Michigan State University and Partners

Questions and Contact Info

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CORS Dashboard

A Tool for Enhanced Monitoring of a CORS Network
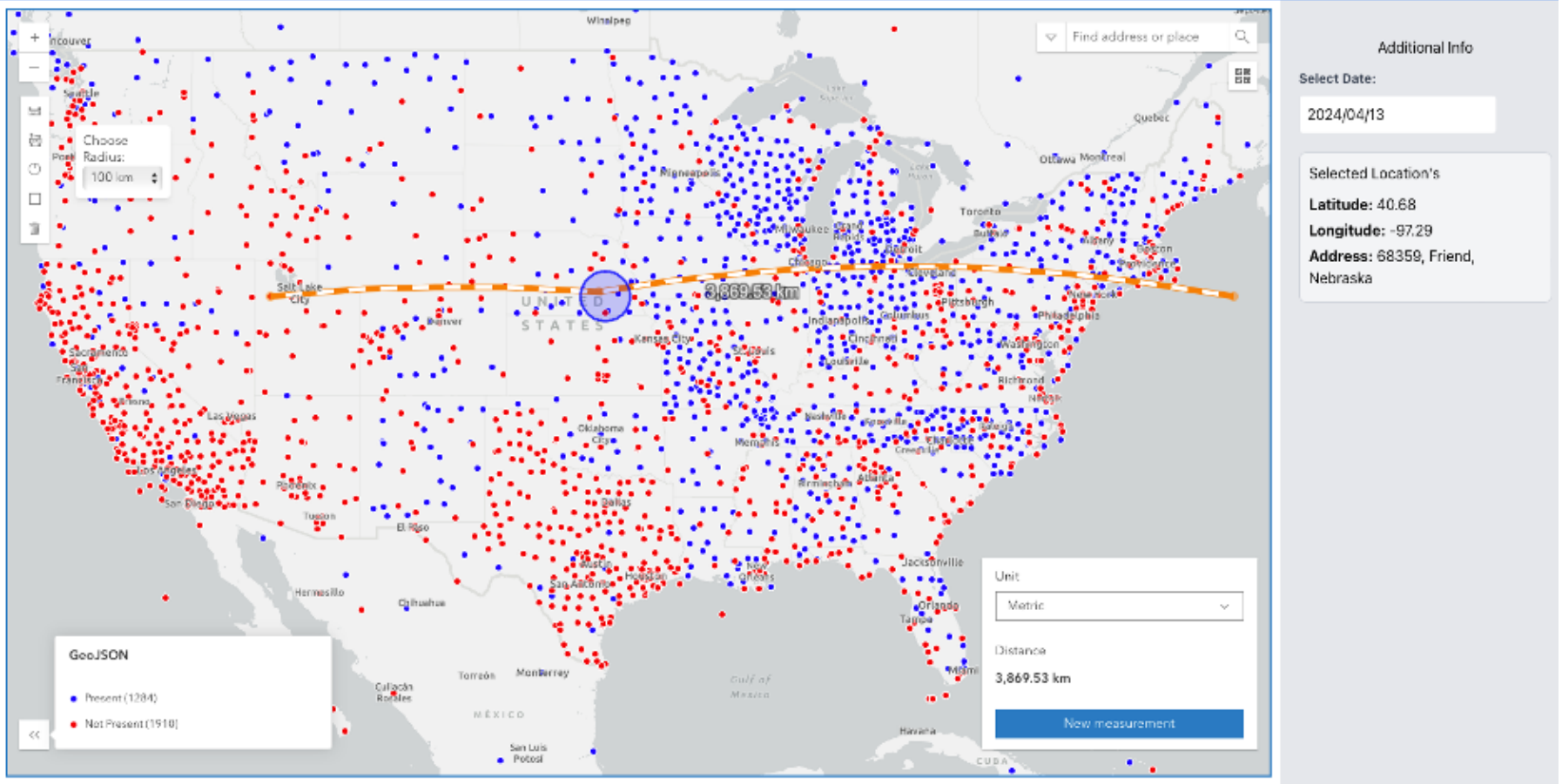
What is the Error in Your Position?

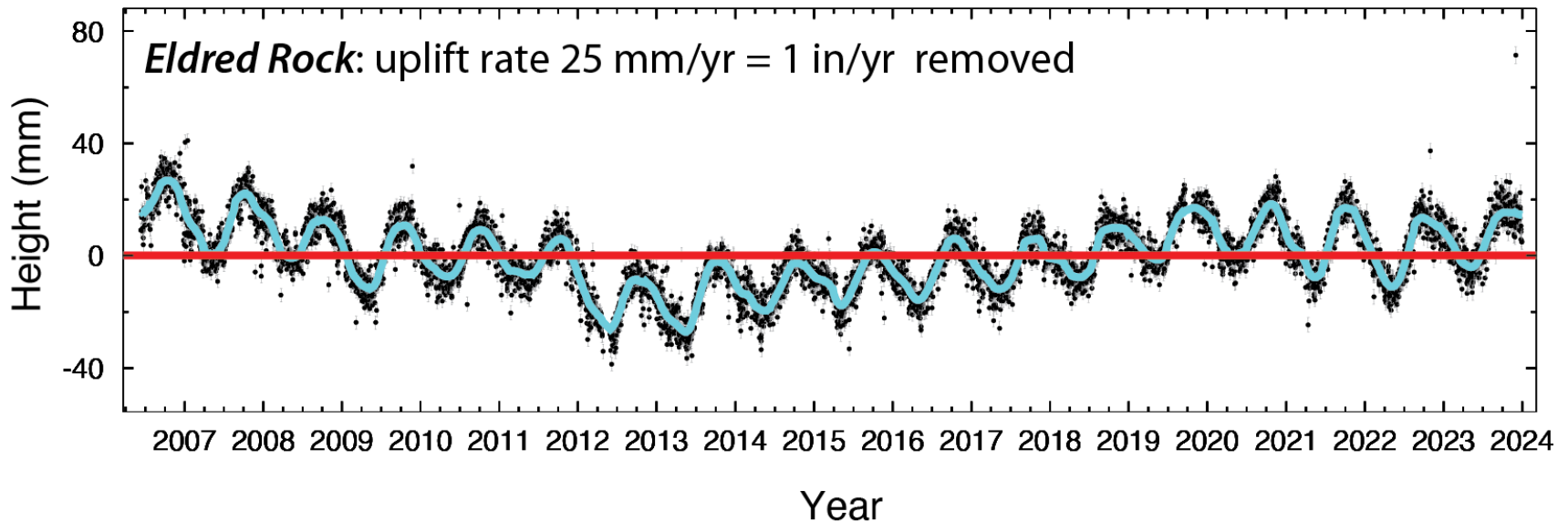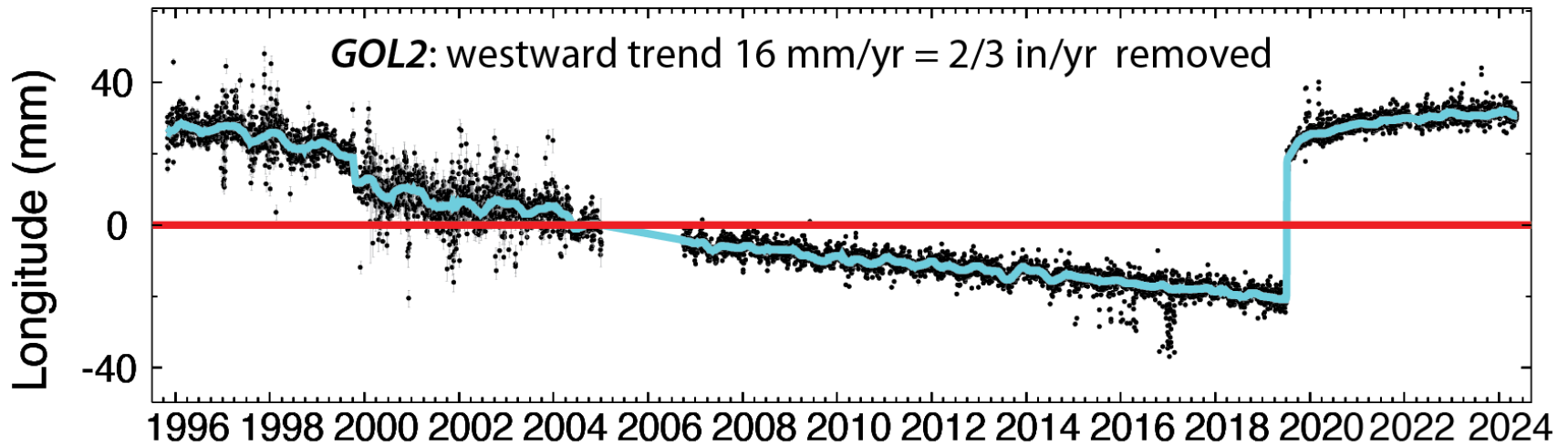$$\sigma^2_{total} = (\sigma^2_{yours} + \sigma^2_{ref})^{0.5}$$

You control

You expect this to be small

- Keeping the error in the spatial reference system small is hard work on a moving, actively deforming Earth!

Enhanced Monitoring of CORS Network

- Are the CORS stations in the locations we think they are?

- If so, hooray!

- If not, can we identify the cause and repair the coordinates?

- Common causes:
  - Earthquakes and other transient tectonic events
  - Equipment changes
  - Inaccurate velocity models
  - Time-varying deformation such as hydrology

Examples

GOL2: westward trend 16 mm/yr = 2/3 in/yr removed

Eldred Rock: uplift rate 25 mm/yr = 1 in/yr removed

Not Just a California/Alaska Problem!
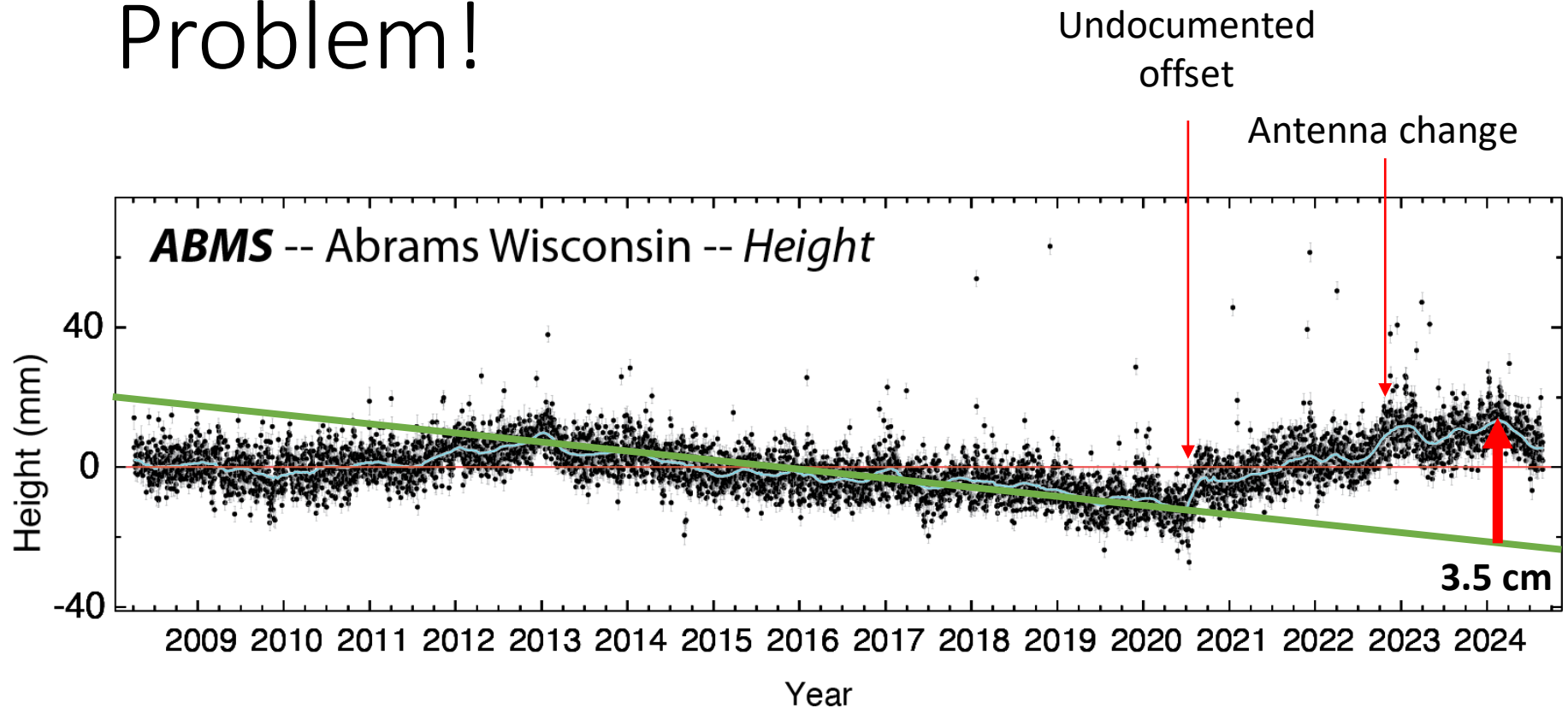
Why is this?

- *Elastic deformation of the solid Earth due to the changing load (weight) of water in the Great Lakes (plus other surface water and groundwater)*

Modules Within CORS Dashboard

- Compare Solutions:
  - With other solutions
  - With Velocity Model

- Compute and Display Metrics, select CORS stations based on metrics

- Earthquake and Postseismic Deformation Modeler:
  - Ingest fault model solutions and generate predictions
  - Statistics on agreement of different fault models
    - How well do the range of geophysical models agree?
  - Forward predict postseismic deformation

Geodesy Master's Program Consortium

Geodesy Master's Degree

- Online
- Coursework-based (no thesis), 2-year program
- Students will take mix of courses from the consortium institutions
- Coursework divided into thematic areas:
  - Foundations of Geodesy
  - Fundamentals of Geodesy and Geophysics
  - Mathematical and Computational Concepts
  - Geodetic Methods and Applications

Foundations of Geodesy

Courses:
- Map Projections (MSU)
- Geodetic Models (MTU)

• Both courses required

• Courses provide background in mapping, projections, datums, reference frames, and transformations.

Fundamentals of Geodesy and Geophysics

Courses:

- Modern Geodesy and Applications (MSU) or Geodetic Methods and Applications (UAF)

- Geodetic Data Processing and Analysis (MSU)

- Solid Earth Geophysics and Geodynamics (MSU) or Foundations of Geophysics (UAF)

- Positioning with GNSS (MTU)

• Students choose at least 2 courses

• Courses provide background in geodetic theory (including orbit determination and GNSS and imaging satellite systems), measurement and interpretation of steady state and time variable motions within the solid Earth, cryosphere, and hydrosphere, data processing, and geophysical modeling.

Mathematical and Computational Concepts

Courses:

- Introduction to Numerical Tools for Earth and Environmental Sciences (MSU)
- Programming and Automation for Geoscientists (UAF)
- Data Analysis and Adjustments (MTU)
- Inverse Problems and Parameter Estimation (UAF)
- Numerical Analysis (UAF)

- Students choose at least 2 courses
- Courses will provide foundation in programming and mathematical techniques (including inversion theory and linear regression) essential for geodesy

Geodetic Methods and Applications

Courses:

- 3D Surveying and Modeling with Laser Scanning Data (MTU)

- Advanced Photogrammetry – Satellite Photogrammetry (MTU)

- Microwave Remote Sensing (UAF)

- InSAR and Its Applications (UAF)

- Digital Image Processing in the Geosciences (UAF)

- Design of Geodetic Networks (MSU)

- Advanced Hydrogeology (MSU)

- Students choose at least one course

- Courses extend knowledge into additional land- and satellite geodetic techniques, network design, and geophysical applications

Timeline for Development

- 2024: Develop University consortium agreements and establish structure for Master's program

- 2024/2025: Develop courses

- Fall 2025: Launch program with first class of students

- *This timeline for launch currently feels optimistic due to bureaucratic hurdles*