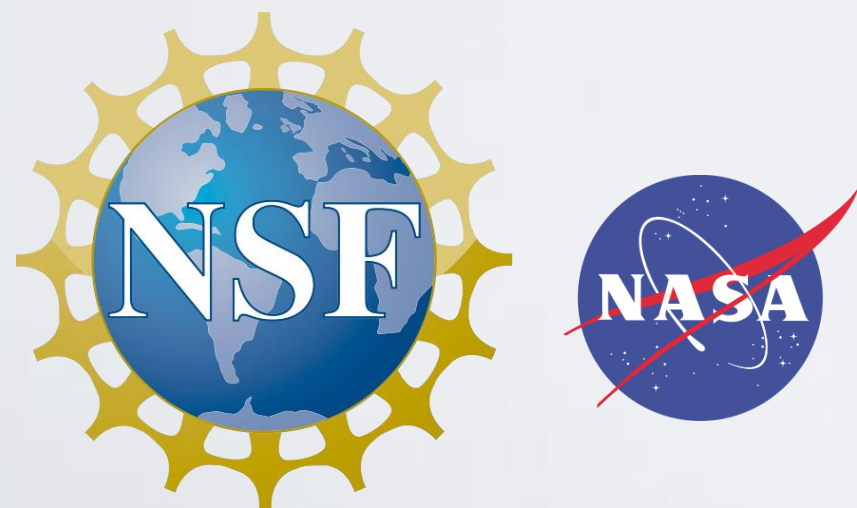


UNAVCO

Powering Science at High Latitudes

Nicolas Bayou – UNAVCO Polar Services



Polar Technology Conference 2014 - Bloomington, IN

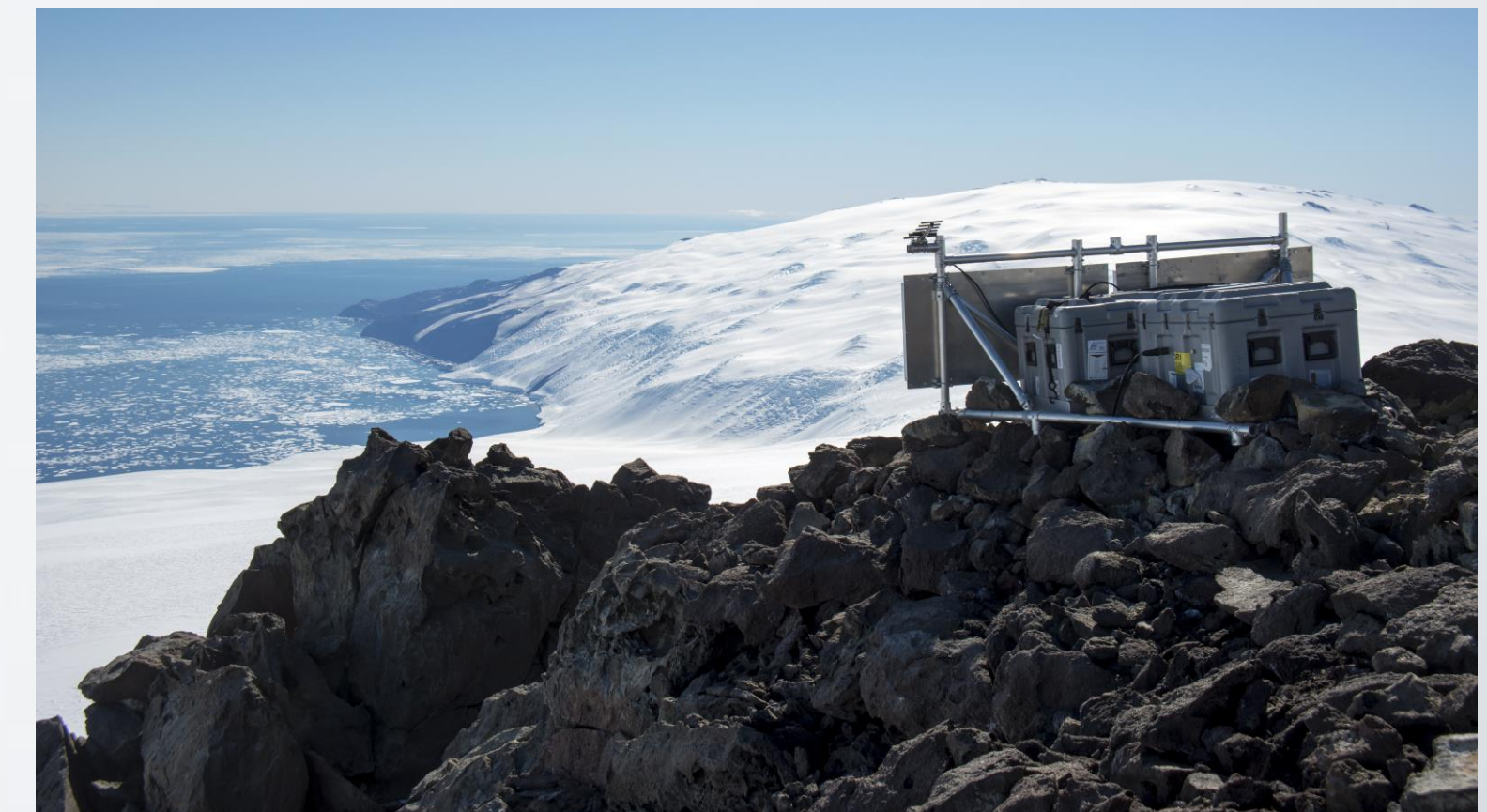
- UNAVCO at a glance
- UNAVCO Polar Services
 - [POLENET](#)
 - Power Systems
 - The Future



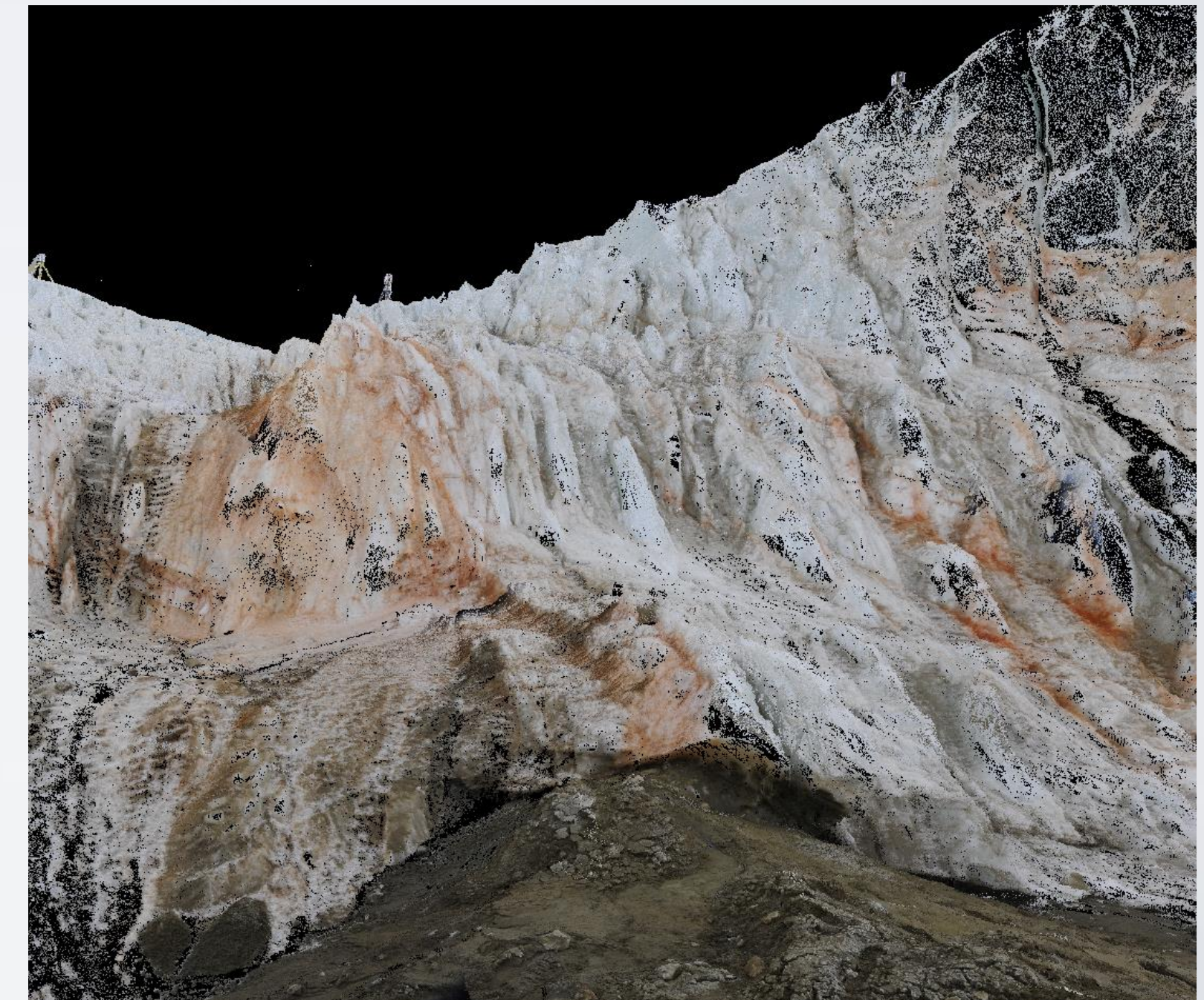
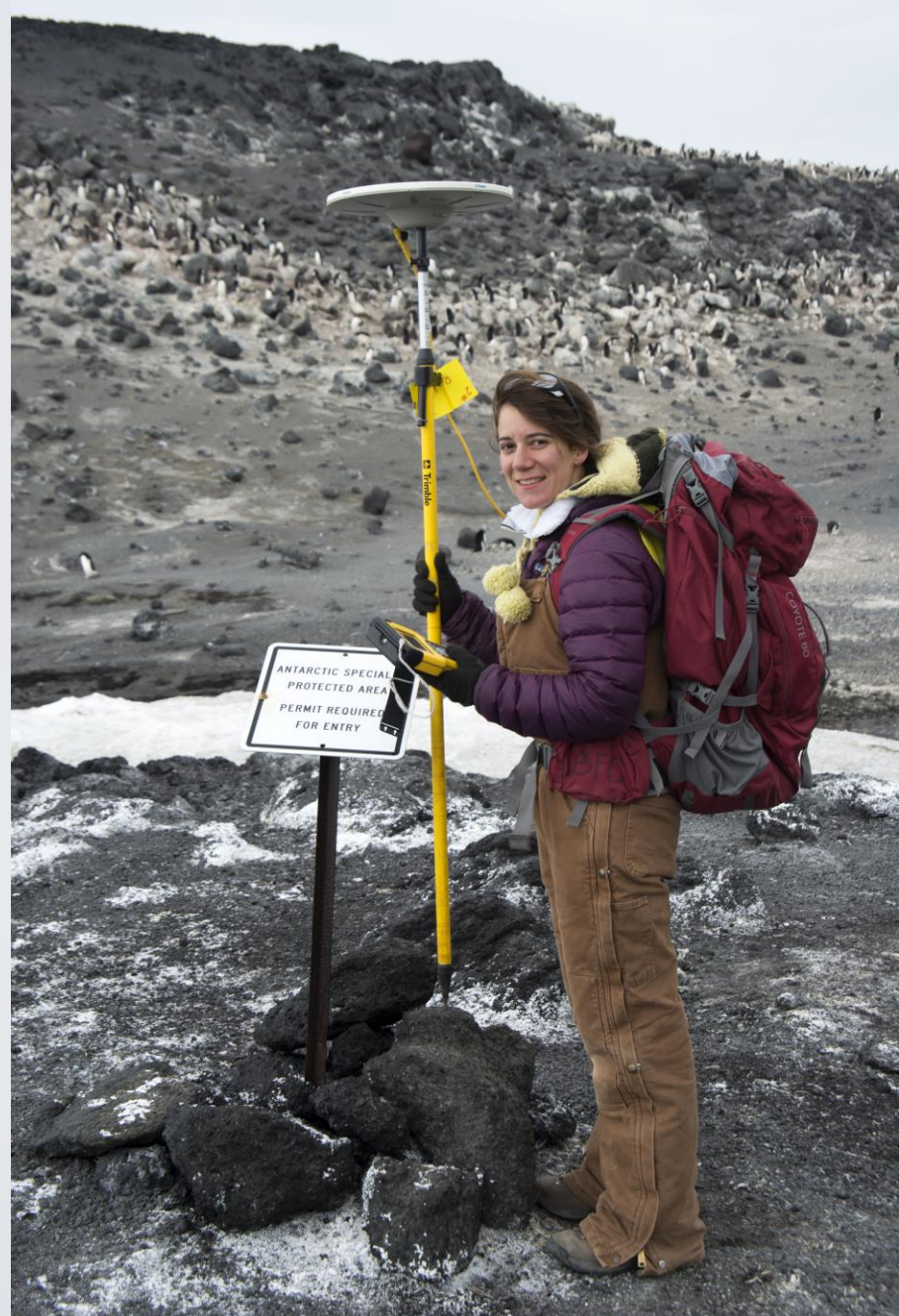
- 30 years serving the science community
- Non-profit university-governed consortium, facilitating geoscience research and education using geodesy. Government funded (NSF, NASA).
- Headquartered in Boulder, CO
- Offices in Anchorage, AK, San Clemente, CA & Portland, OR



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

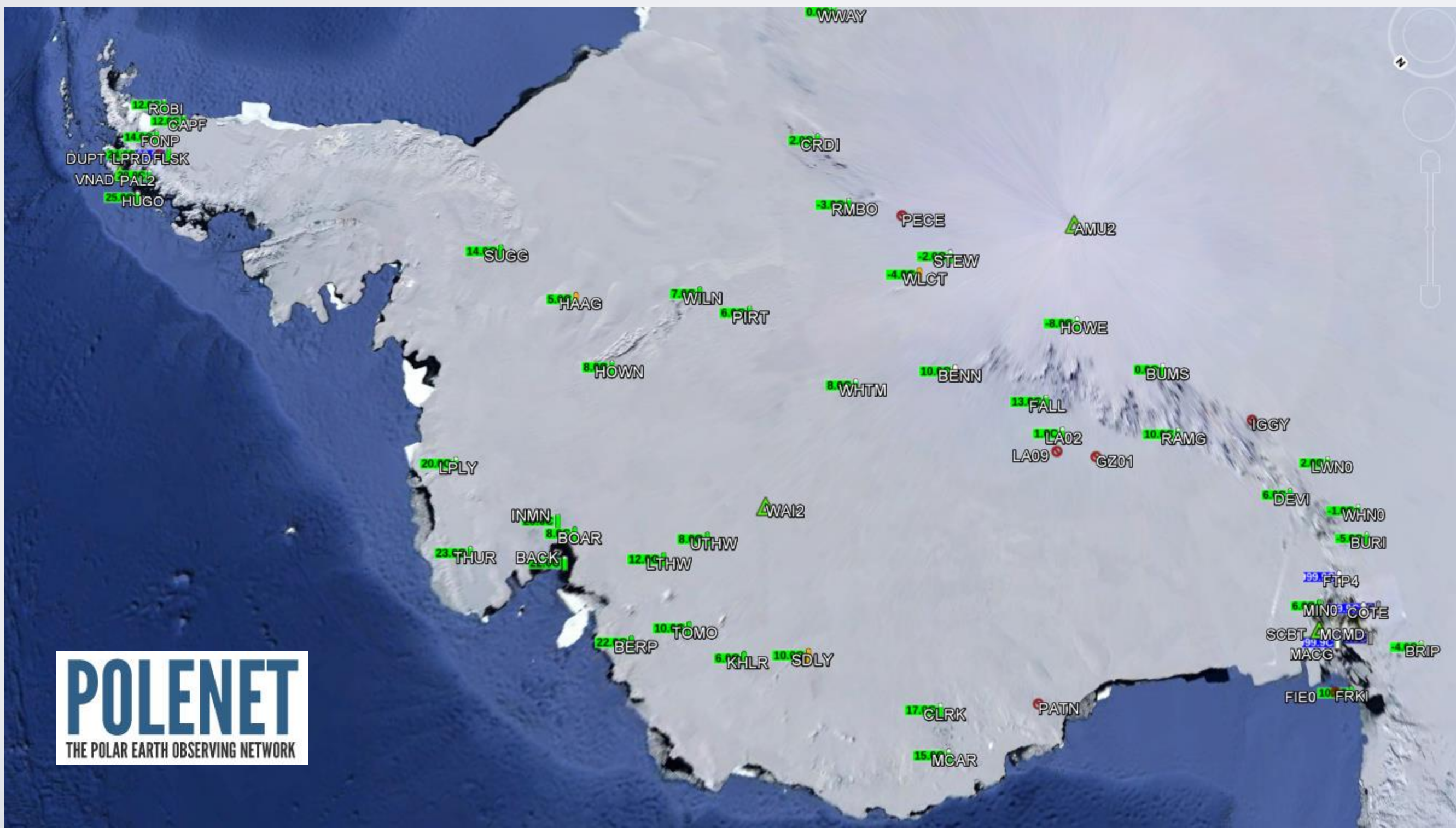


- 5 Professional staff dedicated to supporting polar research projects
- Precise GPS land surveying & 3D Mapping with LiDar

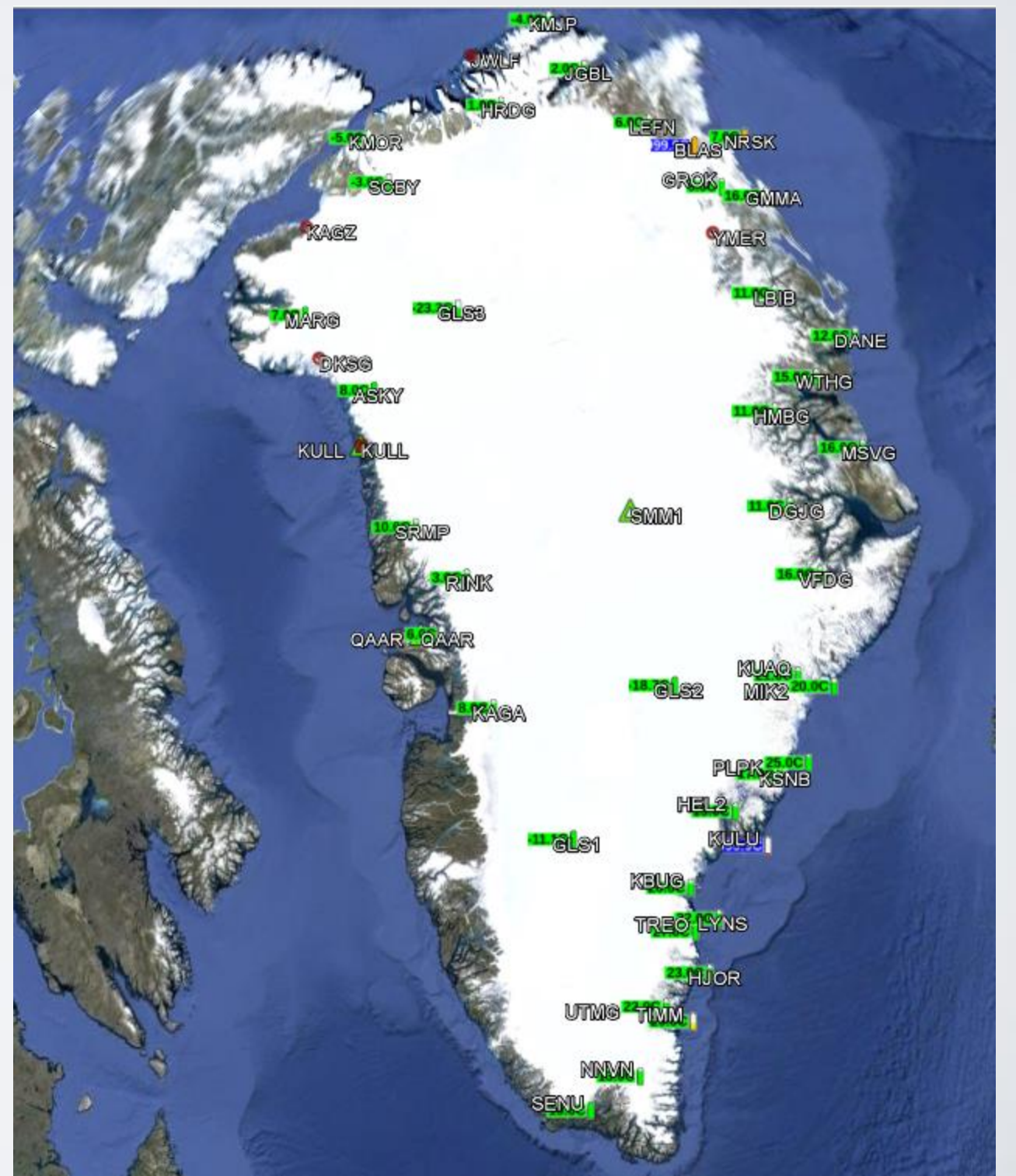


- POLENET: GPS Stations Network

Antarctica – 51 Stations



Greenland – 42 Stations



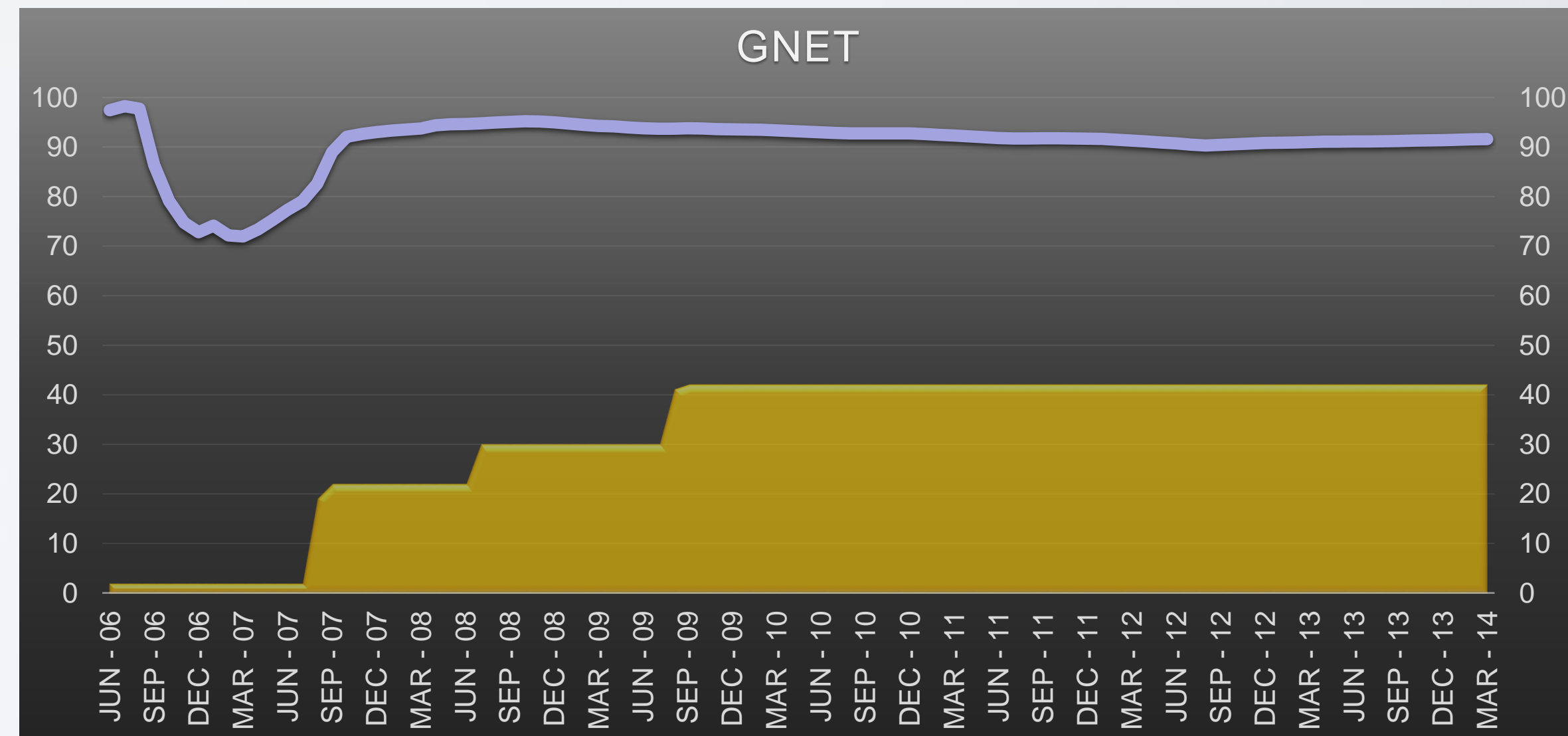
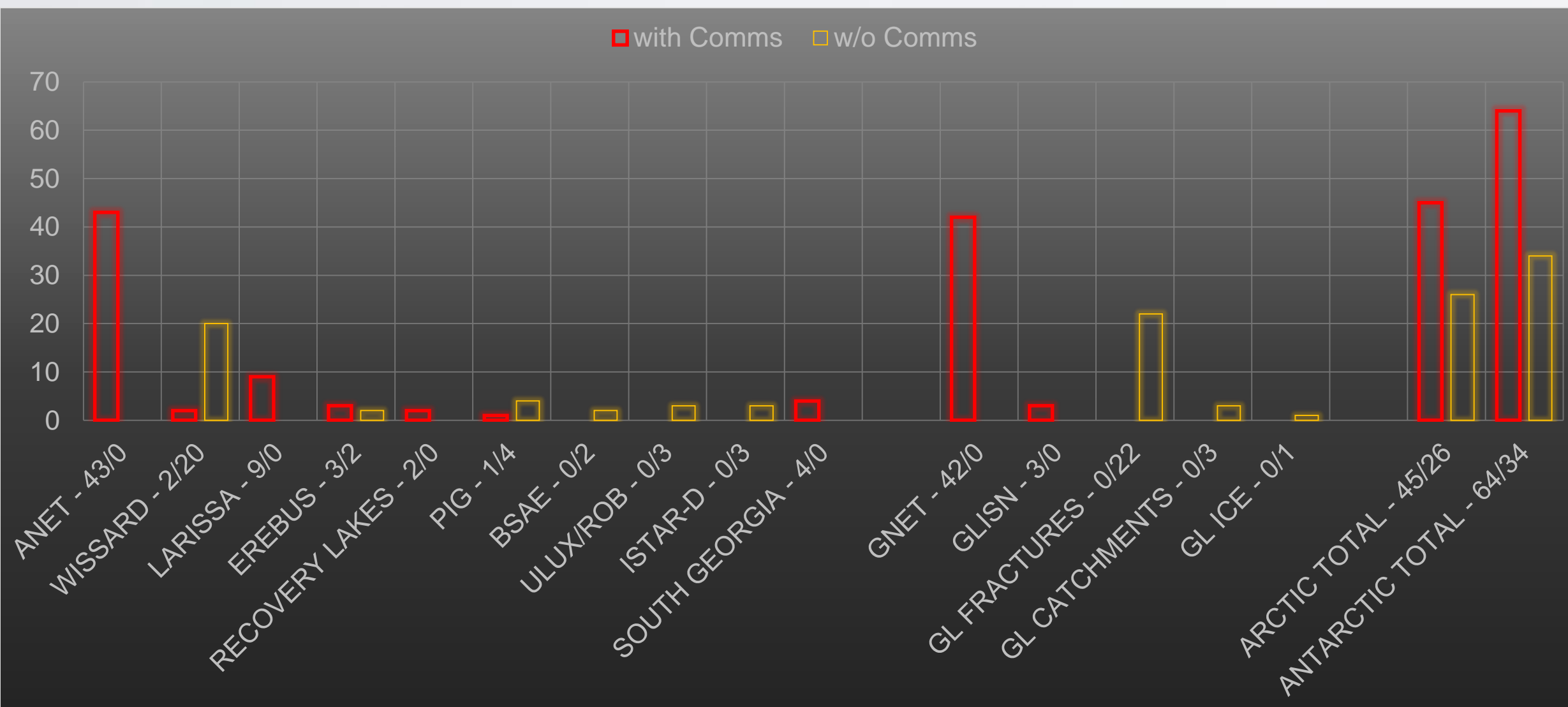
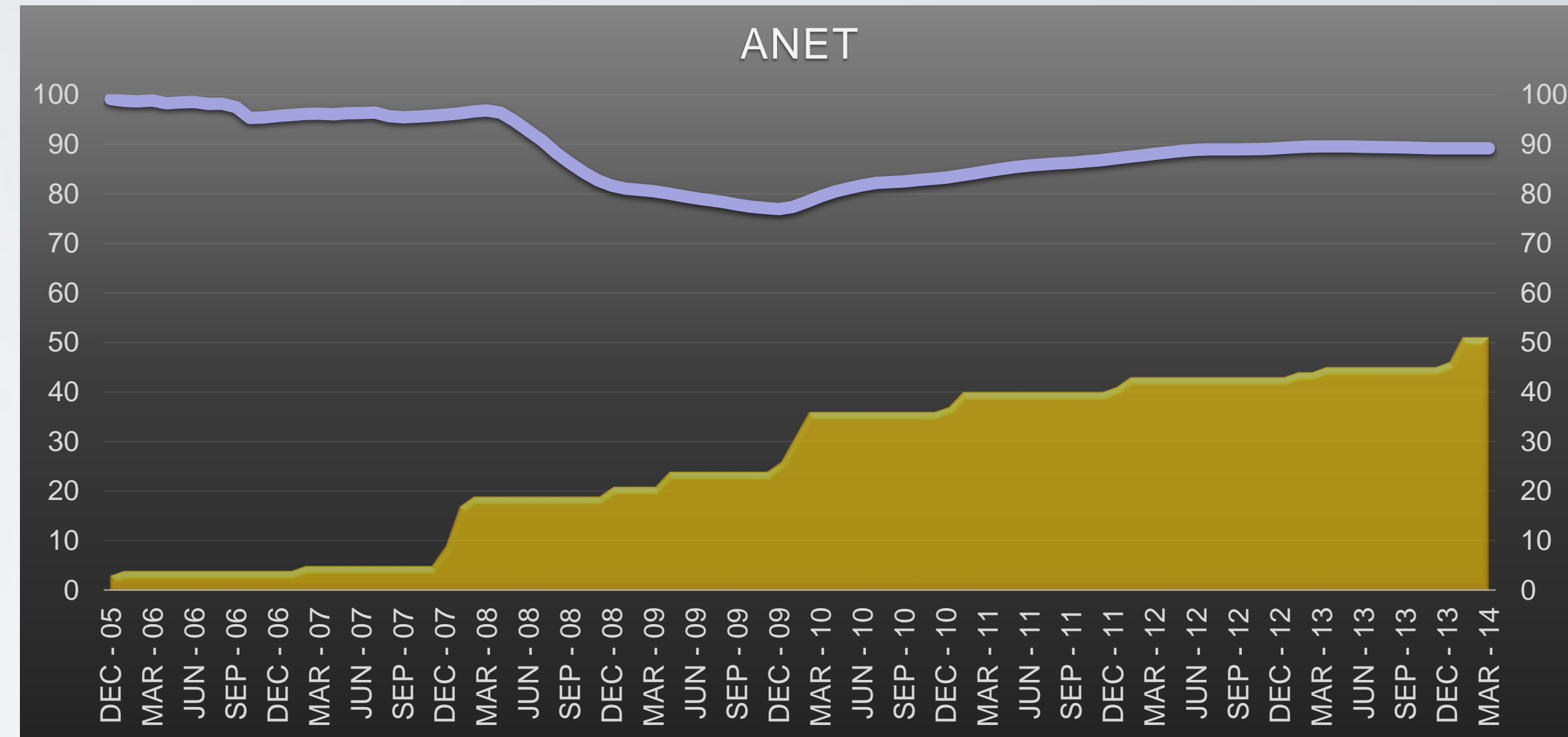


UNAVCO Polar Services

Overall Data Return (March 2014):

ANET: 89.2%

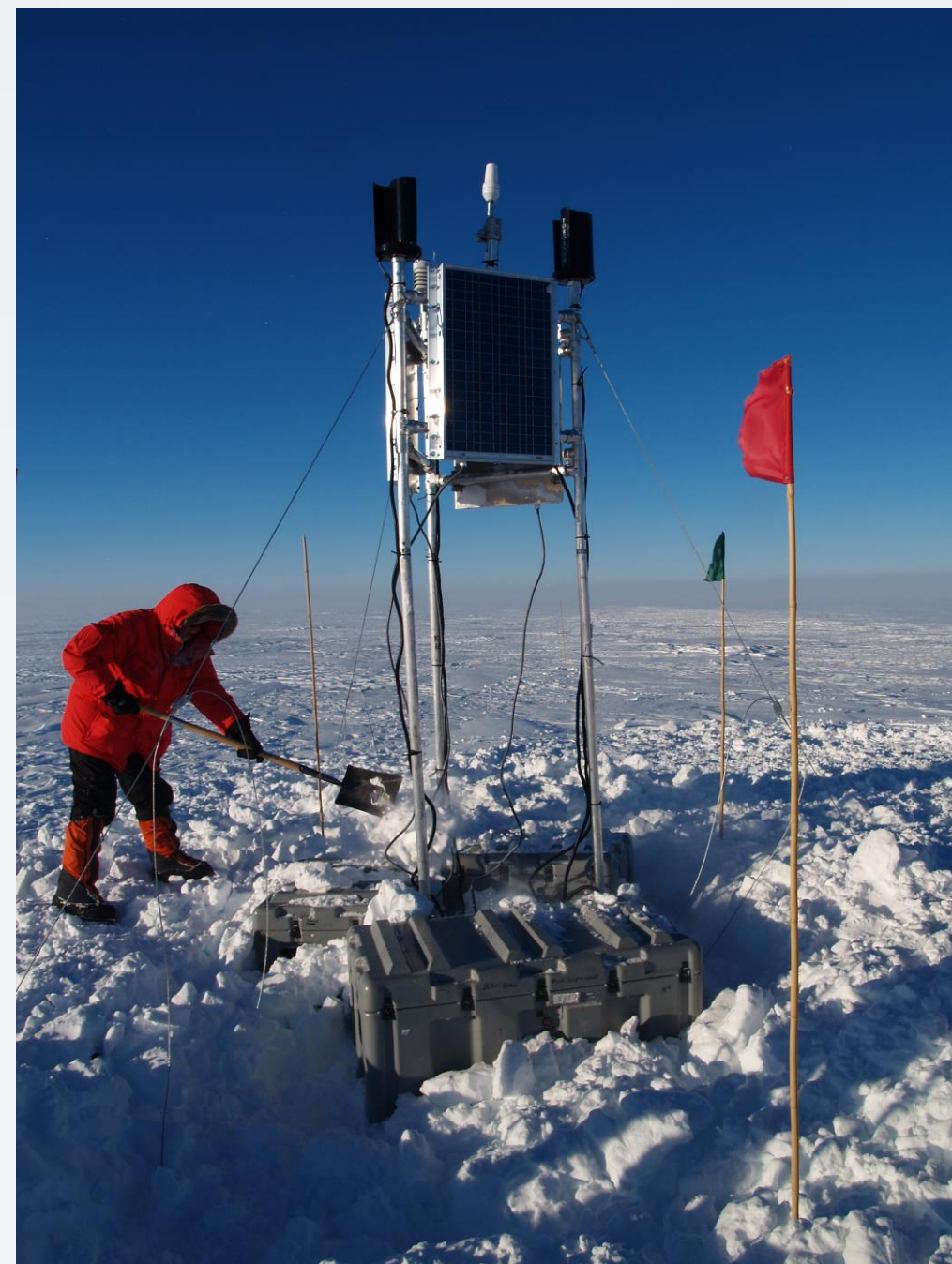
GNET: 91.6%



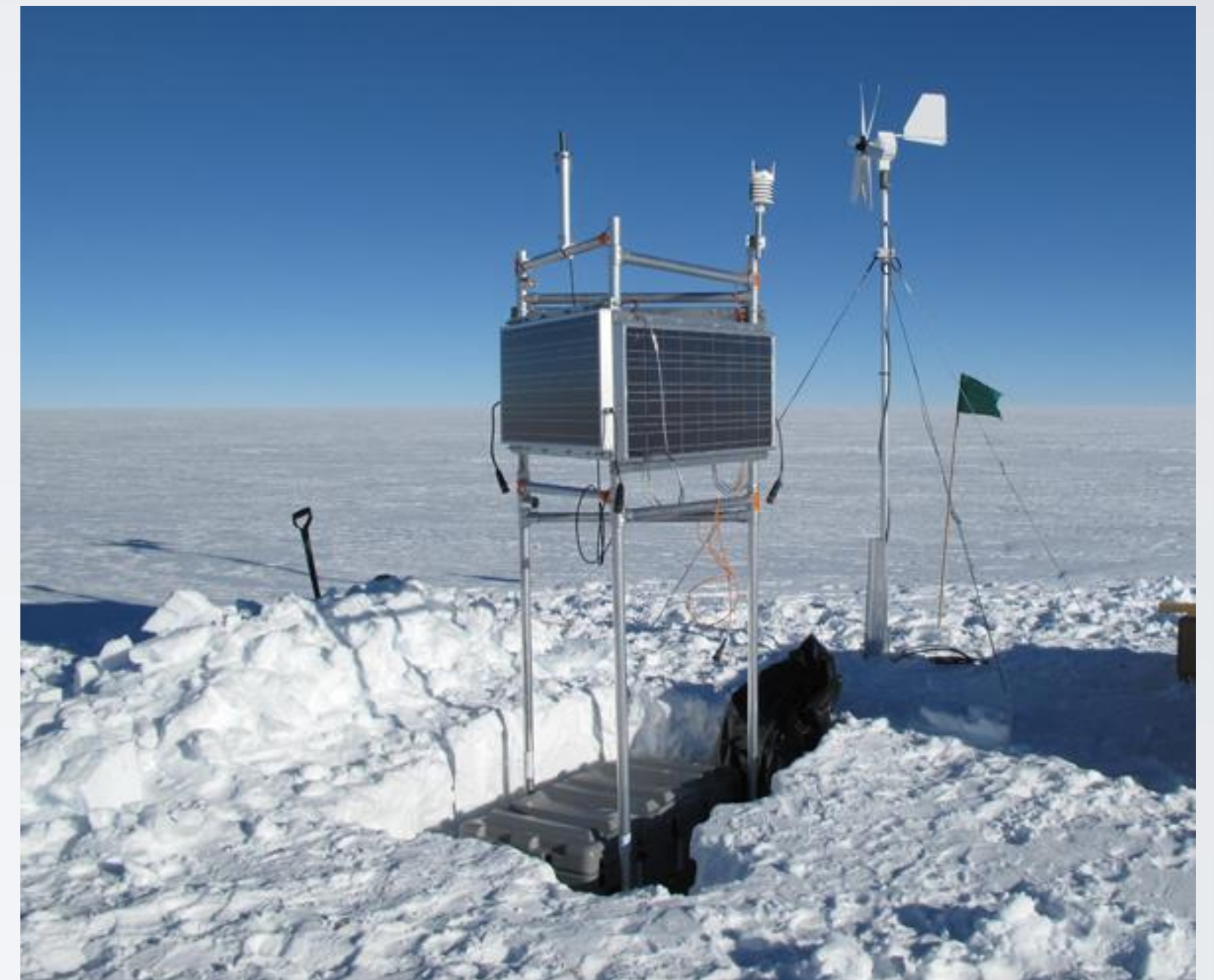
- Power Systems: Powering a wide variety of scientific instruments



Margin Rock System
Bear Peninsula
(BERP)

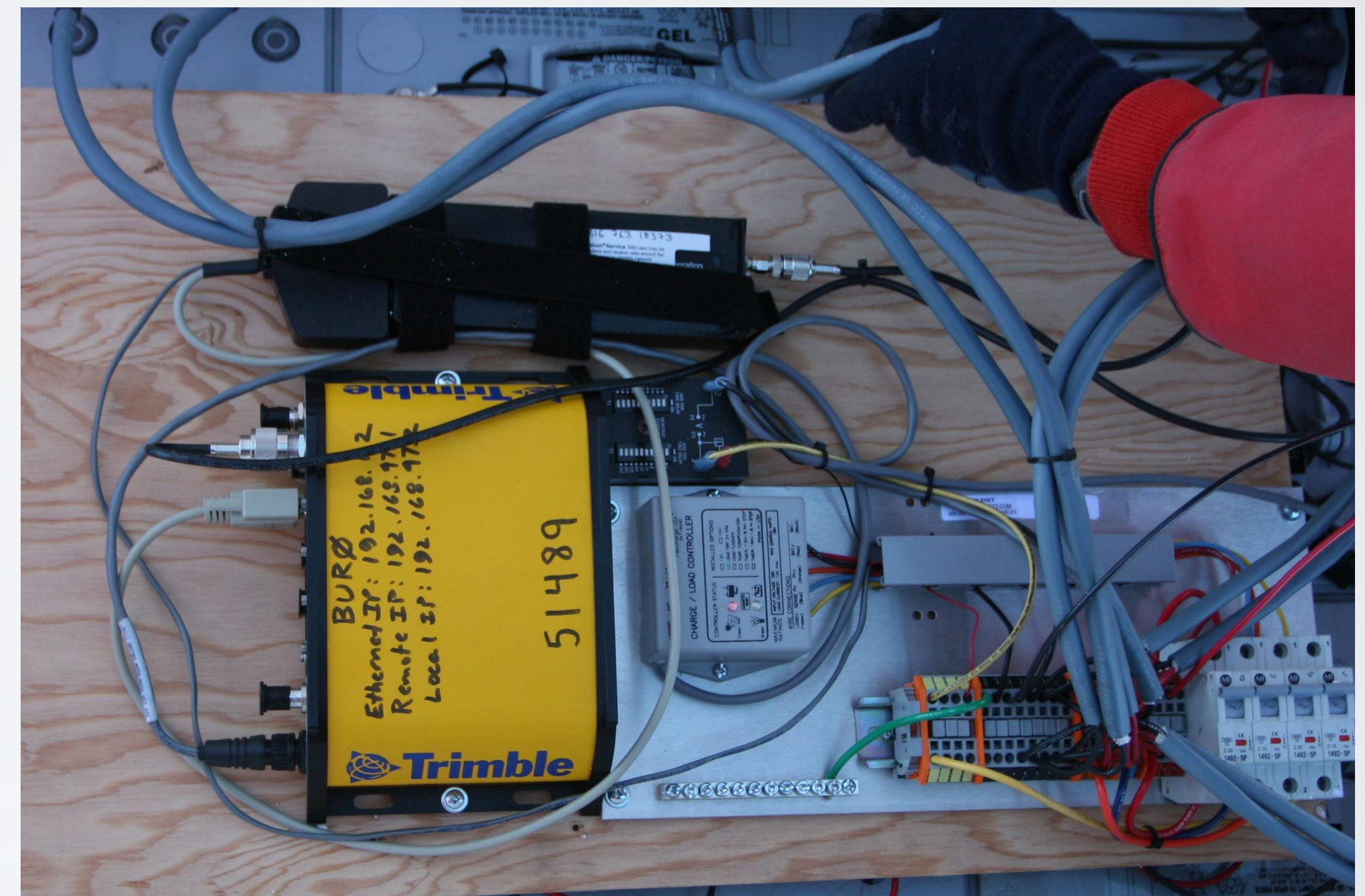


West Antarctic System
Kohler Glacier
(KHLR)

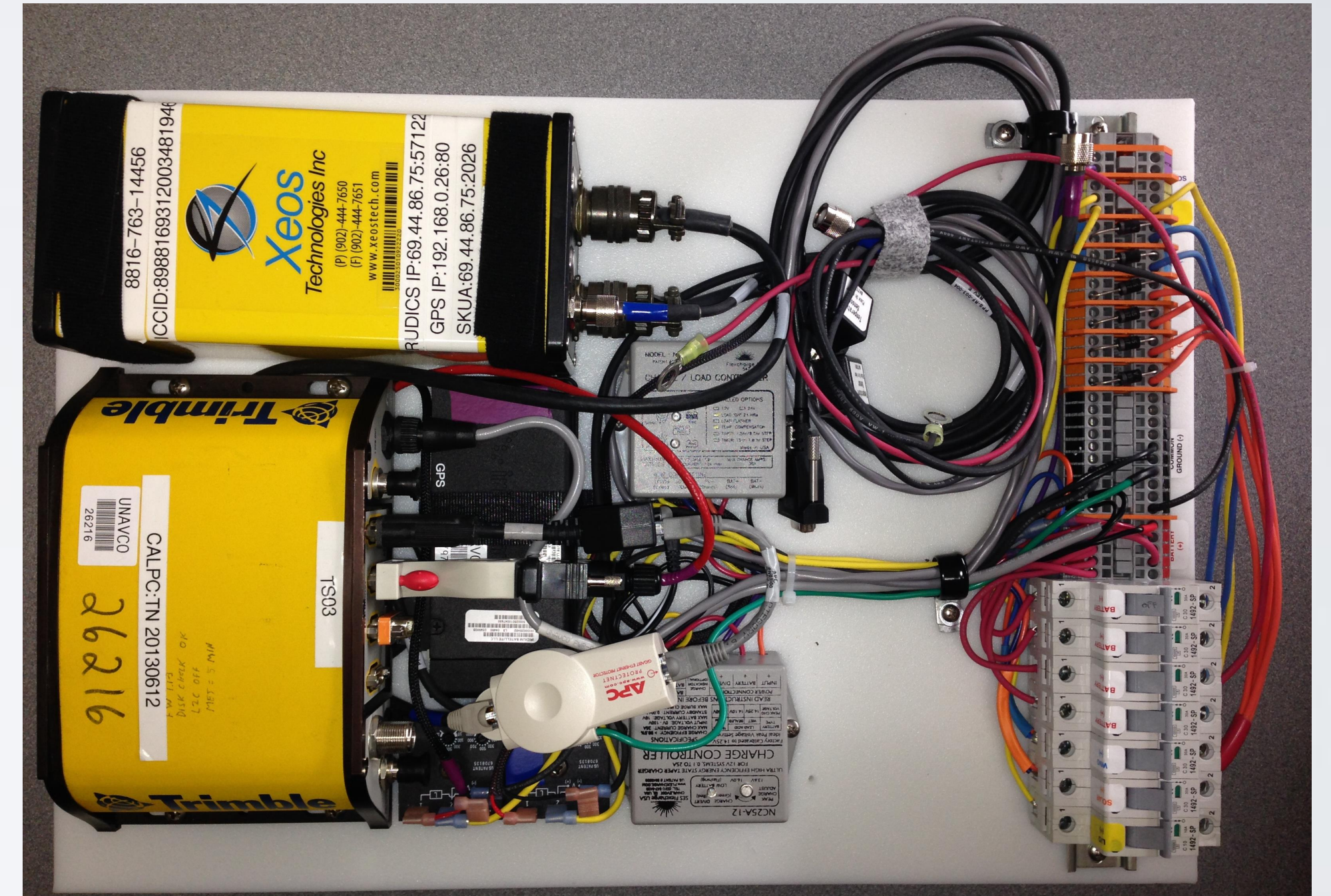


Plateau Snow System
Recovery Lakes
(REC1)

- Remote Polar GPS Stations: PAST design



- Remote Polar GPS Stations: PRESENT design



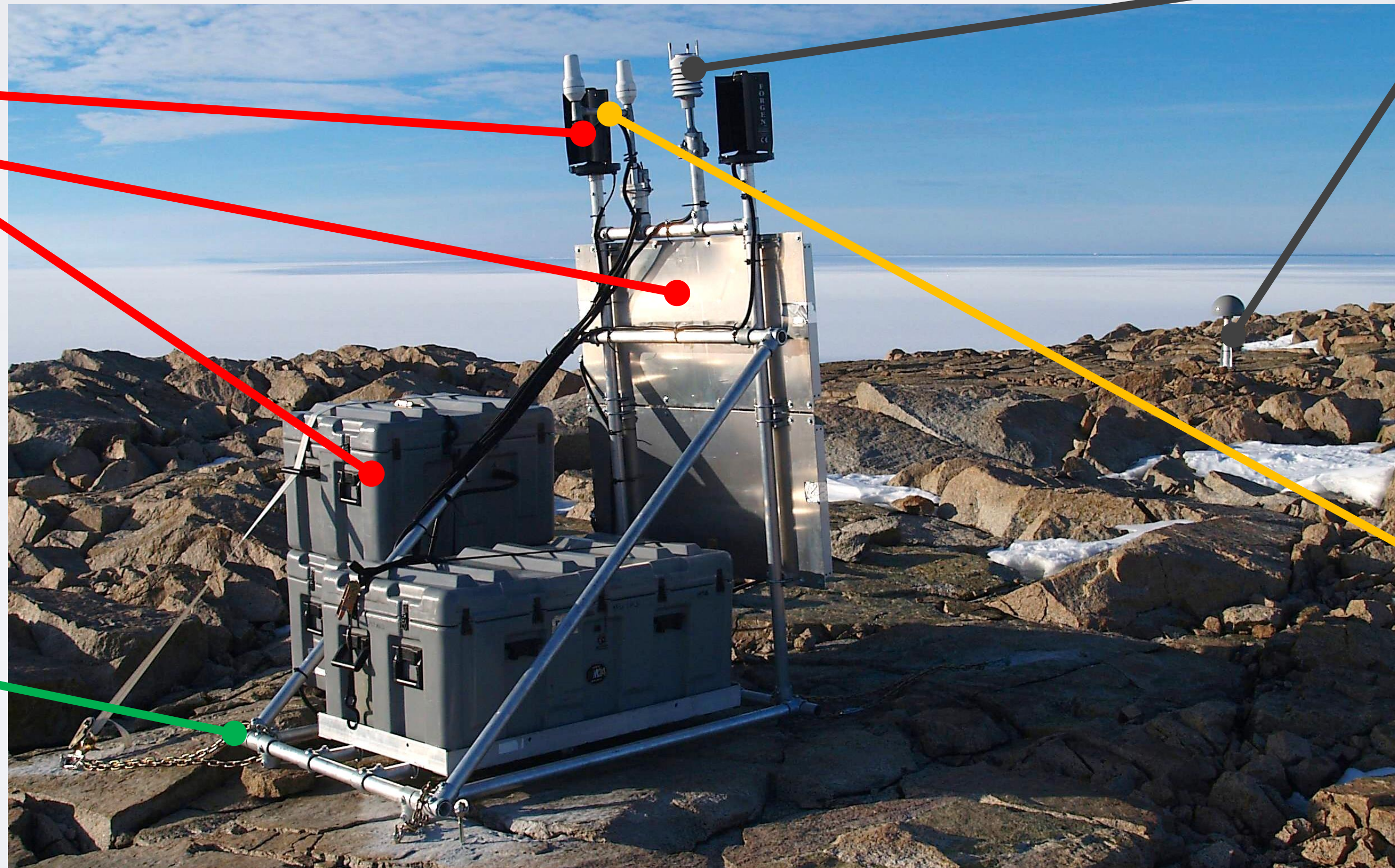
- Power Systems

Power Components:

- Wind Turbine
- 80W Solar Panels
- Batteries Racks (100Ah)

Structural Frame:

- Wind proof
- Wildlife proof



Instrumentation:

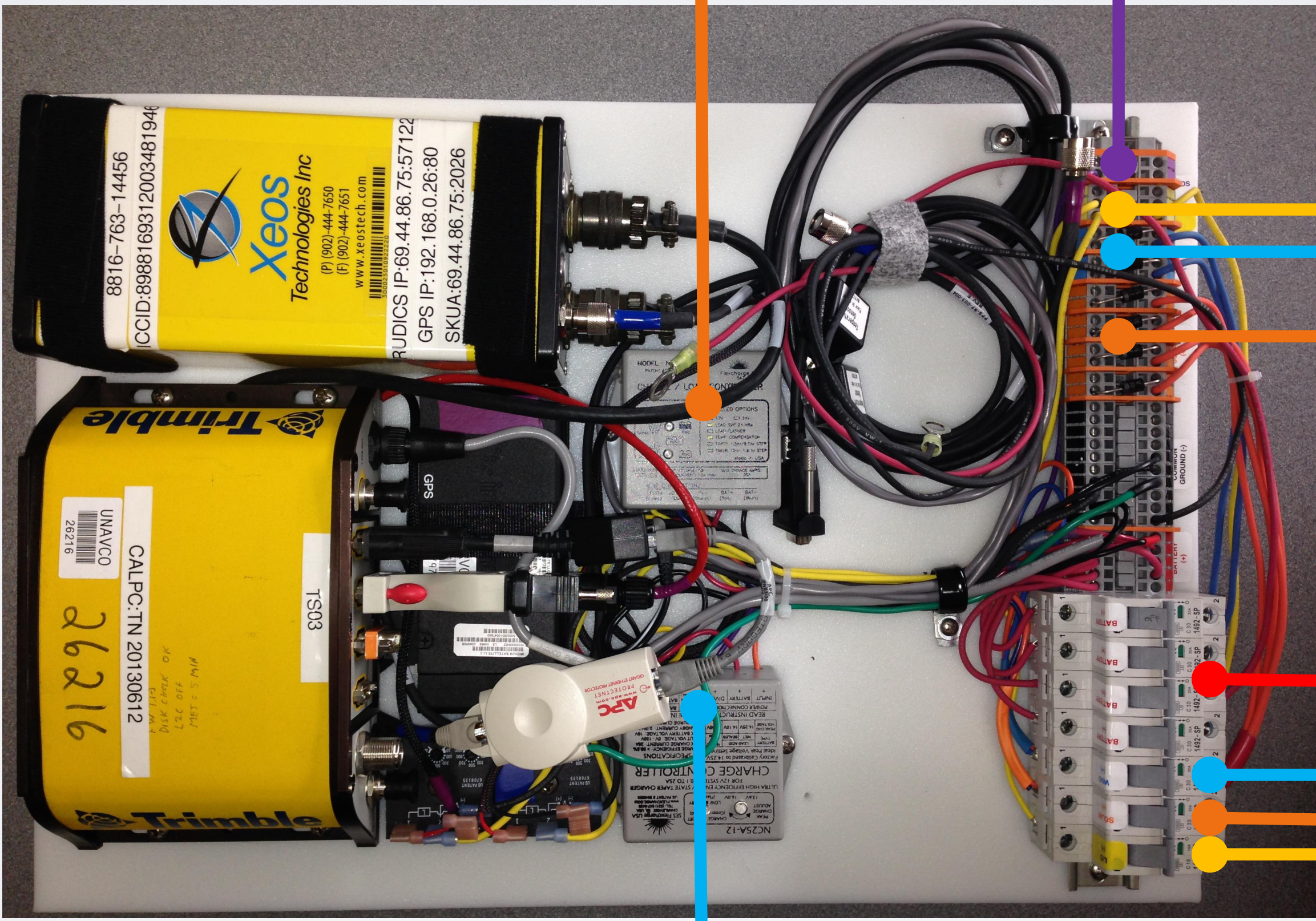
- Weather Station
- GPS Antenna
- GPS Receiver
- Data logger

Communications:

- Iridium

- Power 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

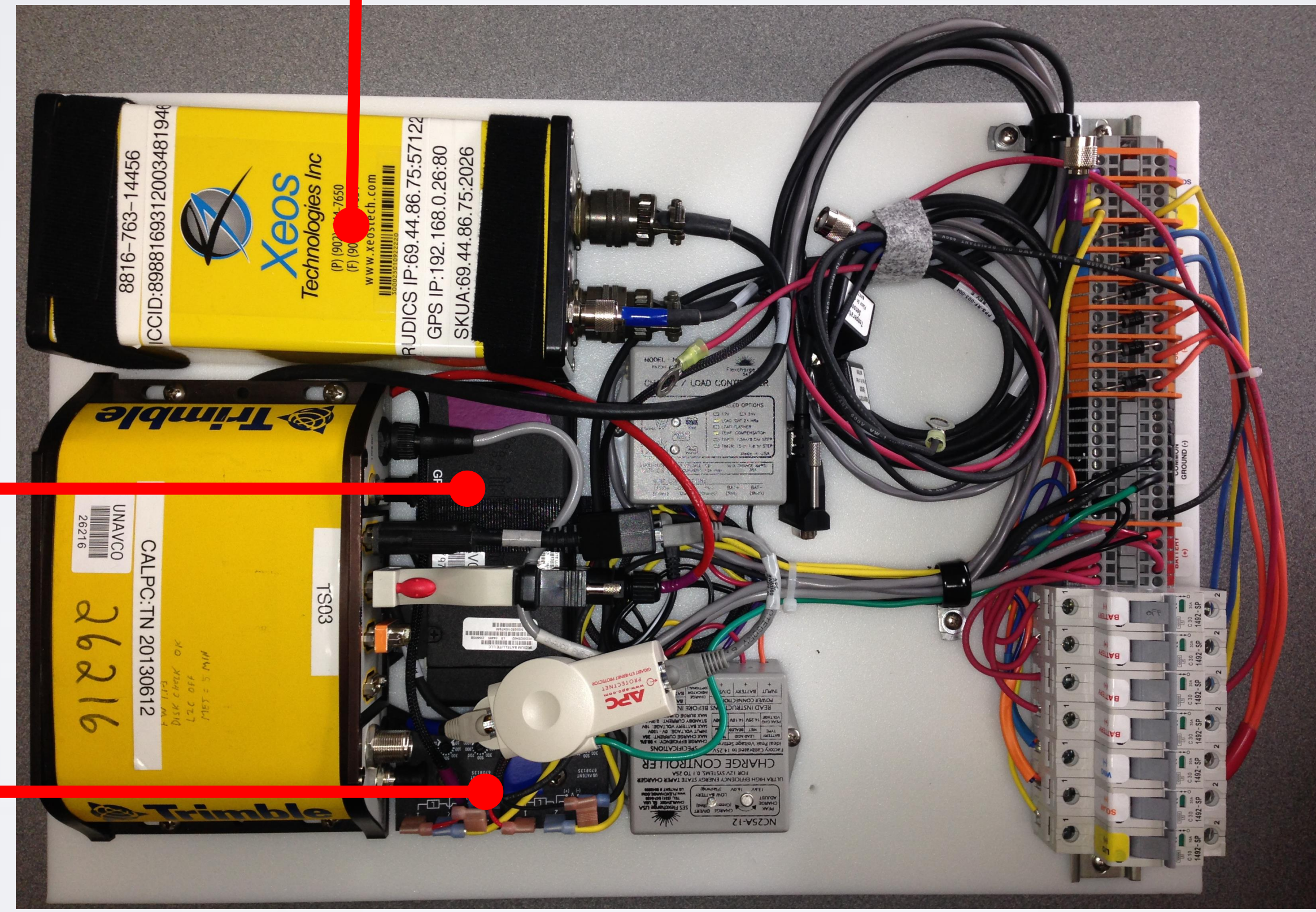
Wind Charge Controller

- Power 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

- Communication Devices

Iridium 9522B

Iridium Satellites Constellation

Serial Connection to instruments

SIM Card

About 1W for 1Mb data download per day

→ [Info on Iridium web site](#)



- Communication Devices

Xeos Xi100B Modems:

Built around the Iridium 9522B

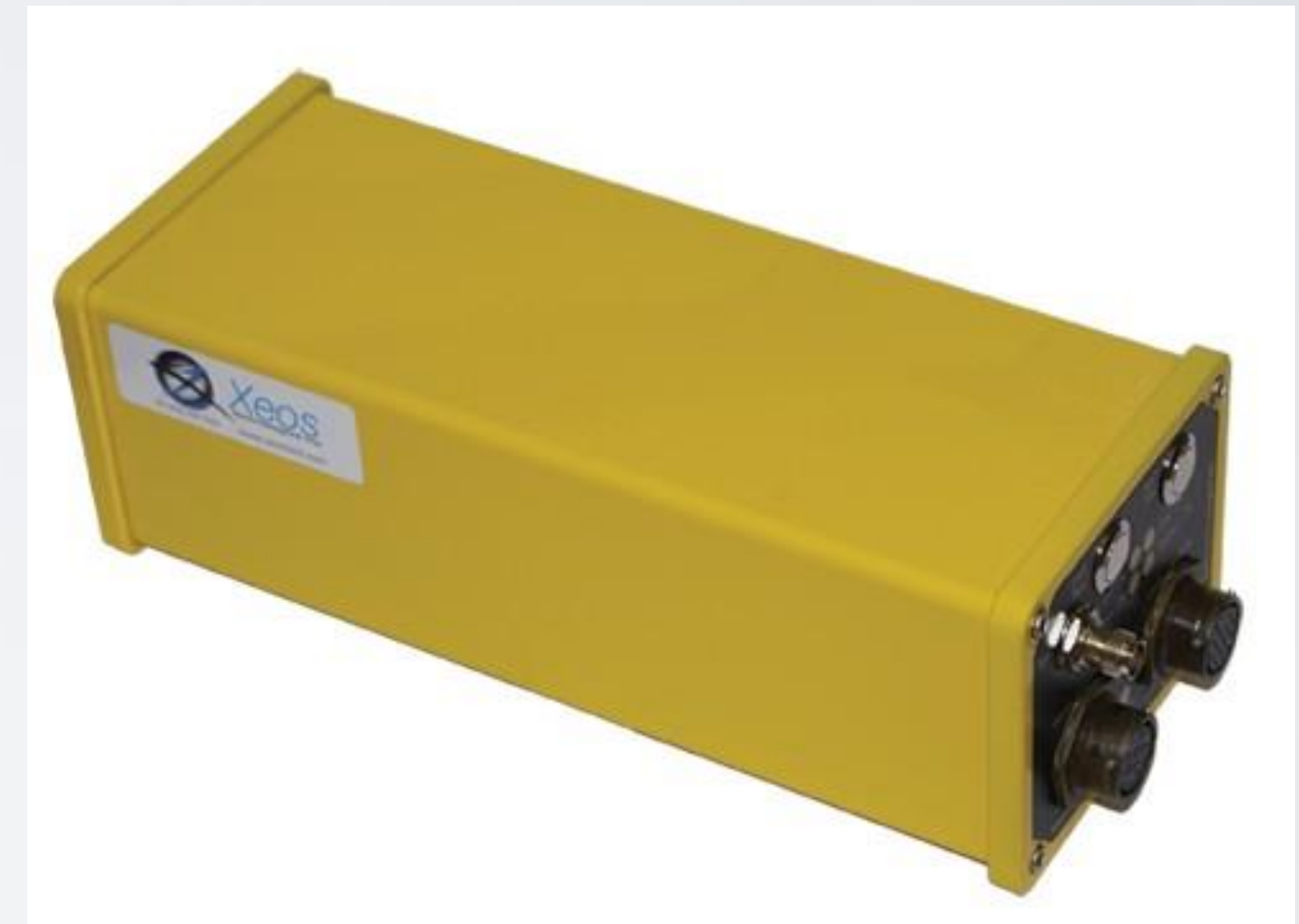
Ethernet & Serial Link to instruments

SBD Messaging, RUDICS, State of health

Heater

Less than 1W for 1Mb data download per day

→ [Info on Xeos Technology web site](#)



- Communication Devices

Intuicom EB-6 Plus Radio Link:

Up to 867 kbps

Up to 40 miles line of sight.

Ethernet Link to instruments

Less than 1W for 1Mb data download per day

→ [Info on Intuicom web site](#)



- 2014 Goals

Power Consumption Reduction: from 4 Watts to 2 Watts

- 50% Battery Weight Reduction
- OEM board level geodetic GPS receivers (~1 Watt)

Advanced rechargeable battery for polar use





- 10% increase in charge density → 10% battery weight reduction

Wind Turbines

- More power at increased reliability

- New GPS Receivers

No significant improvement in the Conventional GPS Receivers

| | Receiver | GNSS | Memory | Power Draw w/Antenna |
|---|------------------------|------|-----------------------------|----------------------|
|  | Trimble NetRs | ● | 1GB | 3.4 W |
|  | Trimble NetR9 | ● | 8GB internal + External USB | 3.8 W |
|  | Javad Sigma | ● | Up to 2GB | 4 W |
|  | Septentrio PolaRx4 Pro | ● | Up to 7.4GB | 6.1 W |

[* More info @ UNAVCO](#)

- OEM Board Level Geodetic GPS Receivers

Trimble BD920-W3g

1.3 Watt (L1/L2 GPS + GLONASS)

WiFi & Bluetooth

RS232, USB & Ethernet

→ [Info on Trimble web site](#)



- OEM Board Level Geodetic GPS Receivers

Hemisphere Eclipse P302/P303

Less than 1.9 Watts (L1/L2 GPS + GLONASS)

USB & Serial Port

Cheap

→ [Info on Hemisphere web site](#)

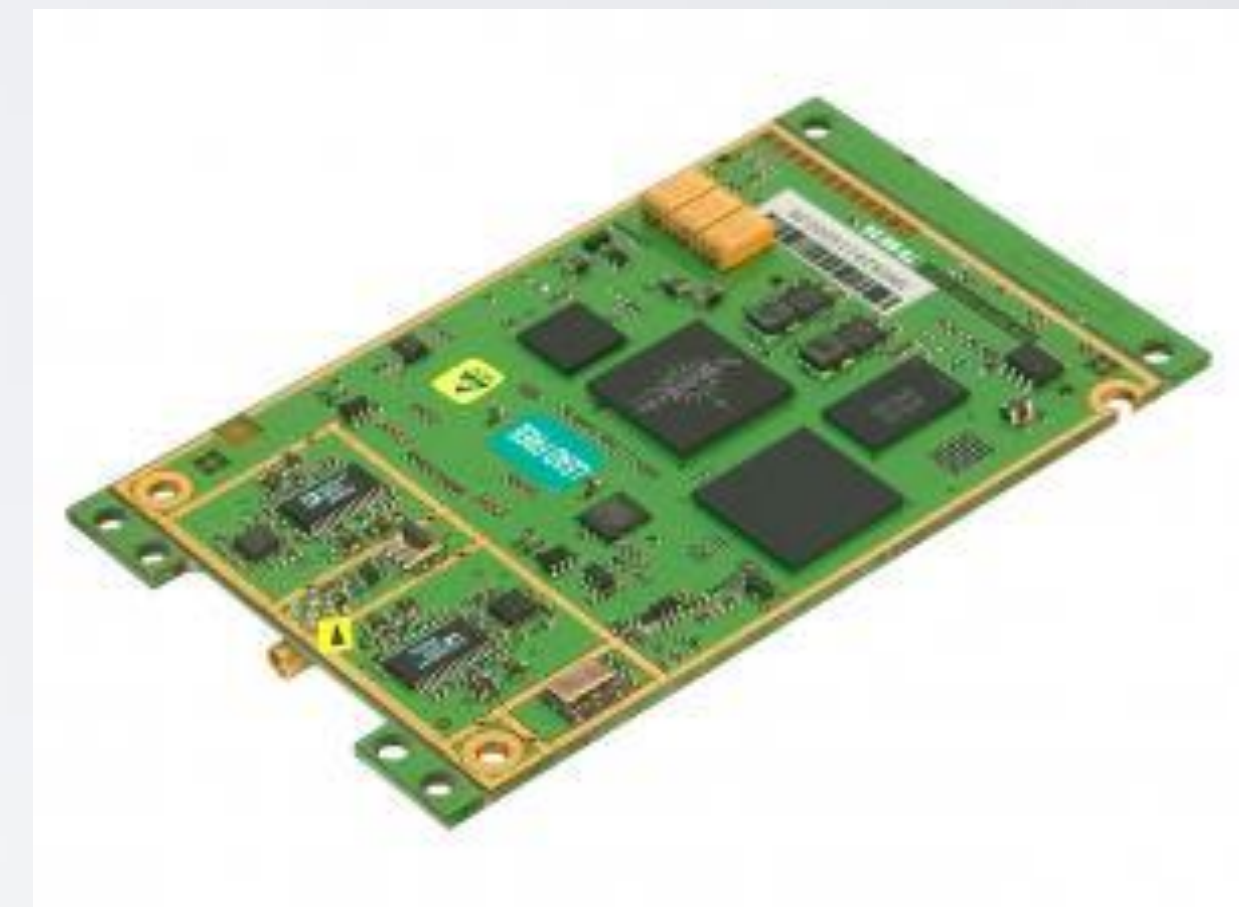


- OEM Board Level Geodetic GPS Receivers

Septentrio AsteRx2e OEM

1.5 Watts (L1/L2 GPS + GLONASS)

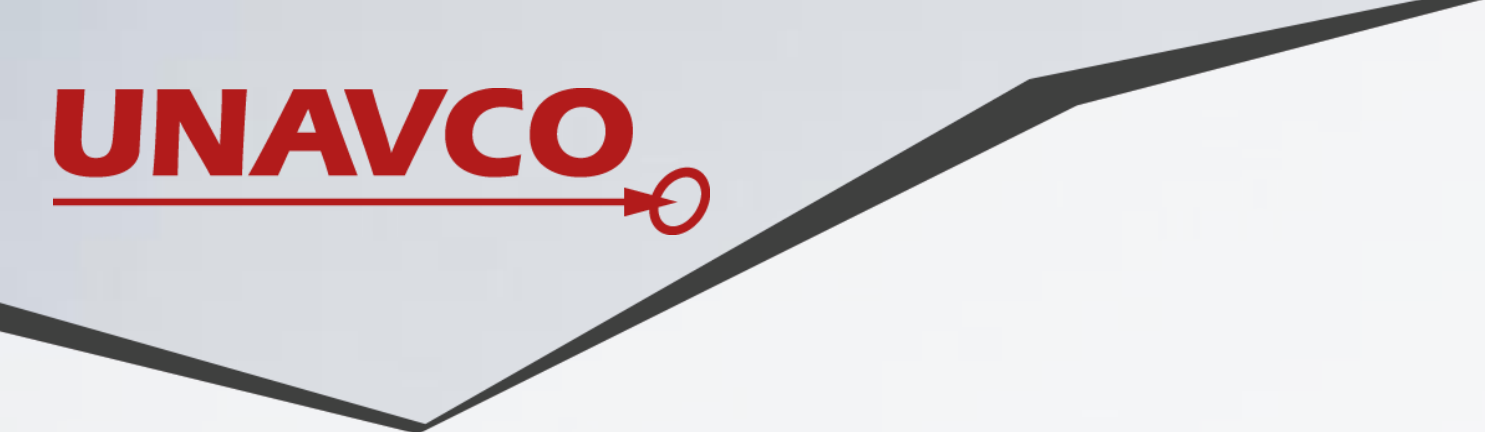
RS232, USB



- OEM Board Level Geodetic GPS Receivers

A wide variety of Low Power OEM board level GPS receivers available

- Can be used with minimal development for campaign GPS
- Heavy development needed in the case of fully communicating autonomous GPS station (NetRS replacement in POLENET style design)



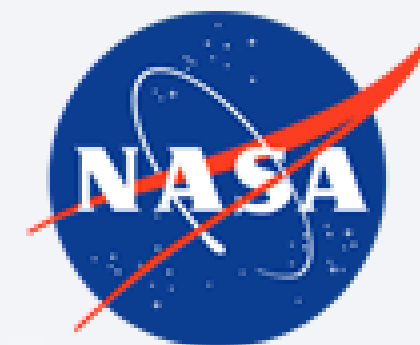
Thank You!

Questions?

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Nicolas Bayou, Engineering: bayou@unavco.org

Polar Technology: www.unavco.org/polartechnology



National Science Foundation
WHERE DISCOVERIES BEGIN