Development of Quality Control Metrics for Variometer Magnetic Data Using Geomagnetic Observatory Measurements

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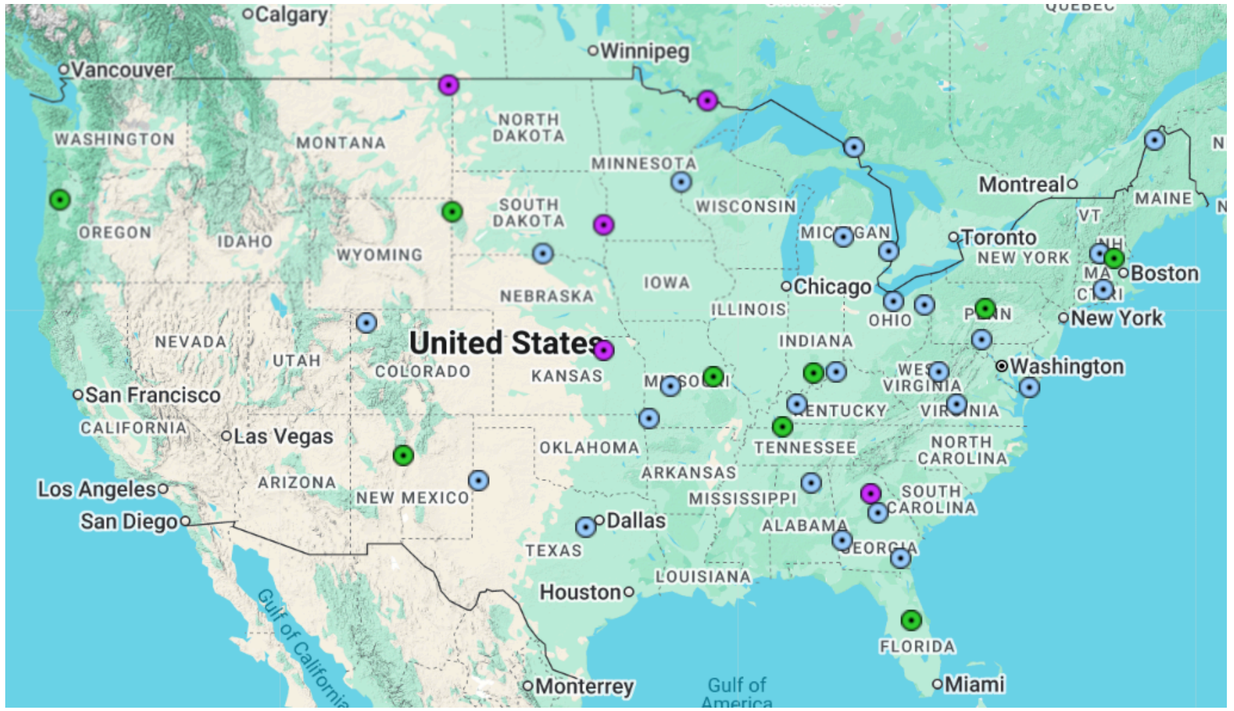
Introduction

- USGS has installed several variometers across US in past decade (right)
- Variometers measure relative change in magnetic field
- Variometers are lower cost and easy to deploy
    - Expands monitoring coverage



US locations of variometers (NSF SAGE)

Problem

In the absence of absolute calibration from geomagnetic observatories, assesing the quality and reliability of variometer data remains challenging.

Project Goals

Wire, Test, & Deploy Two Variometers

- Use the USGS Geomagnetism lab to wire, test, and callibrate two new variometers
- Deploy variometers near the Boulder Magnetic Observatory

Evaluate Variometer Data Quality

- Compare variometer magnetic measurements with reference observatory data
- Identify and quantify issues such as noise, drift, and offsets

Develop Quality Control Metrics

- Create reproducible metrics to assess the reliability of variometer data
- Create automated data quality checks

Primary Data Sets

Fairbanks, AL

- Geomagnetic Observatory
- Variometer

Tucson, AZ

- Geomagnetic Observatory
- Variometer (pending install)

Boulder, CO

- Geomagnetic Observatory
- Variometer (pending install)

Boulder Magnetic Observatory (USGS)

Field Work

- Install of two variometers at the Boulder Magnetic Observatory in late February / early March
- Assess metrics at three locations with observatory + variometer data

Timeline

Phase 1: Jan - Feb

- Gain access to magnetometer lab @ USGS Golden
- Wire and test two variometers

Phase 2: March

- Field Install
- Exploratory data analysis
- Algorithm & metric development

Phase 3: April

- Application to broader variometers
- Figure & report development

Phase 4: May

- Final report and presentation development

Impact

- Improve variometer data quality at sites without full observatories
- Increase confidence in variometer data use in research and science
- Support expansion of variometer networks

Questions?