Permanent seismic monitoring in a remote location: Upgrades at Turtle Mountain

Henry Bland, Kevin Hall,
Robert R. Stewart

Overview

- Monitoring hardware
- What worked well, what worked less well?
- Improvements
- Successes
- Conclusions

Station Locations

Surface seismic monitoring stations

- Six stations
- 1 KHz sample rate
- 24/7 operation for 1.5 years so far
- >50,000 event files recorded

Reliability

- Seismic data acquisition
- Radios & antennas
- Solar power systems
- Data acquisition and processing computers and software
- Control centre power
- Geophones

Seismic data acquisition

- Purpose-build low-power acquisition system
- After working out the bugs, very reliable
- Failures most often caused by lightning

Radio and antenna replacements

Challenges

Geophones

On installation day

Geophones

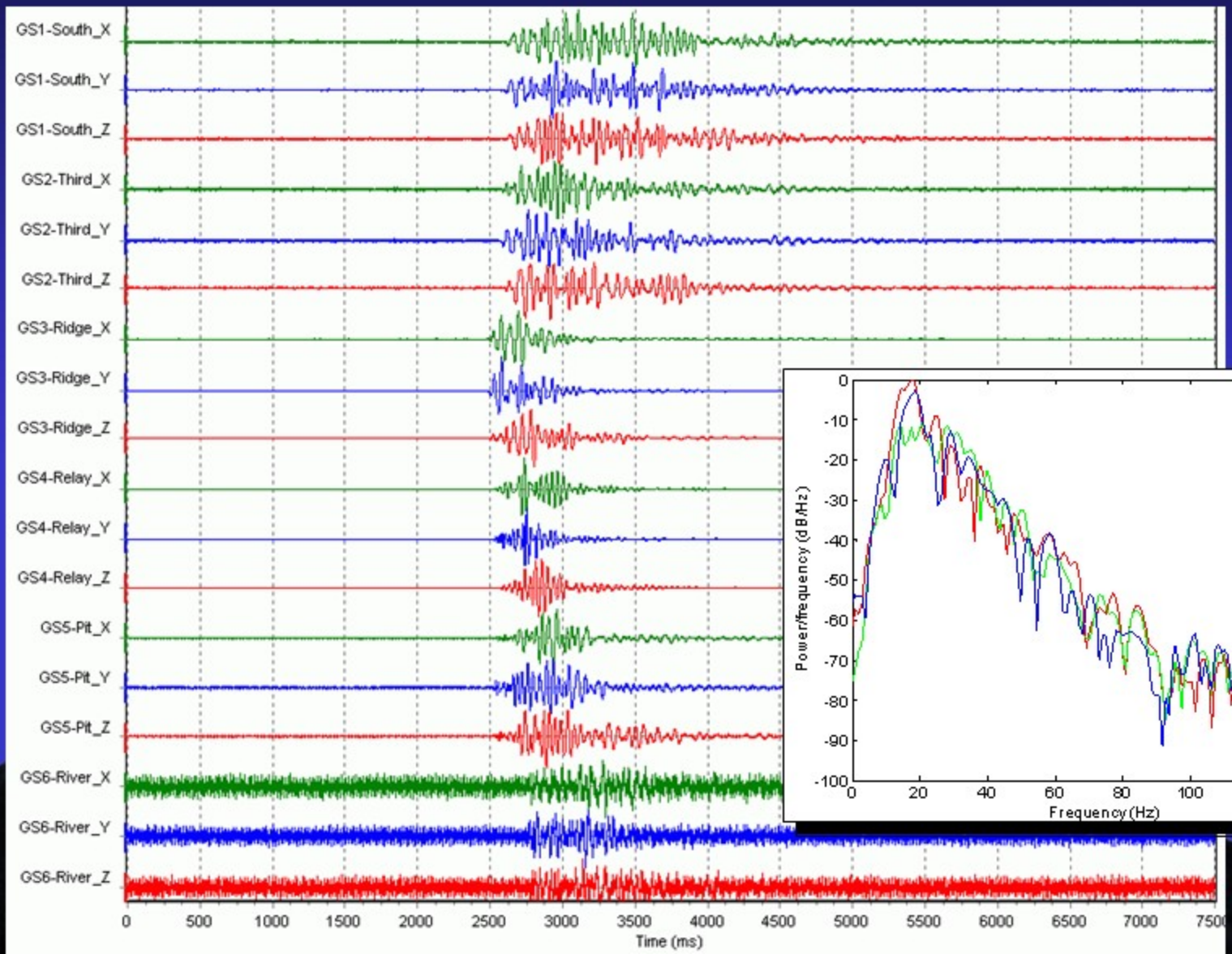
After eight months

Solar power systems

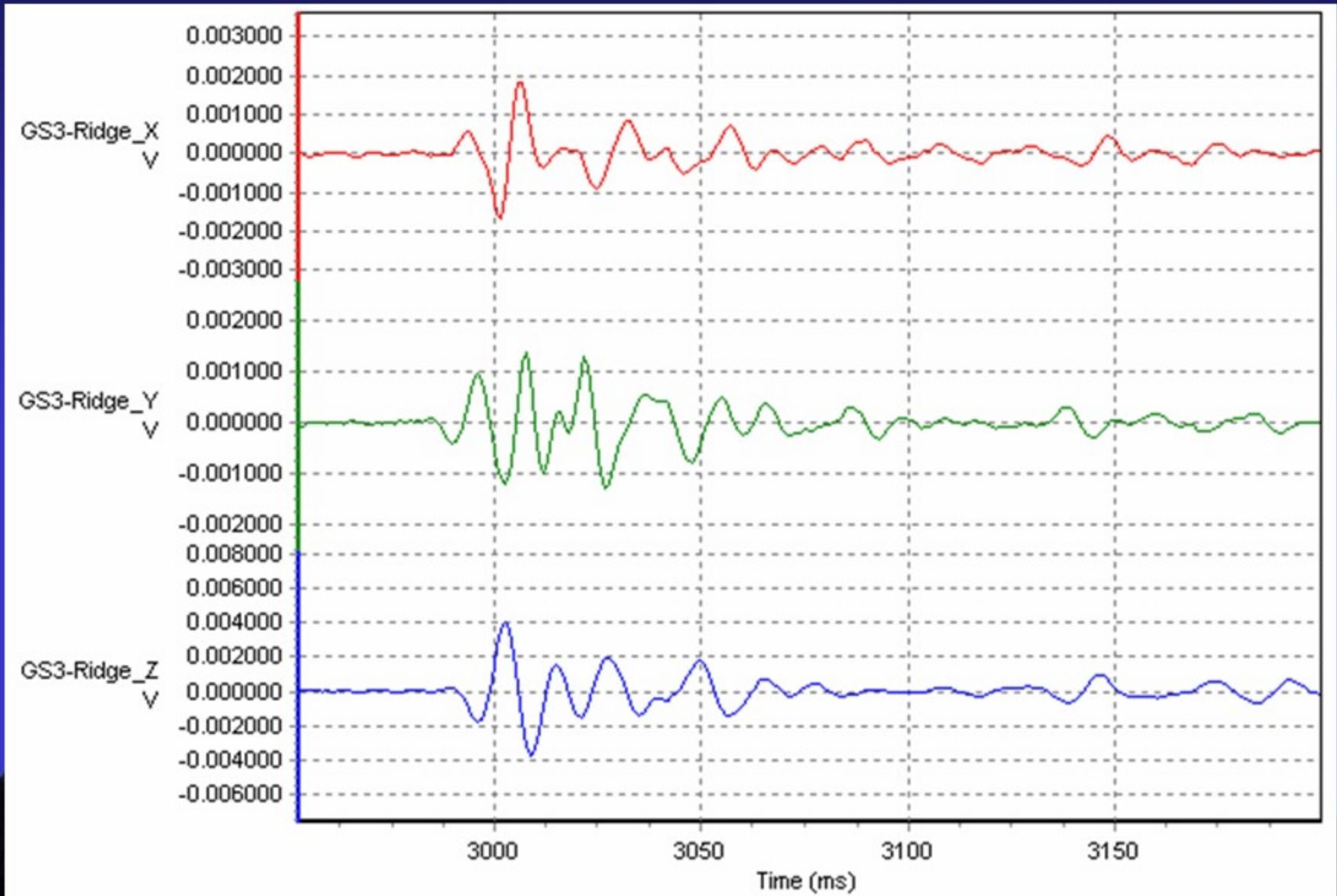
Data acquisition and processing

- Hard drives
  - 3 of 6 drives failed in 2 years.
    RAID to the rescue.
- Software Issues
  - Event triggering needs to be more selective
  - Source location software needs work

Seismic event from Turtle Mountain



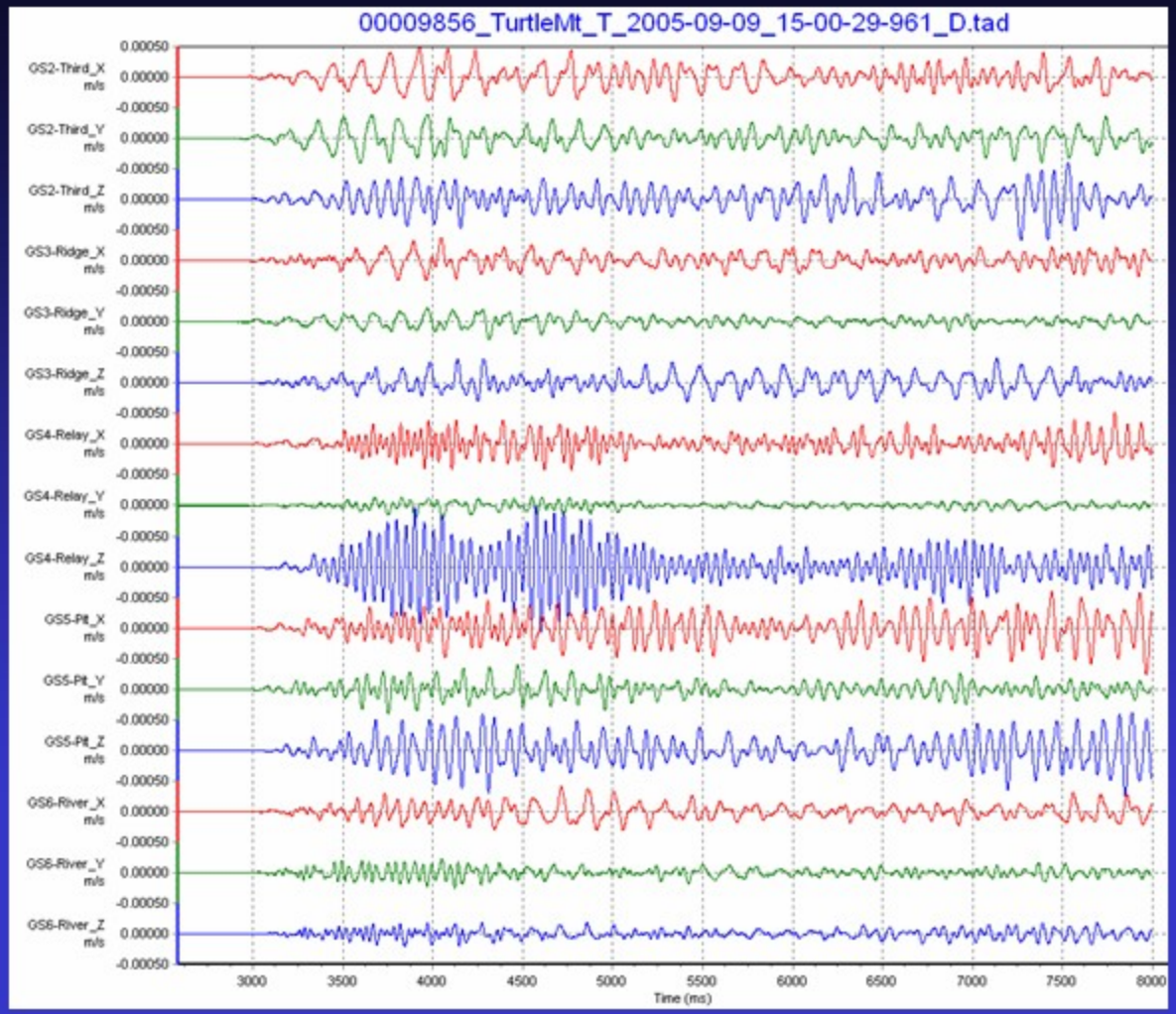
3-C geophone output



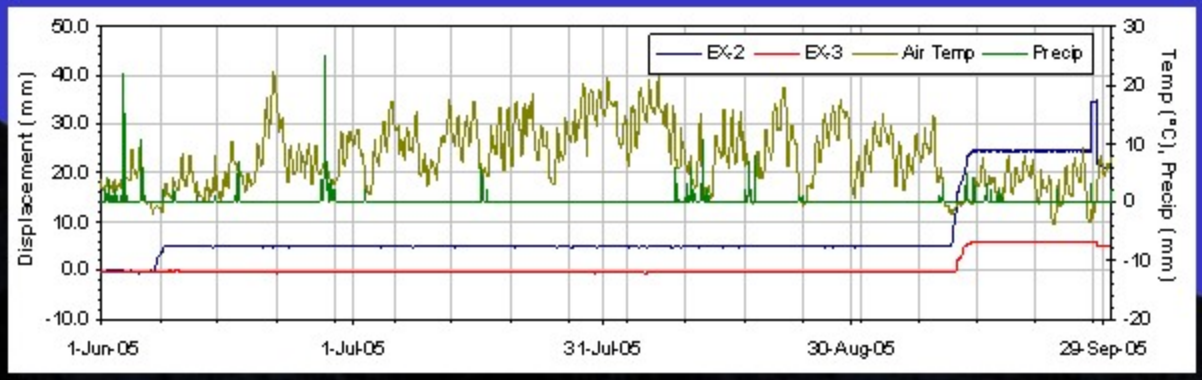
New Micro-array location

New Micro-array location

Micro array



Relevant data example



Conclusions

- Harsh environments demand dependability or redundancy
- Decouple systems
- Design wireless network loads much lower than the published capacity
- Current passive seismic technologies require supervision in these environments

Acknowledgements

Alberta Geological Survey

- Willem Langenberg
- Corey Froese
- Fransisco Moreno