The AGAP Seismic Deployment: Solutions to Logistical and Technical Challenges.

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Introduction

Technical Challenges

Logistical Challenges
Background: What is the AGAP Project?

- Study of the Gamburtsev Mountains
- GAMBIT: Aerial Geophysical Survey (Gravity, Radar, ...)
- GAMSEIS: Seismic Network (Seismic Tomographic Study)
Map of the GAMSEIS Array
A Typical Station in the Array
Logistic Challenges:

✧ Accessibility:
  • Limited opportunity to access site
  • Large distances to cover
  • Problems in case of Emergency

✧ Temperature:
  • Hard on personnel
  • Hard on equipment
  • Good for ACL

✧ Altitude:
  • Mostly hard on personnel (fatigue)
  • Bad for ACL (loose all the gains from Temperature 😞)
  • Need for Oxygen
AGAP Array size compared to US
Logistic Challenges (cont’d):

◊ Length of season:
  • Only very limited time window to do the work. Everything has to happen fast.

◊ Weather:
  • Usually good on the Plateau, but aircraft minima are pretty high.
  • Sastrugis can be a problem. Thank goodness for KBA pilots!

◊ Cost! : ~90hrs of Twin Otter for 26 sites, with 8 personnel + extra help.
Technical Challenges:

✧ (Extreme) Temperature:
  • De-rating of batteries.
  • Electronic stop working.
  • Makes everything brittle.
  • Need for very large amount of insulation.

✧ Power:
  • Big problem in winter, not in summer.
  • Strive for low power → low heat → T problem and vice-versa
Speaking of Power
Technical Challenges (cont’d):

✧ Reliability:
  • Particularly necessary because of the inaccessibility.

✧ Near real time data vs long term storage:
  • Can be an issue with PI (No data for a long time)
  • Law of diminishing returns: cost of additional expensive Lithium batteries to run real time telemetry versus cost of visit to the site.
  • Is it really necessary to get data real time?
Solutions to Most Challenges

- Small
- Light
- Fast
Small & Light

- Less ACL limits and volume limits
  ➔ Can service/install more than one site per mission

- More personnel can join forces for the service/install run
  ➔ Operation goes faster...

... which brings us to the next point
Fast

• Simple install or service means that we spend less time at the site, which means we can go through the array faster.
• This allows for more down time (if needed) and weather days.
• This makes it easier on the personnel, especially concerning altitude issues.
• One advantage of working at very high latitude: Light 24/7. We were able to work with day and night crews.
Fast (cont’d)

• To achieve this:
The system is designed with minimum assembly on site.
All that need to be done on site is:
  – Burry sensor
  – Burry electronic box
  – Install solar panels

• The whole operation takes < 1hr with a crew of 4.
Fast
Conclusion:

• Year around seismic data recording on the Antarctic Plateau offer lots of challenges.
• Solutions involve simple designs that involve small and light equipment.
• Solutions also involve equipment that can be deployed rapidly.

• Questions?