from most human interference. The SQUID
magnetometer operated at Hermanus for the duration of this study is a
high-Tc two-axis device (measuring the z and x components of the geomagnetic field). This SQUID magnetometer operates in liquid nitrogen, and
is completely unshielded in the field of about 26 µT. The environment is
magnetically clean to observatory standards, but experiences more human
interference than that at LSBB. The high-Tc SQUDs also experience 1/f
noise at low frequencies which the low-Tc SQUIDs do not suffer from, but
the big advantage to the current study is that the SQUIDs are within 50
m from the observatory fluxgates.

Apply to be
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Yes

Level for award
 (Hons, MSc,
   PhD)?

MEng

Main supervisor (name and email)
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Would you like to
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Yes

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