

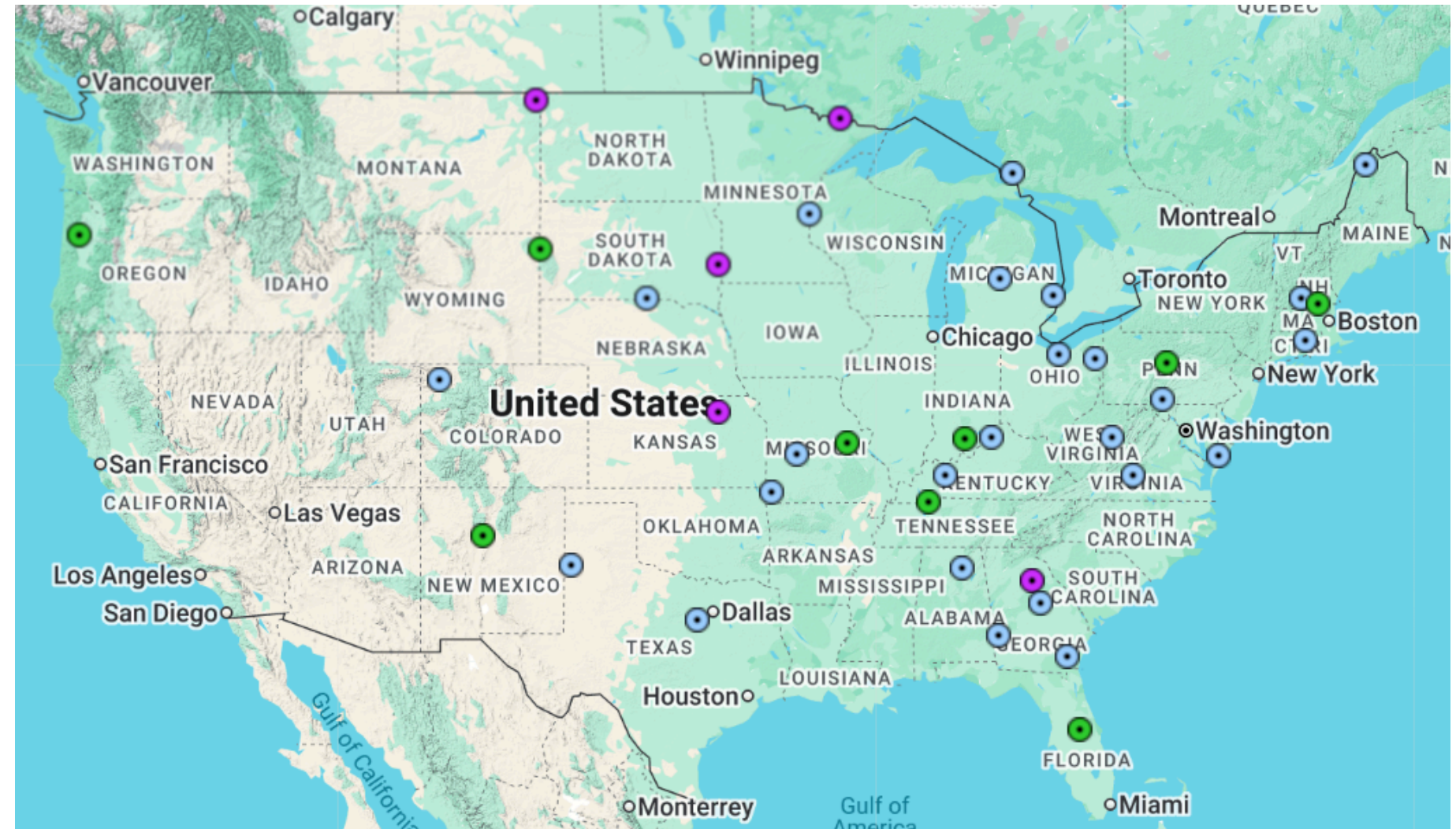
Development of Quality Control Metrics for Variometer Magnetic Data Using Geomagnetic Observatory and Collocated Seismic Measurements

Julia Berglind & Peyton Chandler, Department of Geophysics

Advisors: Rich Krahenbuhl (CSM), Brian Shiro (USGS), Adam
Ringler (USGS), & Josh Rigler (USGS)

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



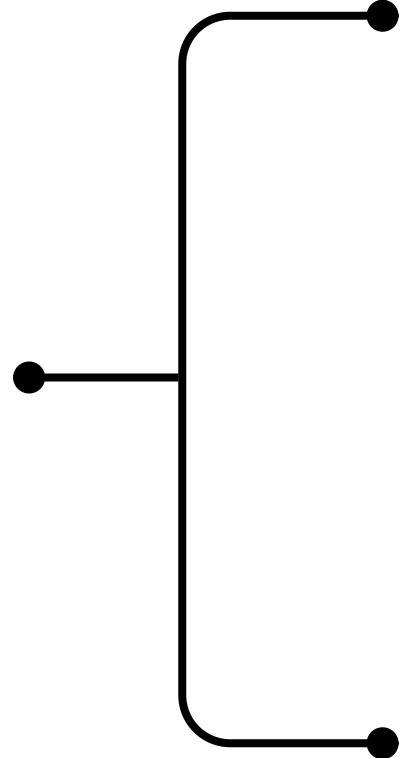
US locations of variometers (NSF SAGE)

Seismic Colocation



- Variometer + seismometer + geomagnetic observatory
- Seismic instruments can pick up magnetic-field induced noise
 - Changes in Earth's magnetic field can induce currents at seismic stations
 - Currents may look like ground motion
- Compare time-series magnetic and seismic data to find potential correlations
- Integrate into metrics

Problem



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

Project Goals

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
- Seismometer

Tucson, AZ

- Geomagnetic Observatory
- Variometer (pending install)
- Seismometer (~15 km away)

Boulder, CO

- Geomagnetic Observatory
- Variometer (pending install)



Boulder Magnetic Observatory (USGS)

Field Work

- Potential install of variometer 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
- Exploratory data analysis & pre-processing

Phase 2: March

- Field work @ Boulder Observatory
- Algorithm and 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
- Develop framework for colocation of magnetic and seismic data



Questions?