How do we put a HamSCI Personal Space Weather Station in Antarctica?

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Introduction

Antarctica's unique geomagnetic location and minimal human-made electromagnetic interference make it an ideal site for geospace research. The McMurdo and South Pole Stations are already equipped with a variety of instruments for continuous observation of space weather events affecting critical systems like spacecraft, GPS, radio communications, and power grids. This project focuses on updating and improving the space weather instruments at these stations. This report discusses the current status of RF equipment at South Pole Station and the potential for future research.

Station Locations

Figure 1. Map of Antarctica showing the locations of South Pole, Palmer, McMurdo, and Neumayer Stations.

Equipment

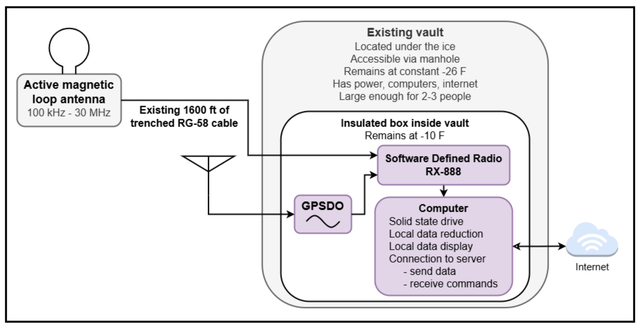


Figure 2. Block diagram representation showing main elements of the proposed PSWS system in Antarctica.

Receiver

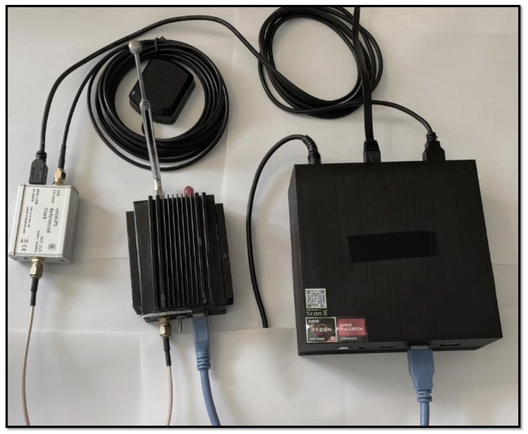
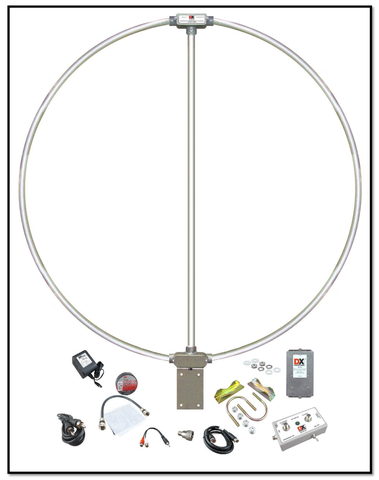


Figure 3. The WSPRDaemon – GRAPE Full Spectrum Receiver is a component of the HamSCI personal space weather station (PSWS) capable of receiving the entire MF and HF bands [1].

Antenna



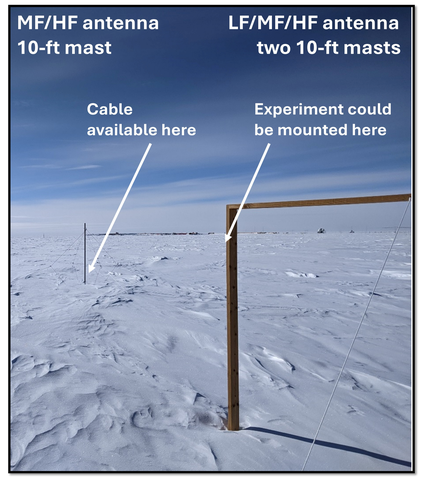


Figure 4. (Left) The RF Pro 1B active magnetic loop antenna can receive signals in the 100 kHz to 30 MHz range [2].

Figure 5. (Right) Antenna mast in the vicinity of South Pole Station. An RF Pro 1B antenna may be mounted to this mast in the future.

Observations from Neumayer German Antarctic Station

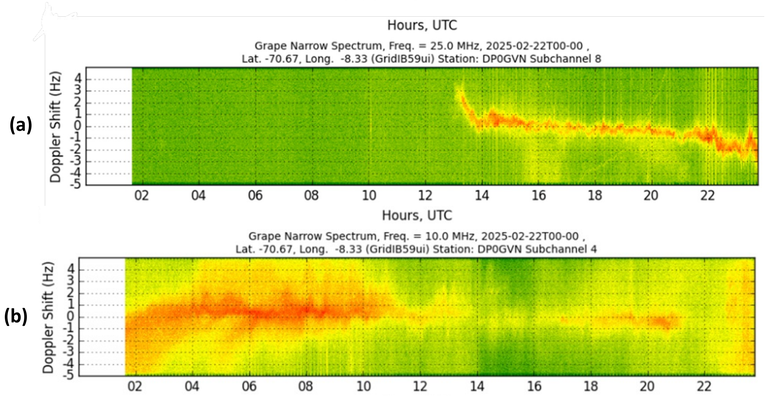


Figure 6. HF Doppler observations of signals of opportunity at (a) 25 MHz and (b) 10 MHz made at the Neumayer German Antarctic Station. Received signals are on the same frequency as the WWV, Fort Collins, Colorado, USA transmitter, although exact signal source observed here needs further confirmation. Observations on both frequencies show evidence of diurnal variations and small-scale ionospheric variability.

Plans for South Pole Deployment

- The earliest date team members can deploy to South Pole Station is the 2026-2027 field season
- Plans for the next two years include site survey and potentially sending equipment to research technicians in Antarctica

Conclusion

The aim of this project is to install PSWS instrumentation in Antarctica within the next few years. The uncertain status of some of the current equipment and environmental considerations present some challenges. However, the existing infrastructure at South Pole Station provides valuable opportunities for future work.

References

[1] HamSCI. *WSPRDaemon Grape – Overview, Specifications, Sourcing*. hamsci.org/wsprdaemon-grape-overview-specifications-sourcing

[2] DX Engineering. *DX Engineering RF-PRO-1B® Active Magnetic Loop Antennas DXE-RF-PRO-1B*. dxengineering.com/parts/dxe-rf-pro-1b

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