Abstract: In keeping with the philosophy that "what the world needs now is a good $500 magnetometer" we have done further development and testing on what seems to be a very stable low-cost triaxial magnetometer. With core sensor per axis we were able to get detection limits of less than 1 nT with one-second sampling.

Timing is derived from a GPS heartbeat pulse.

Experiments showed that designs with two sensors per axis produced more problems than they solved.

Ground magnetic fields arise from numerous sources. In order to study these the simultaneous measurement of magnetic signals from multiple sites is required. The best way to do this is by deploying low cost magnetometers at many sites.

Conclusions

Pulse-Counting Magnetometers (PIComags)

The key technology for our inexpensive magnetometers is the Speake PFG100 circuit board. Our prototype has a 16-bit counter, 1.2 V, 10 Hz. The PFG100 version is optimally run at 1 Hz. The limit of a PIComag with a simple counting circuit is slightly lower than the three PICs in our system. We have come to the conclusion that the PIComag is capable of resolution which for practical purposes is useful. In addition, it has GPS-based timing so that it can be used to study rapidly varying phenomena.

Clearly, the PIComag is capable of resolution which for practical purposes is useful. In addition, it has GPS-based timing so that it can be used to study rapidly varying phenomena.

The limit of a PIComag with a simple counting circuit is slightly under 1 nT resolution, and it is optimally run at 1 Hz. These limits are not easily exceeded, but are suitable for many types of studies.

References:

Simple Aurora Monitor pages: http://sam-europe.de/


Microchip: http://www.microchip.com

Acknowledgement

Bob Irwin of Northern Lakes College has been a key partner in AUGO array placements and testing including a test PIComag. PIComag measurements and calibration were done by Ben Warrington, formerly of AUGO. AUGO is the Athabasca University Geophysical Observatory.

Conclusions

We met our design goal of producing a research quality magnetometer at a very low cost. A new and better PCB design has been professionally manufactured, this or a design based on premade boards could allow many magnetometers to be deployed for research and education.