UNAVCO

Powering Science at High Latitudes

Nicolas Bayou – UNAVCO Polar Services

Polar Technology Conference 2015 – Denver. CO

Outline

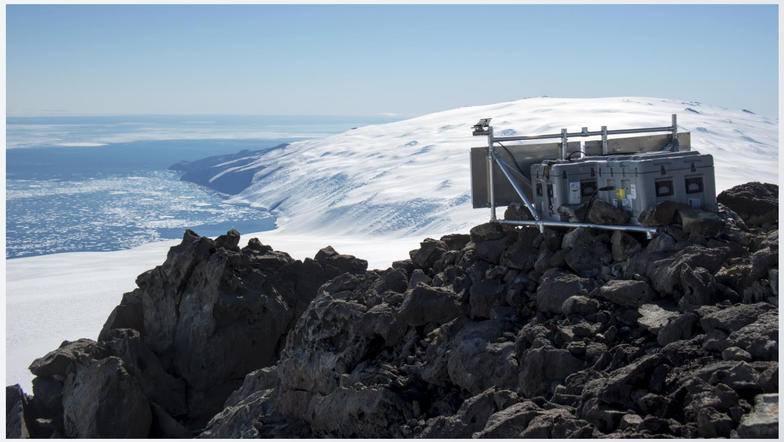
- UNAVCO at a glance
- UNAVCO Polar Services
  - POLENET
  - Power & Communication Systems
  - The Future

UNAVCO at a glance

- 30 years serving the science community
- Non-profit university-governed consortium, facilitating geoscience research and education using geodesy. Government funded (NSF, NASA).
- Headquartered in Boulder, CO
- Offices in Anchorage, AK, San Clemente, CA & Portland, OR

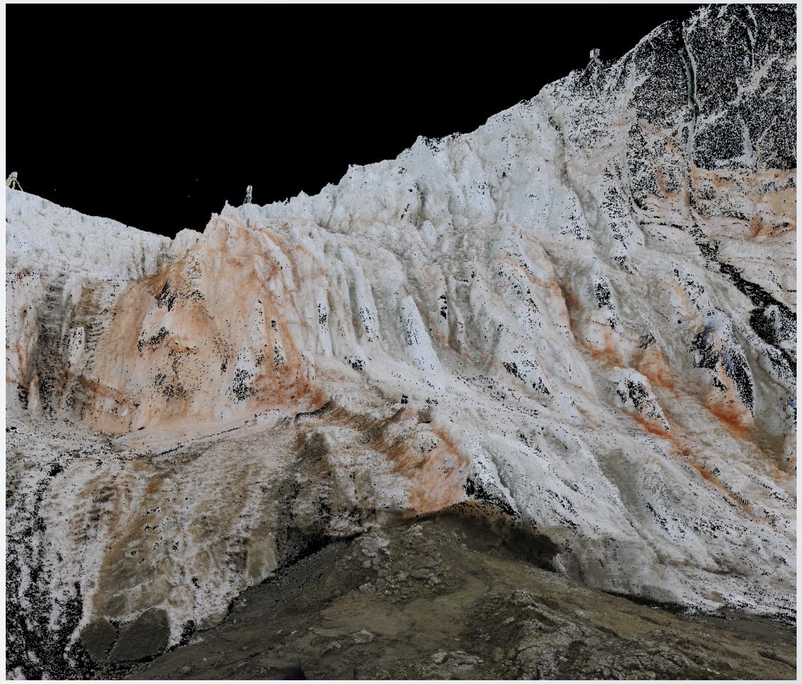
UNAVCO at a glance

- We offer:
  - Operation and support of geodetic networks
  - Technical support
  - Free and open data archive
  - Software development for accessing and processing data
  - Training



UNAVCO Polar Services

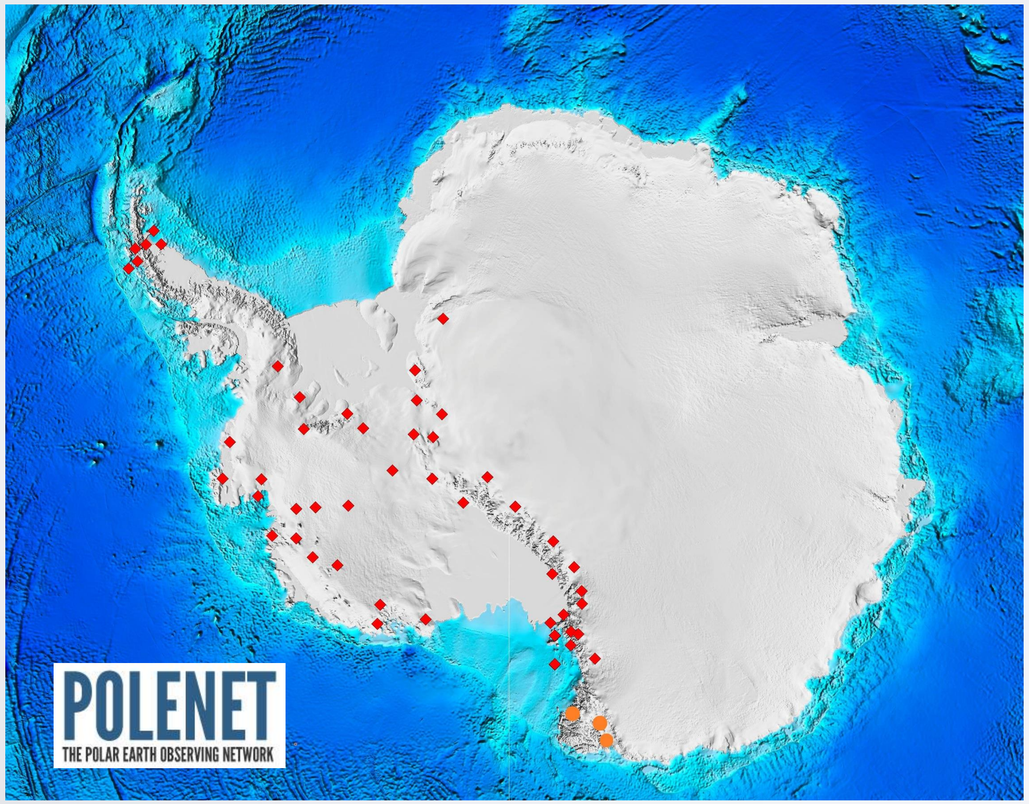
- 7 Professional staff dedicated to supporting polar research projects
- Precise GPS land surveying & 3D Mapping with LiDar



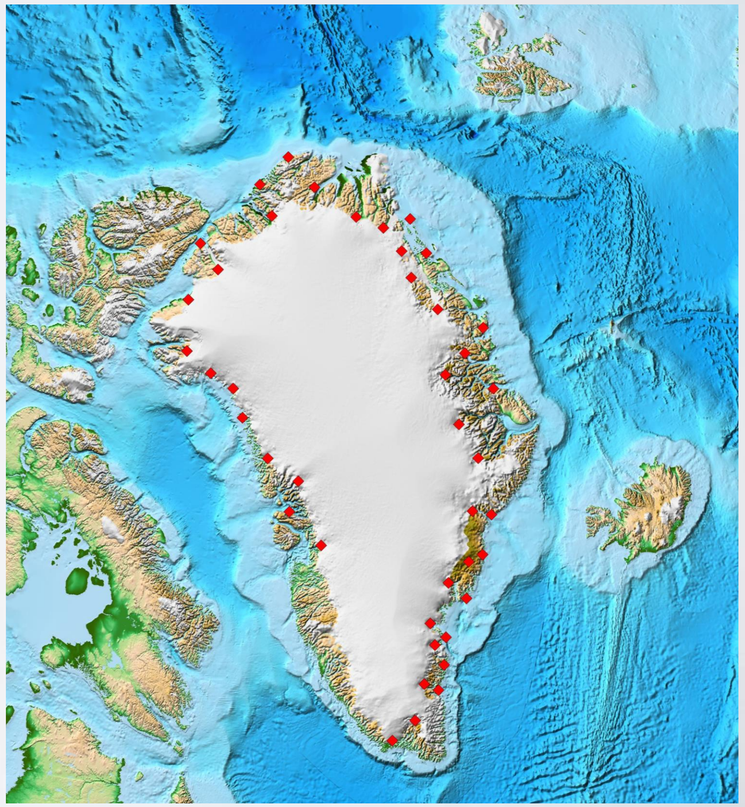
GPS Sites Network & Management

- POLENET: GPS Stations Network

Antarctica – 54 Stations (3 new sites!)

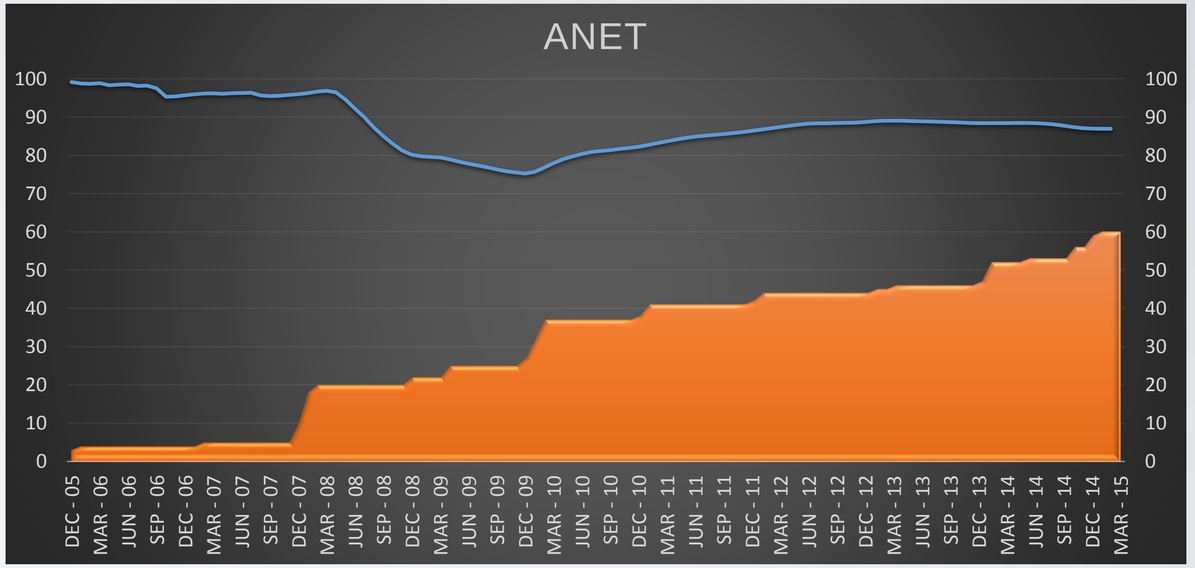


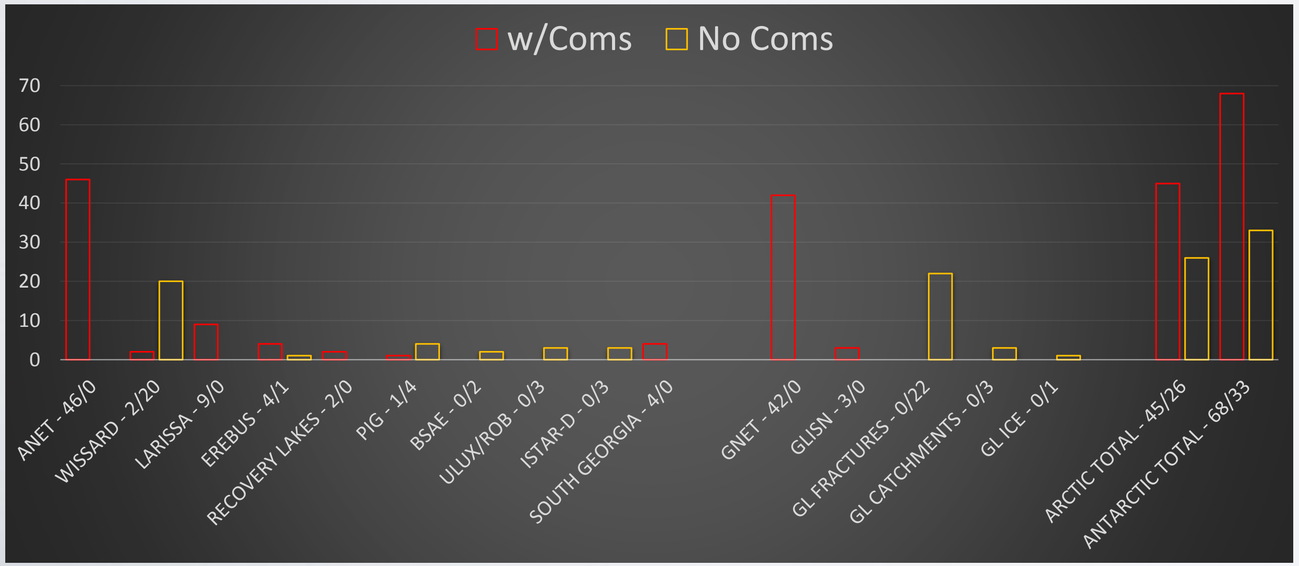
Greenland – 42 Stations

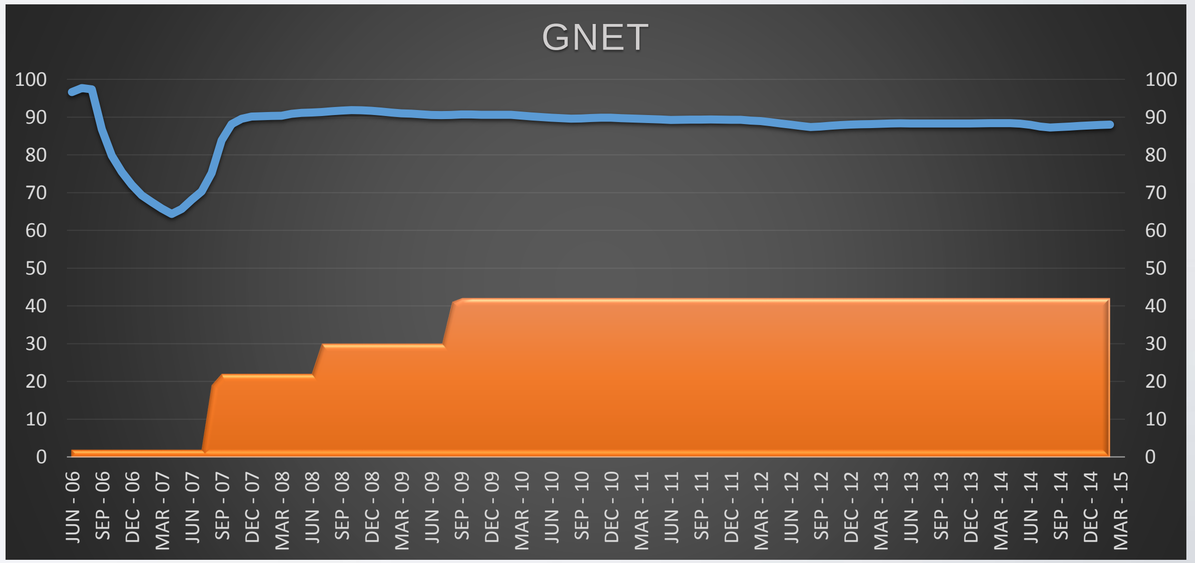


GPS Sites Network & Management

Overall Data Return (Feb. 2015):
ANET: 87.1%
GNET: 88.1%





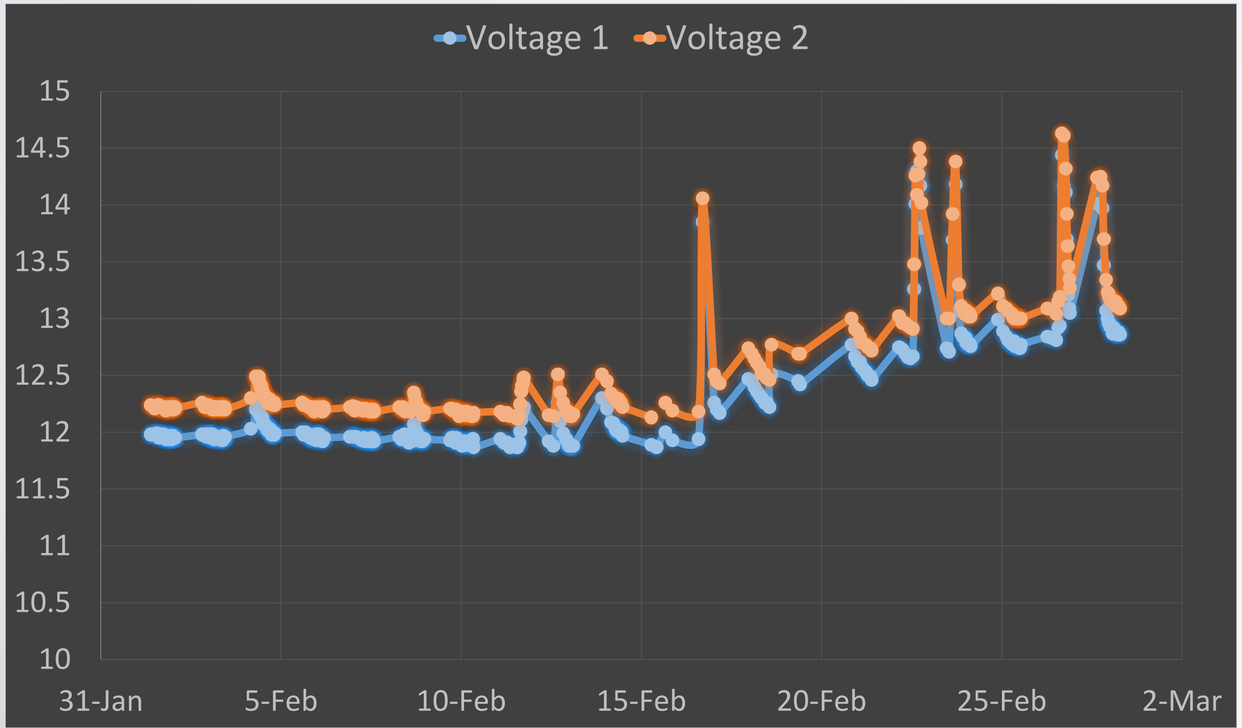


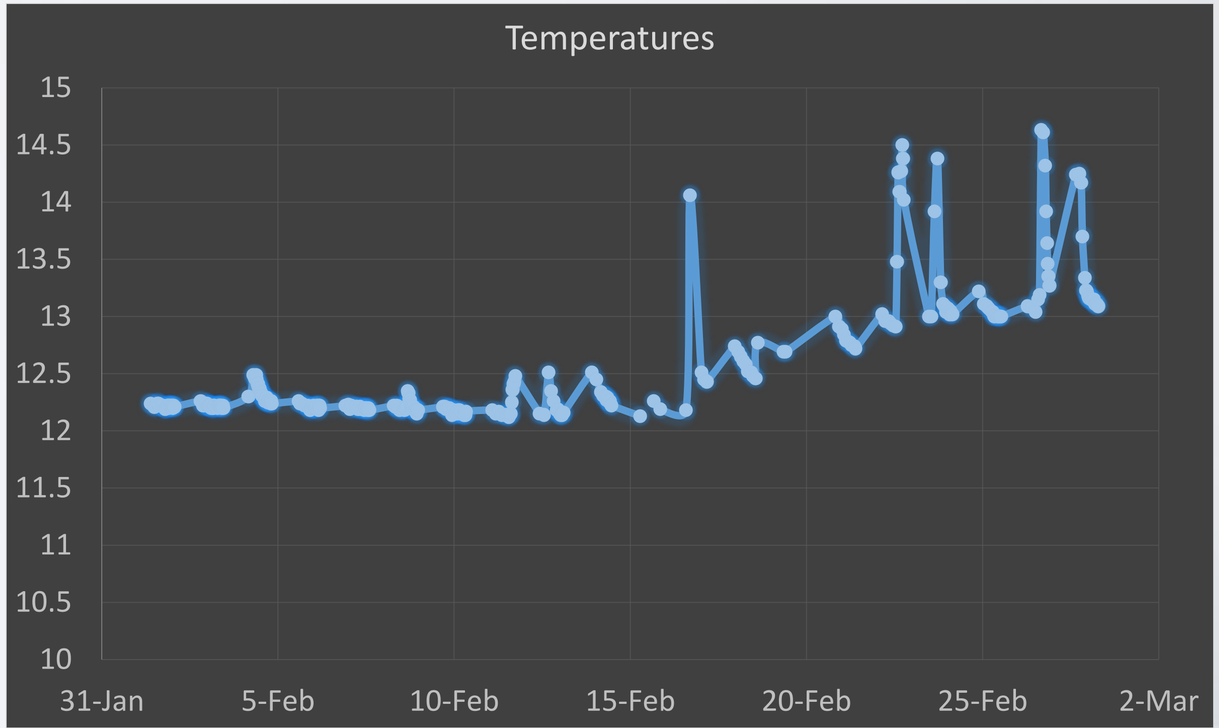
GPS Sites Network & Management

- Remote Sites Network Monitoring

  State of Health (Voltages/Temperatures)

  Data Return

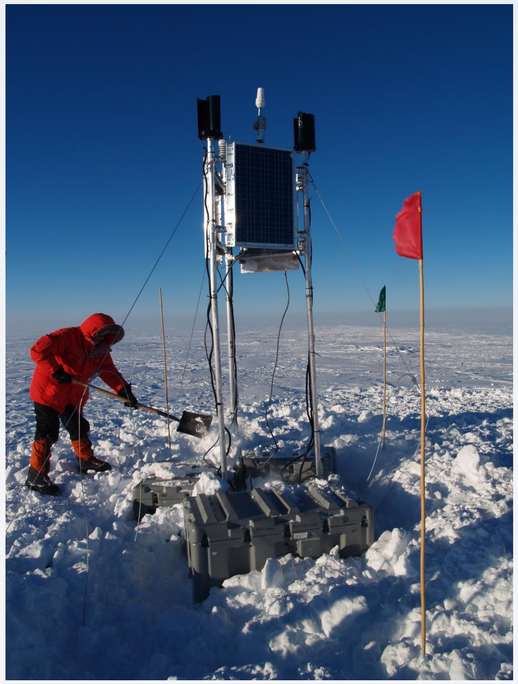




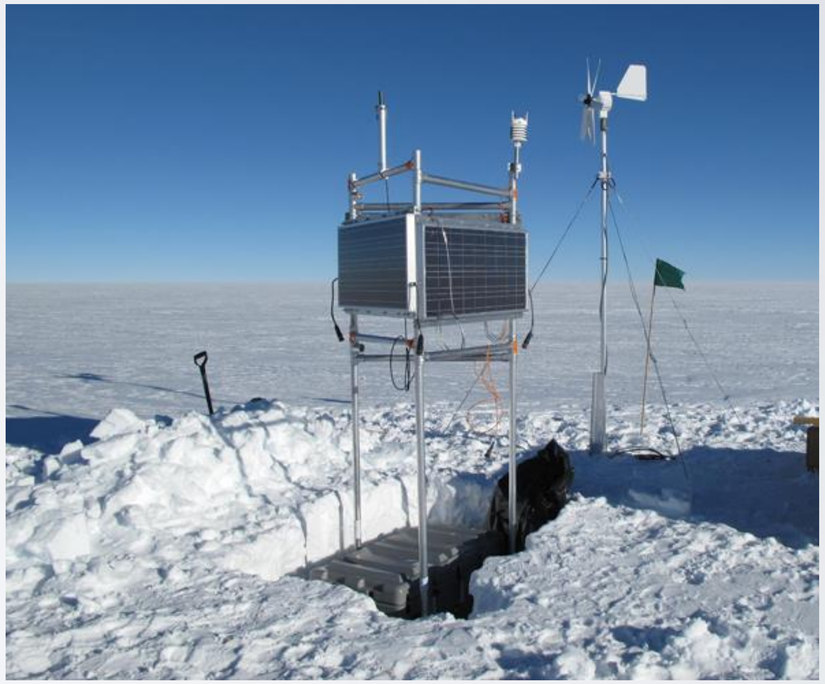
Power & Communication Systems

- Power Systems: Powering a wide variety of scientific instruments

Margin Rock System
Bear Peninsula
(BERP)



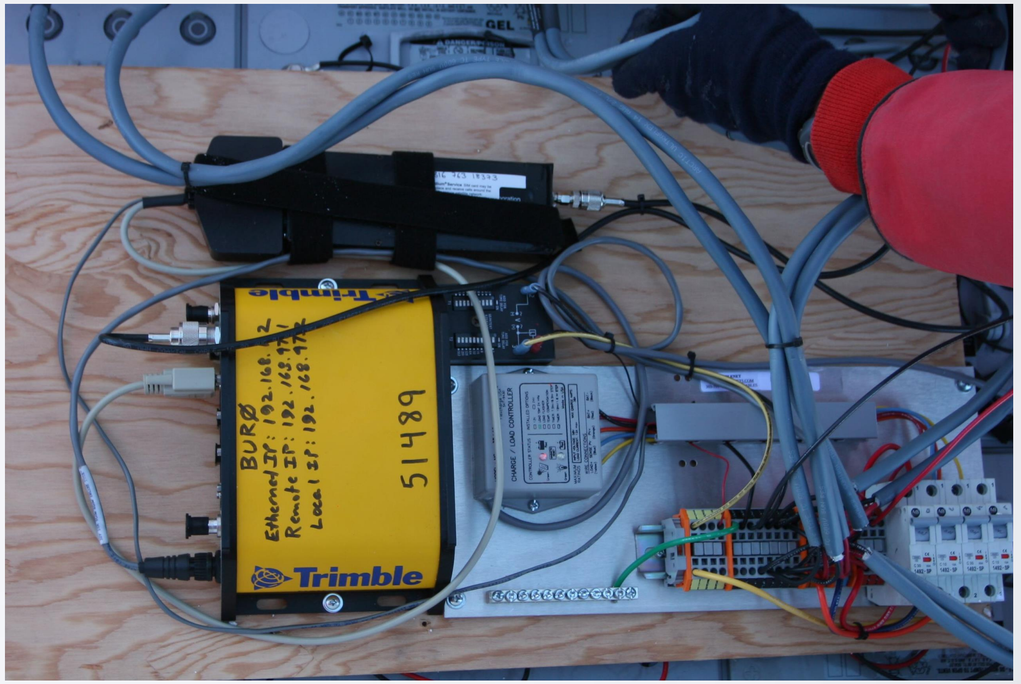
West Antarctic System
Kohler Glacier
(KHLR)



Plateau Snow System
Recovery Lakes
(REC1)

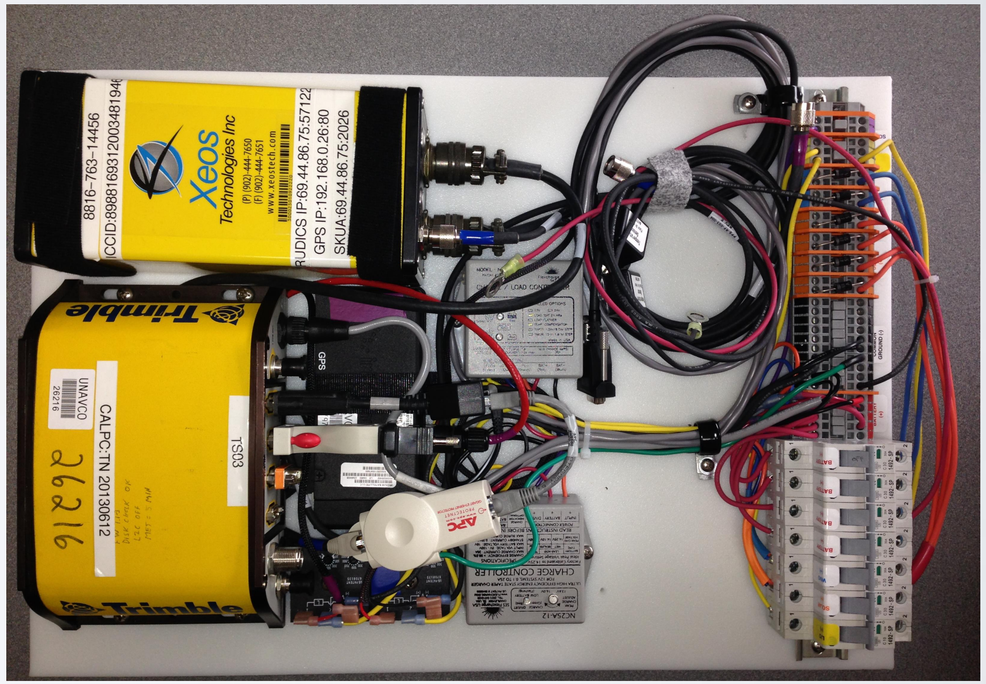
Power & Communication Systems

- Remote Polar GPS Stations: PAST design



Power & Communication Systems

- Remote Polar GPS Stations: PRESENT design



Power & Communication Systems

- Power Systems

Power Components:
Wind Turbine
80W Solar Panels
Batteries Racks (100Ah)

Structural Frame:
Wind proof
Wildlife proof

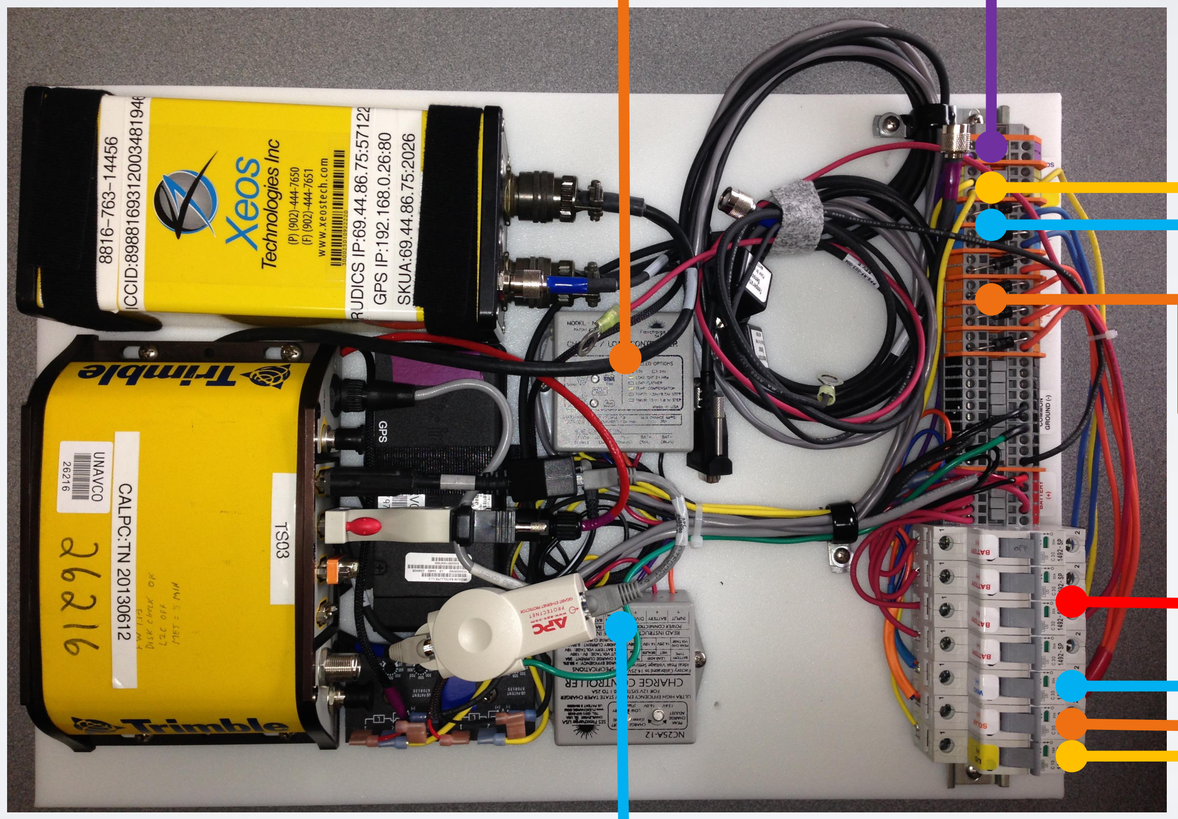
Instrumentation:
Weather Station
GPS Antenna
GPS Receiver
Data logger

Communications:
Iridium

Power & Communication Systems

- Power Supply & Communication Board

Solar Charge Controller
w/LVD Circuit



Heat Pad Connector

Load Connector
LVD Protected

Power Connectors
Diode protected
Up to 2 Wind Turbines
Up to 4 Solar Panels

Breakers
1 per Battery Bank (4)
1 for Wind Turbines
1 for Solar Panels
1 for the Load

Wind Charge Controller

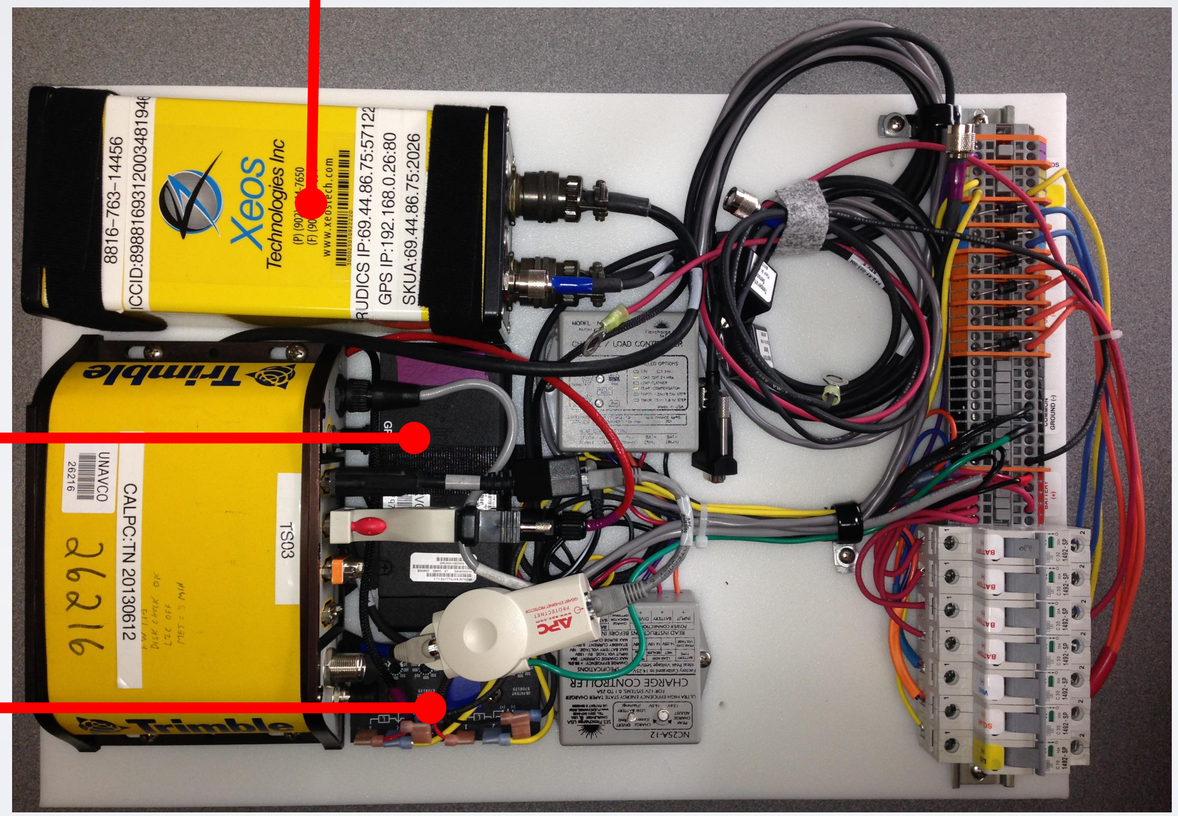
Power & Communication Systems

- Power Supply & Communication Board

Xeos Xi100b Modem (RUDICS)

Iridium 9522B Modem

Timers



Comms Configurations:

Single Modem (Xi100 or 9522B)
2 Iridium 9522B Modems
Xi100b + Iridium 9522B
Radio Link (Intuicom/Freewave)

RF Protection:

Iridium RF Surge Suppressor
GPS Antenna Surge Protector
Grounding plates
Anti Static Bag

Power & Communication Systems

- Communication Devices

Iridium 9522B Modem

Iridium Satellites Constellation

Serial Connection to instruments

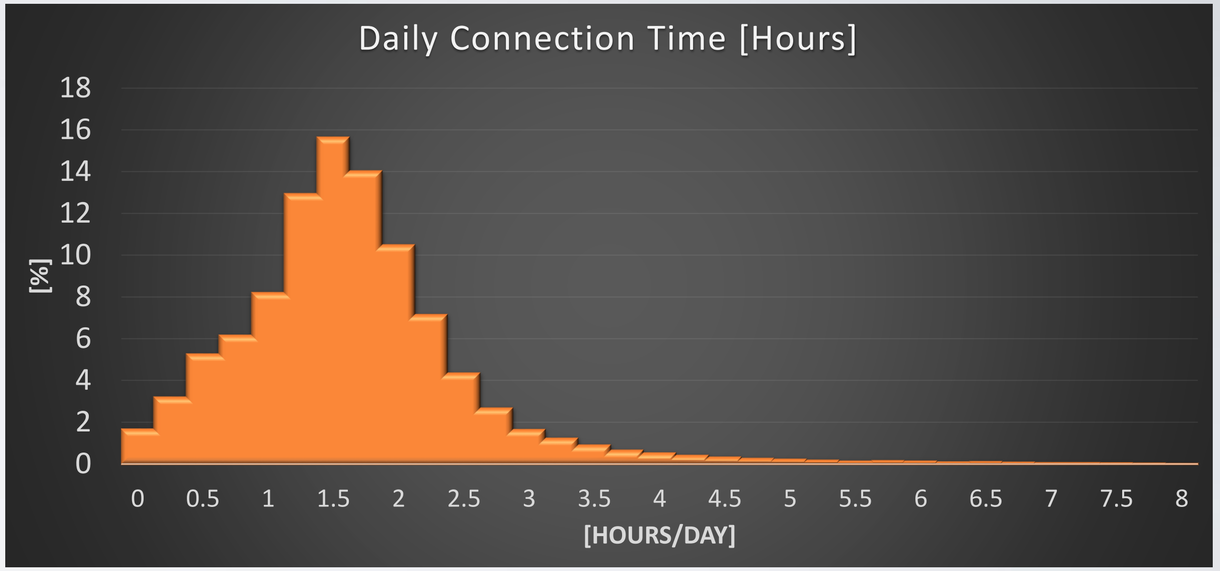
SIM Card

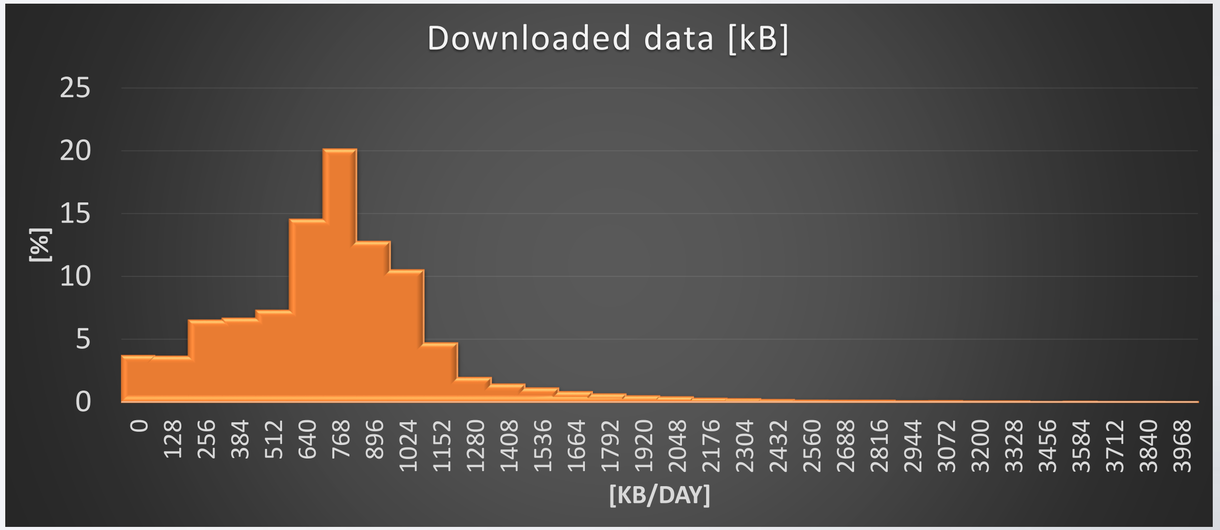
About 1W for 1Mb data download per day

→Info on Iridium web site

Power & Communication Systems

- Communication Statistics





Power & Communication Systems

- Communication Devices

Xeos Xi100B Modem:

Built around the Iridium 9522B

Ethernet & Serial Link to instruments

SBD Messaging, RUDICS, State of health

Heater

Less then 1W for 1Mb data download per day

→Info on Xeos Technology web site

Power & Communication Systems

- Communication Devices

Intuicom EB-6 Plus Radio Link:

Up to 867 kbps

Up to 40 miles line of sight.

Ethernet Link to instruments

Less then 1W for 1Mb data download per day

→Info on Intuicom web site

Power & Communication Systems

- Communication Devices

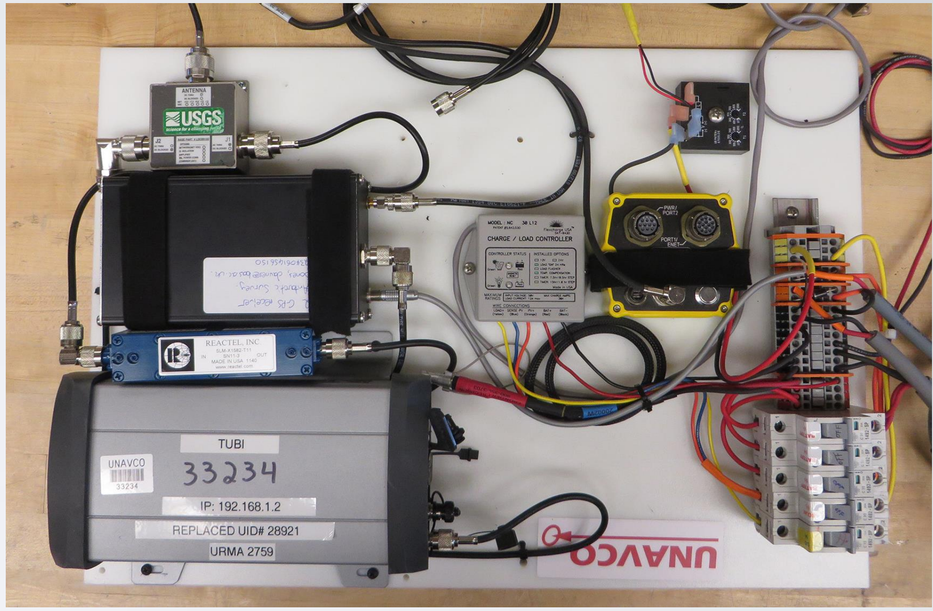
Xeos Xi202 SBD Modem:

Short burst data modem for state of health and basic instruments control.

Xeos developing a firmware to use with Trimble NetR9 via its Ethernet port.

Current Development Projects

- Low Power GPS device in test



British Antarctic Survey design (Dr. David Jones)

Testing on our McMurdo test site

Ashtec MB100 OEM L1/L2 GPS OEM board

Iridium 9602 SBD (Short Burst Data) modem

Paired with NetR9 for performance comparison

British Antarctic Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Current Development Projects

- Download Hub

Greenland project on Helheim Glacier

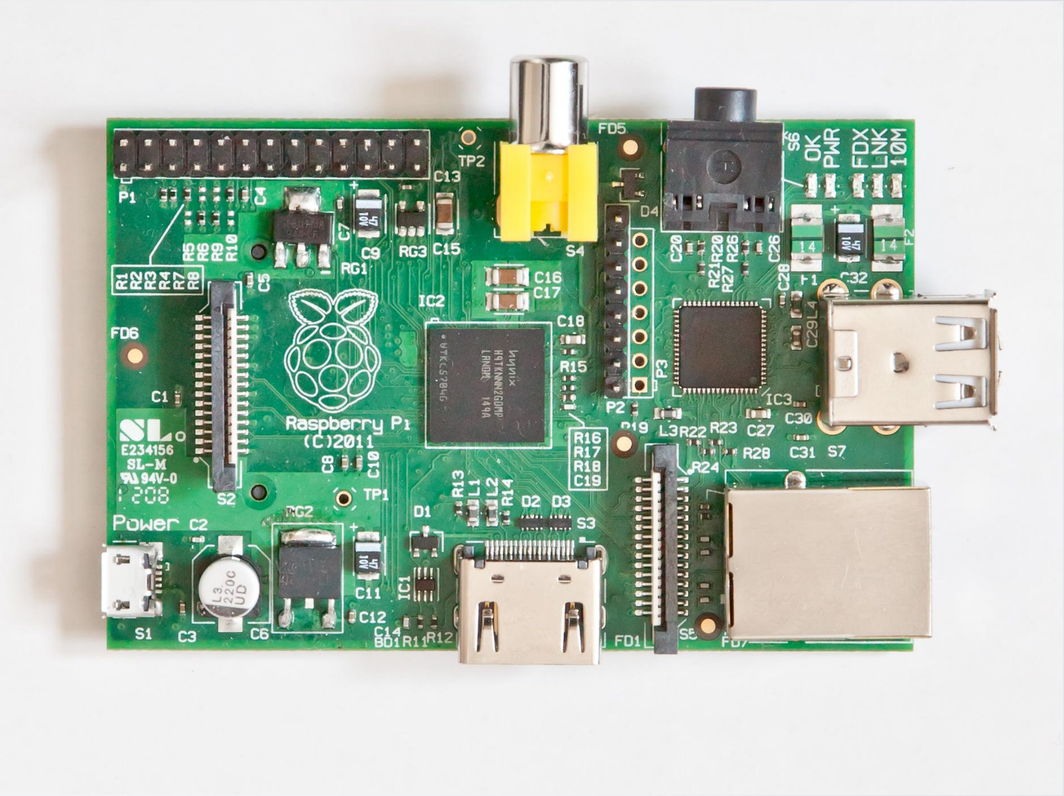
7 autonomous GPS sites on the glacier

(Trimble NetR9 and Ethernet Radio)

1 repeater

1 Download Hub to gather the data, powered by a Raspberry Pi (Linux low power, cheap board)

Summer only.



Infrastructure and Polar GPS Receivers RFPs

- Infrastructure GPS Receiver RFP

Replacement for the Trimble NetR9/NetRS receivers

GNSS capabilities

Infrastructure GPS RFP (March 2nd, 2015) - GNSS Receiver RFP

- Polar GPS Receiver RFP

Low power focus (2W) and integrated coms

Work in progress – Soon to be released

Thank You!

Questions?

Contact Us / Useful Links

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UNAVCO Polar Group: www.unavco.org/polar

National Science Foundation

WHERE DISCOVERIES BEGIN