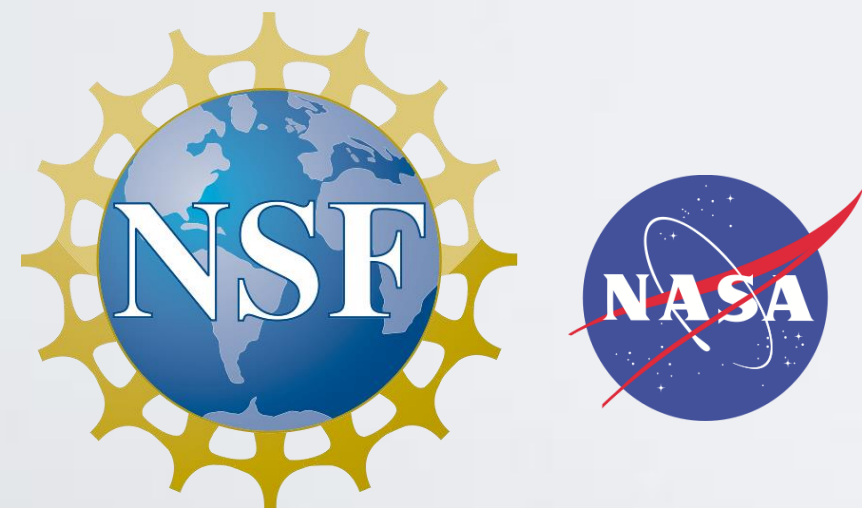


**UNAVCO**

# Powering Science at High Latitudes

Nicolas Bayou – UNAVCO Polar Services



Polar Technology Conference 2016 – Denver, CO



- UNAVCO at a glance
- UNAVCO Polar Services
  - [POLENET](#)
  - Power & Communication Systems
  - New Systems





- 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





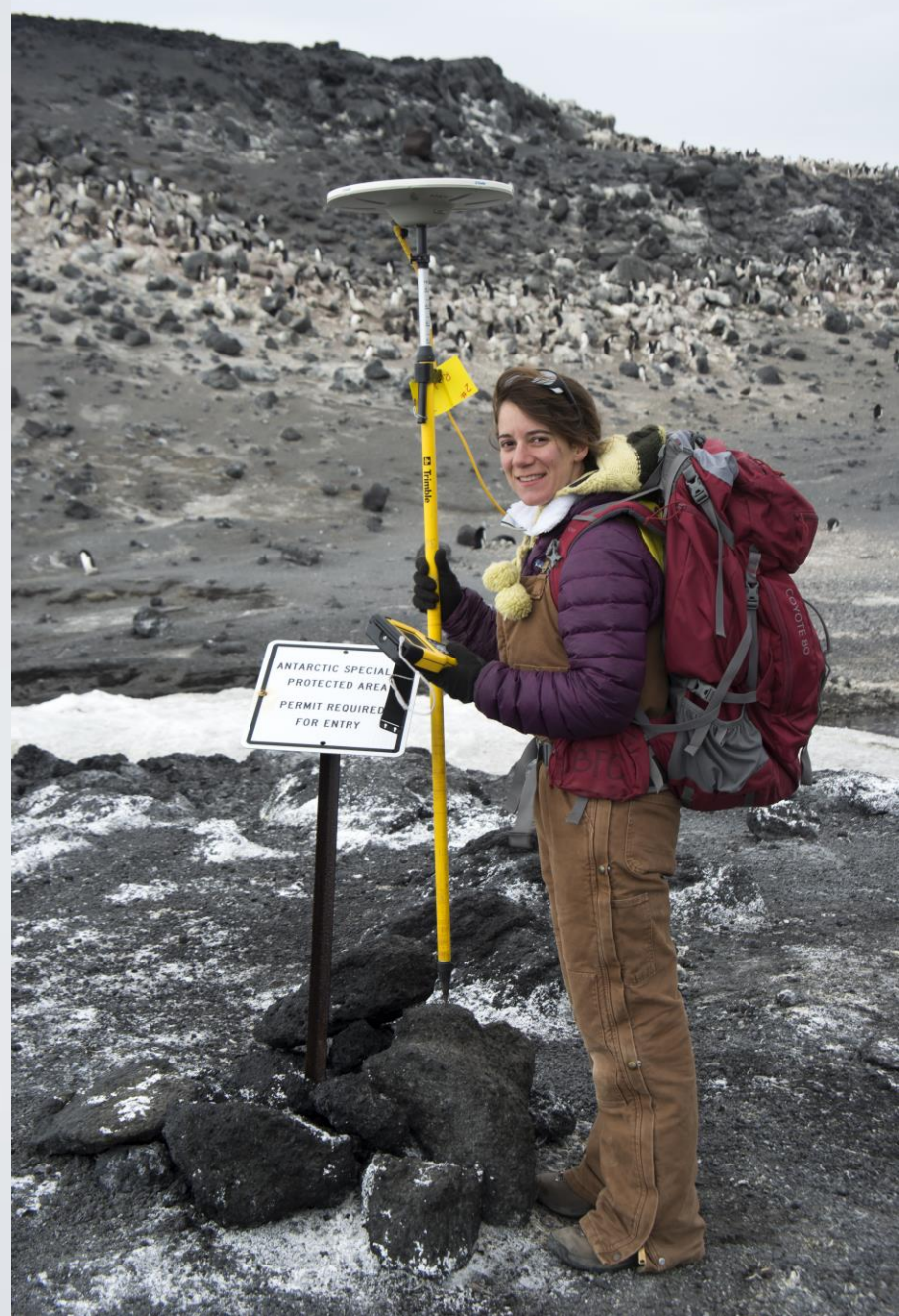
We offer:

- Operation & Support of Geodetic Networks
- Technical Support
- Free and Open Data Archive
- Training
- Campaign GPS
- Terrestrial LiDAR
- Software development for accessing and processing data





- 7 Professional staff dedicated to supporting polar research projects
- Precision Geodesy & 3D Mapping with Terrestrial LiDAR
- Customized solution for powering scientific instruments at high latitudes

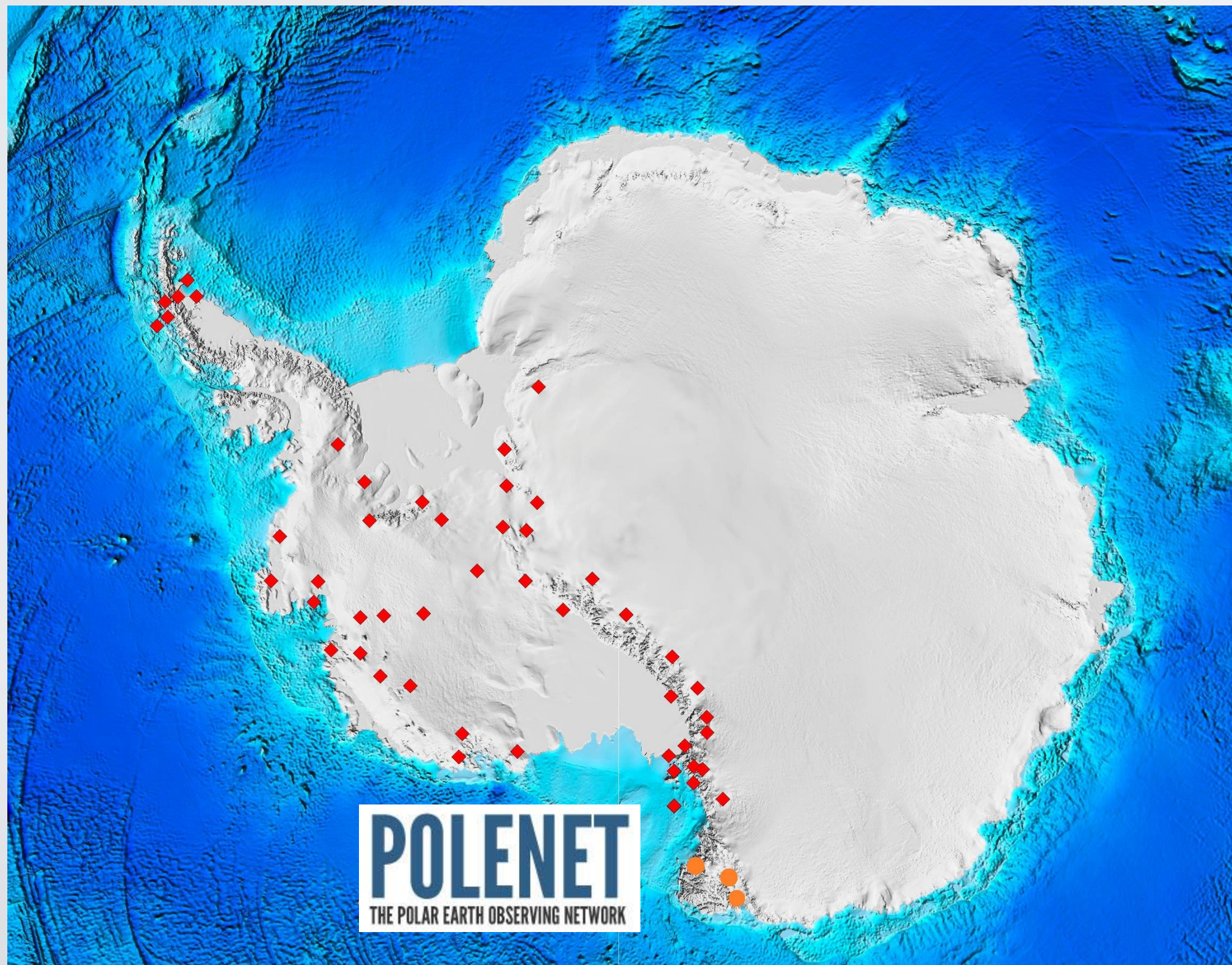




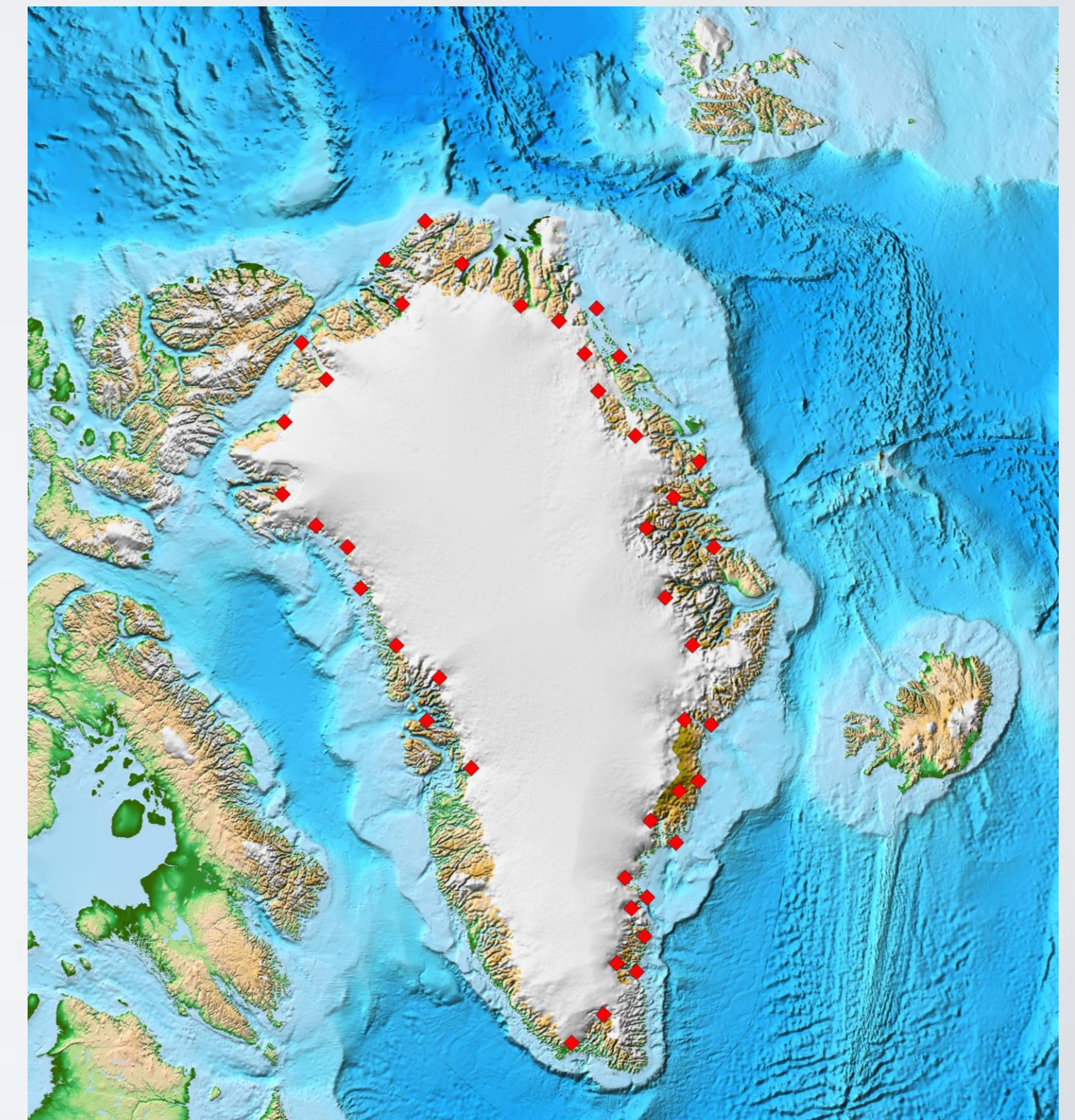
# GPS Sites Network & Management

- POLENET: GPS Stations Network

Antarctica – 55 Stations



Greenland – 42 Stations





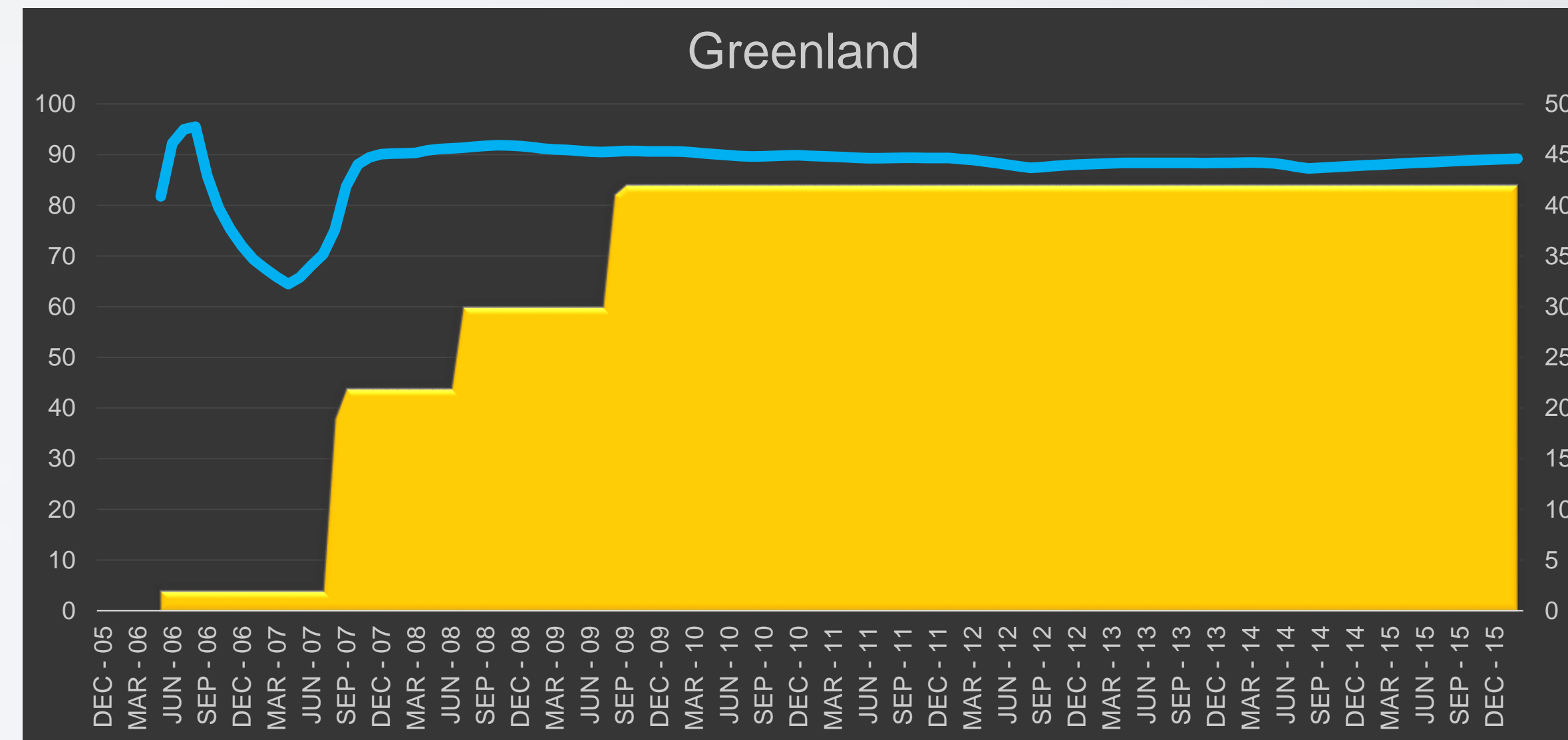
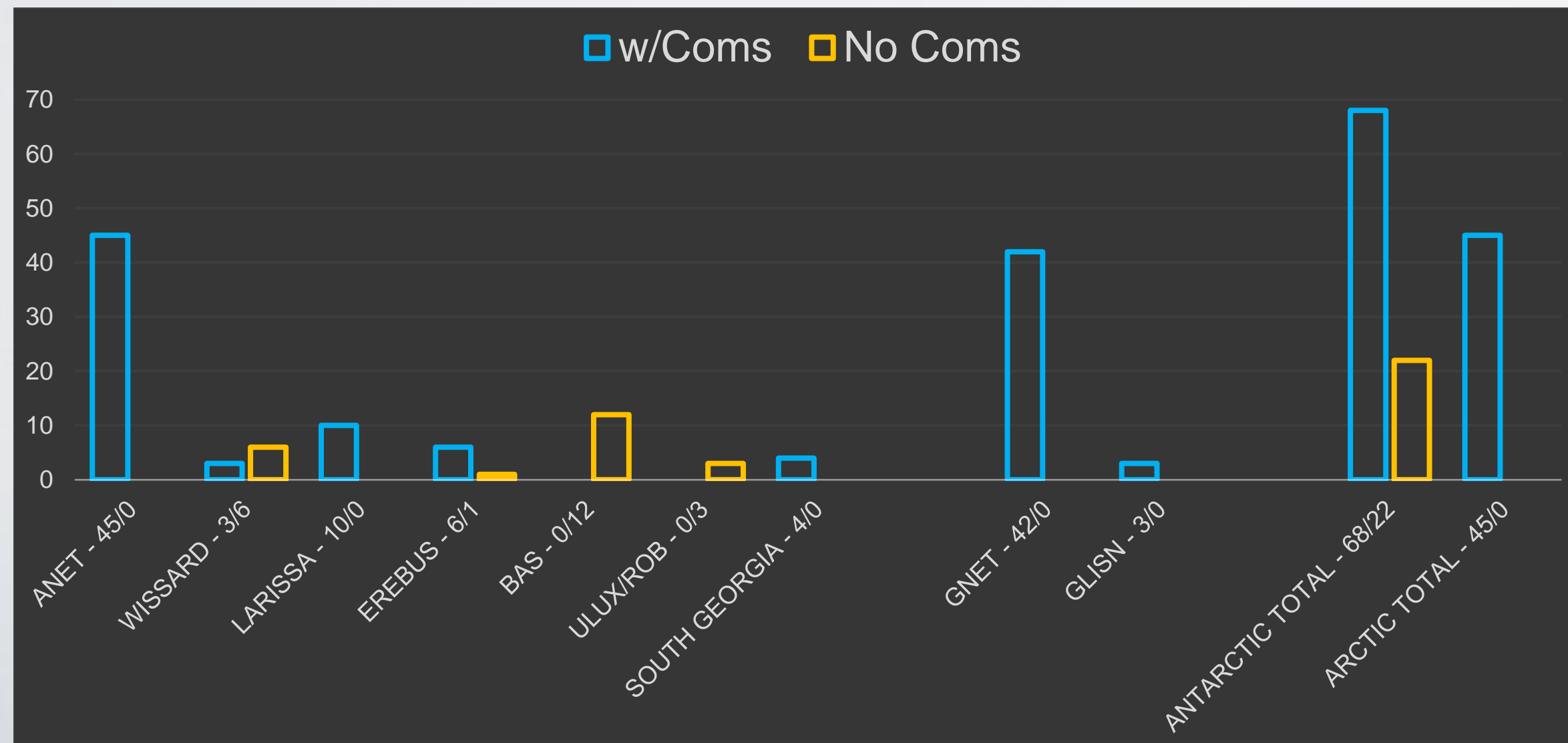
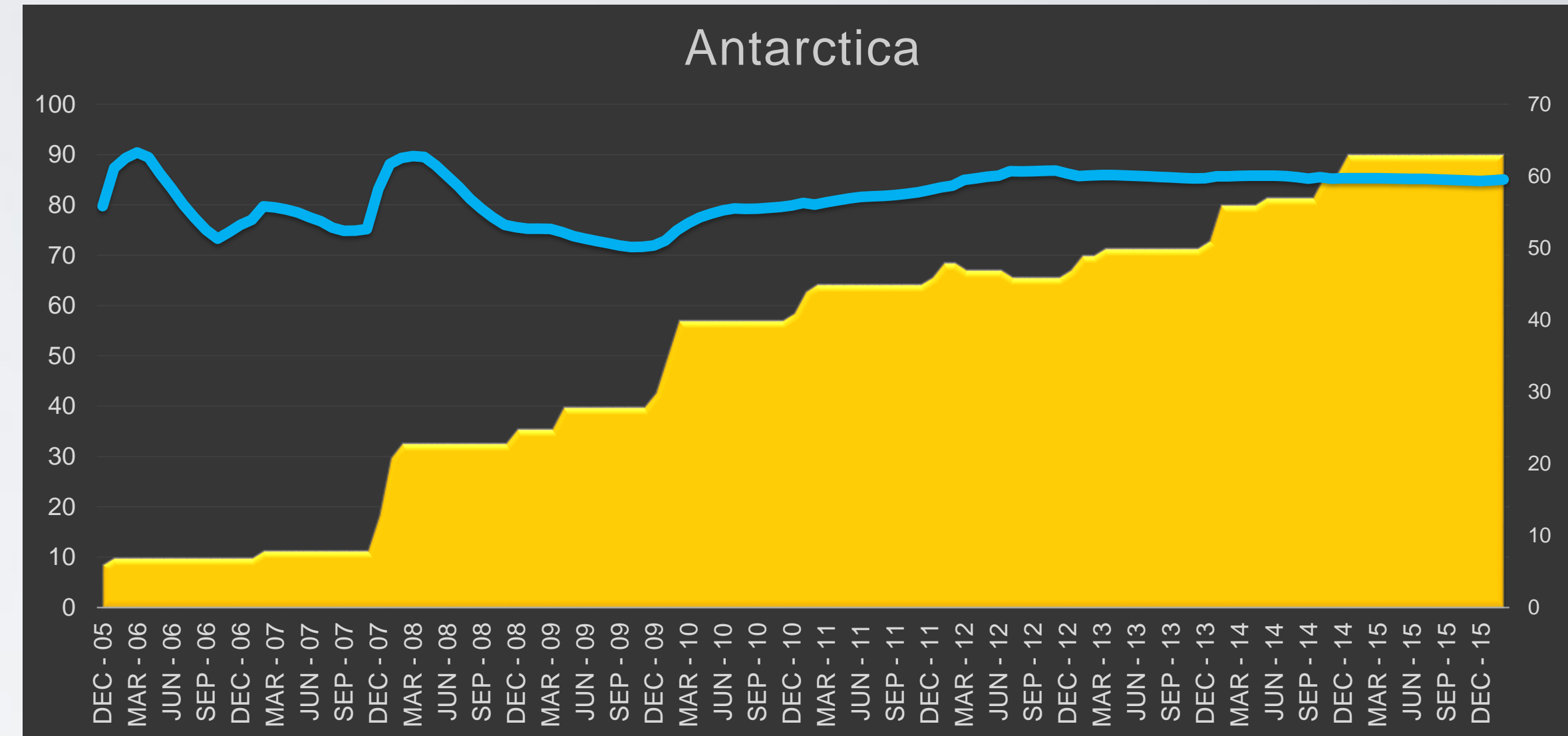


# GPS Sites Network & Management

Overall Data Return (Feb. 2016):

ANET: 88.5%

GNET: 89.2%





# Power & Communication Systems

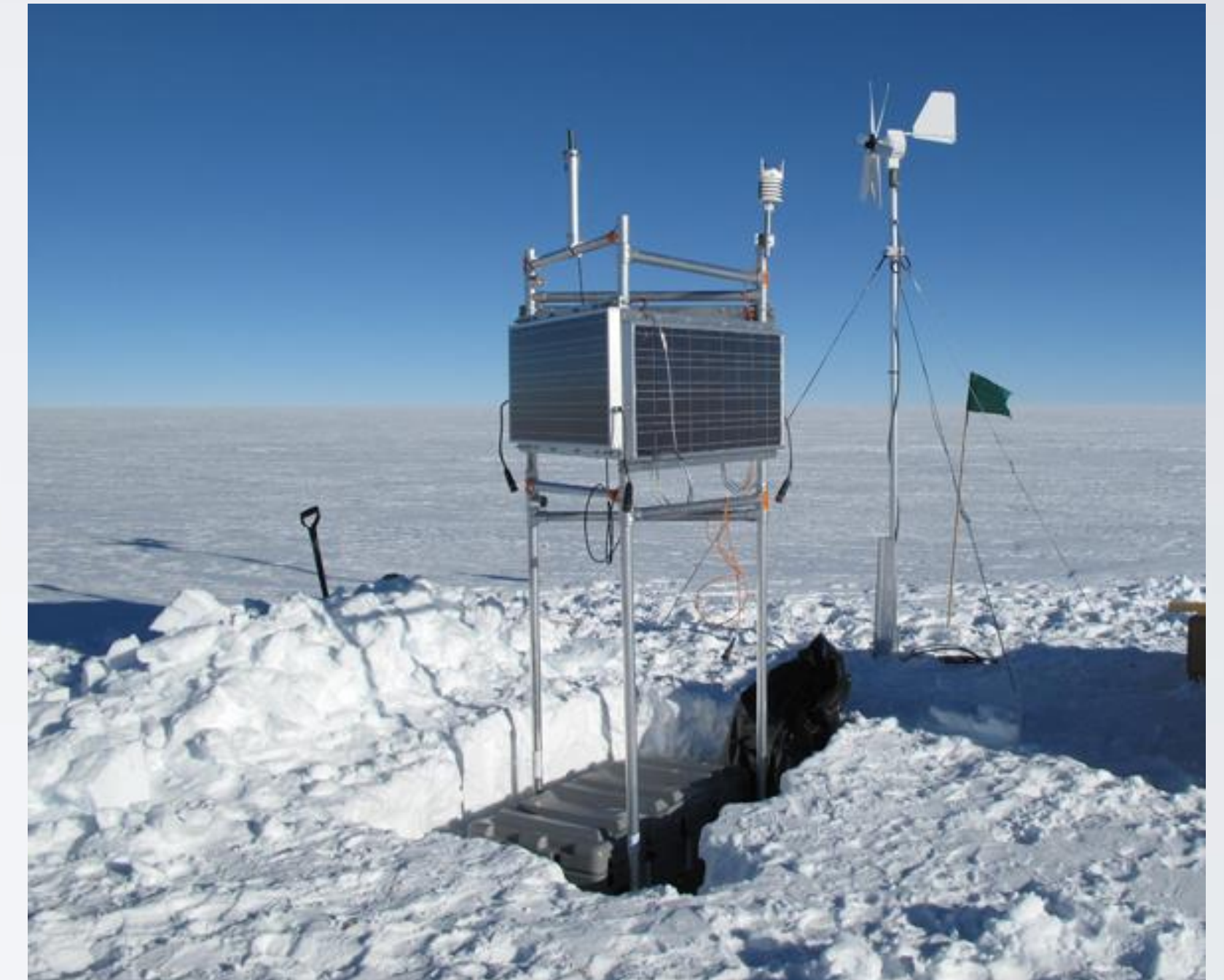
- Power Systems: Powering a wide variety of scientific instruments



Margin Rock System  
Bear Peninsula  
(BERP)



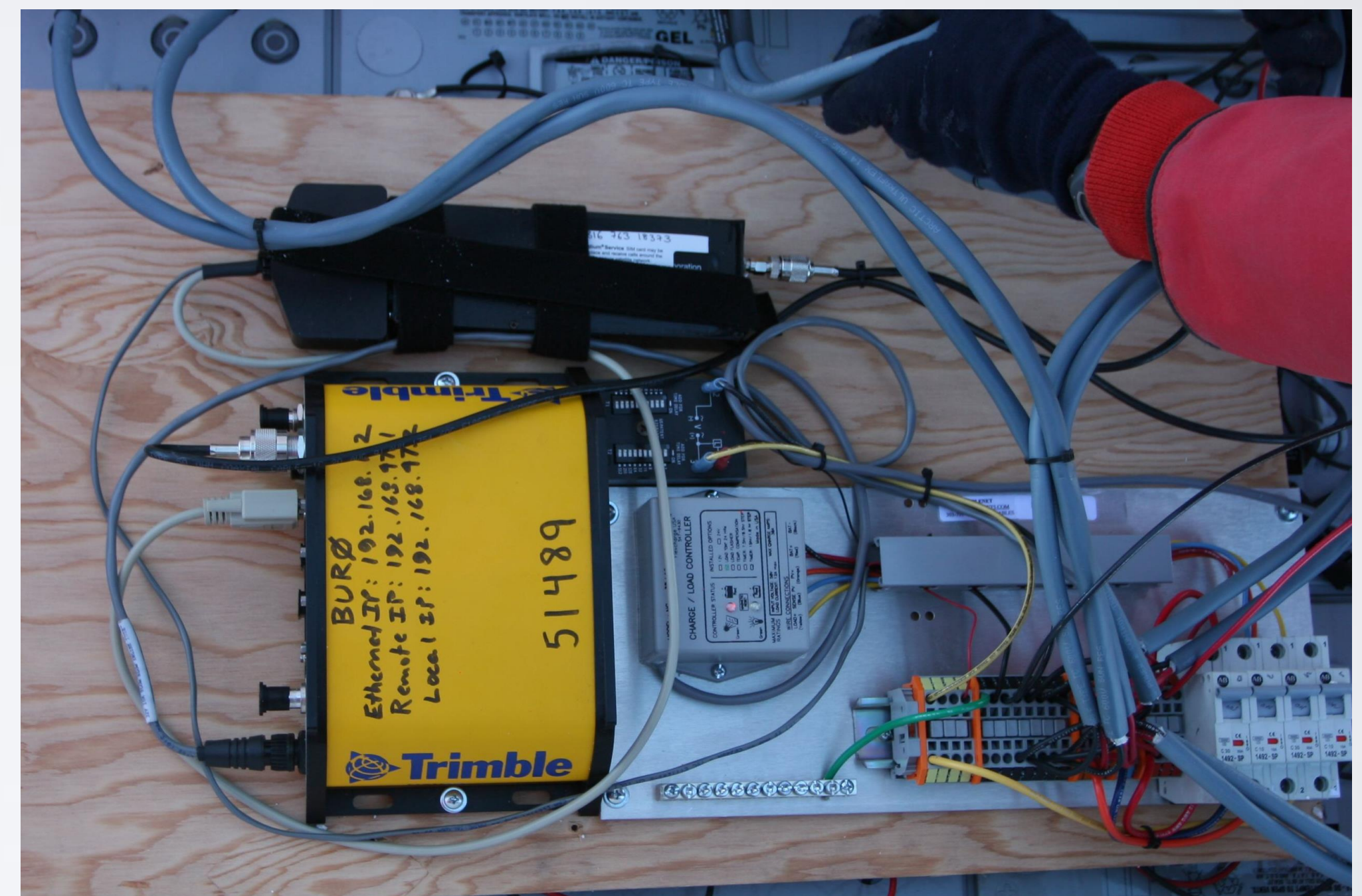
West Antarctic System  
Kohler Glacier  
(KHLR)



Plateau Snow System  
Recovery Lakes  
(REC1)

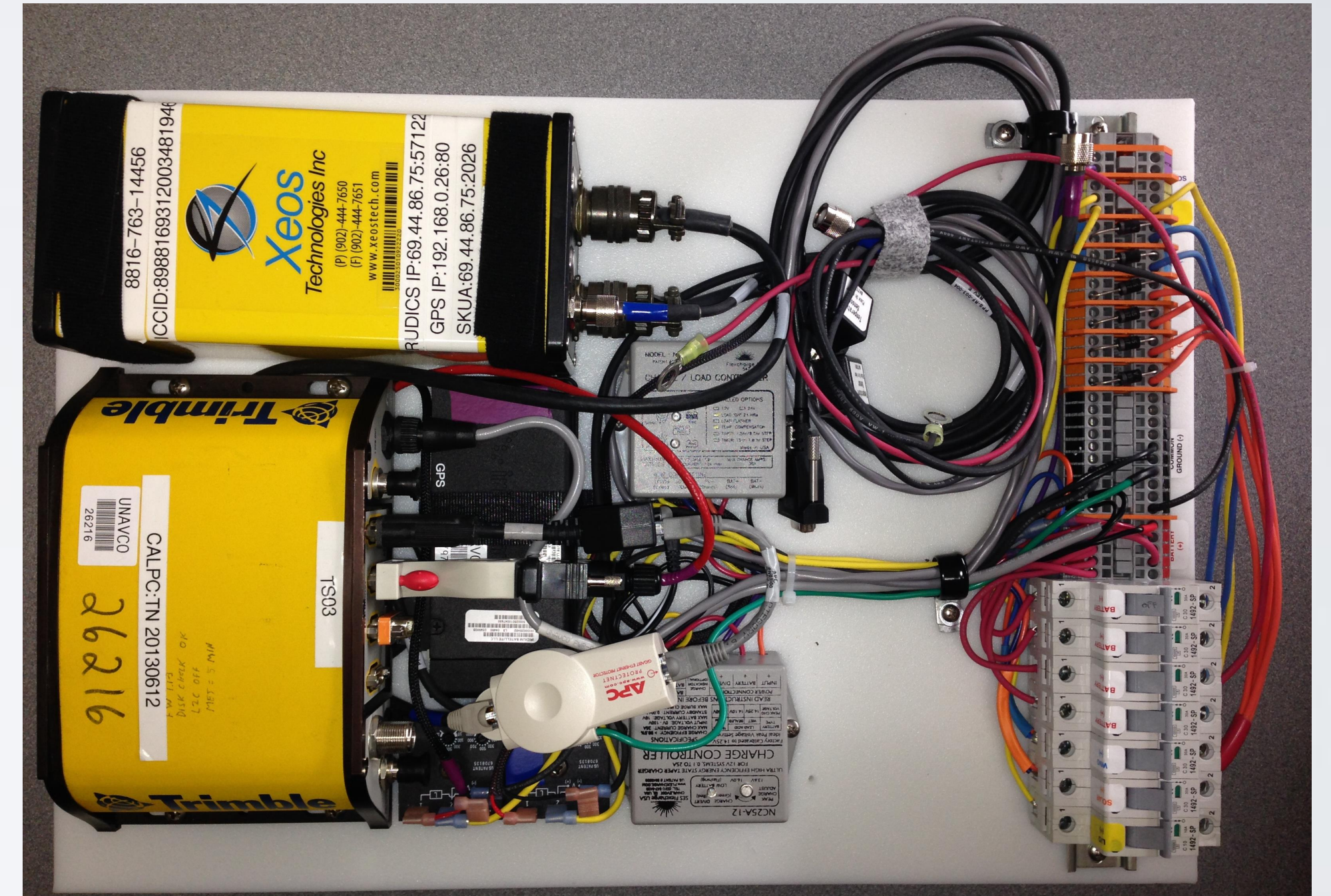


- Remote Polar GPS Stations: PAST design





- Remote Polar GPS Stations: PRESENT design





# Power & Communication Systems

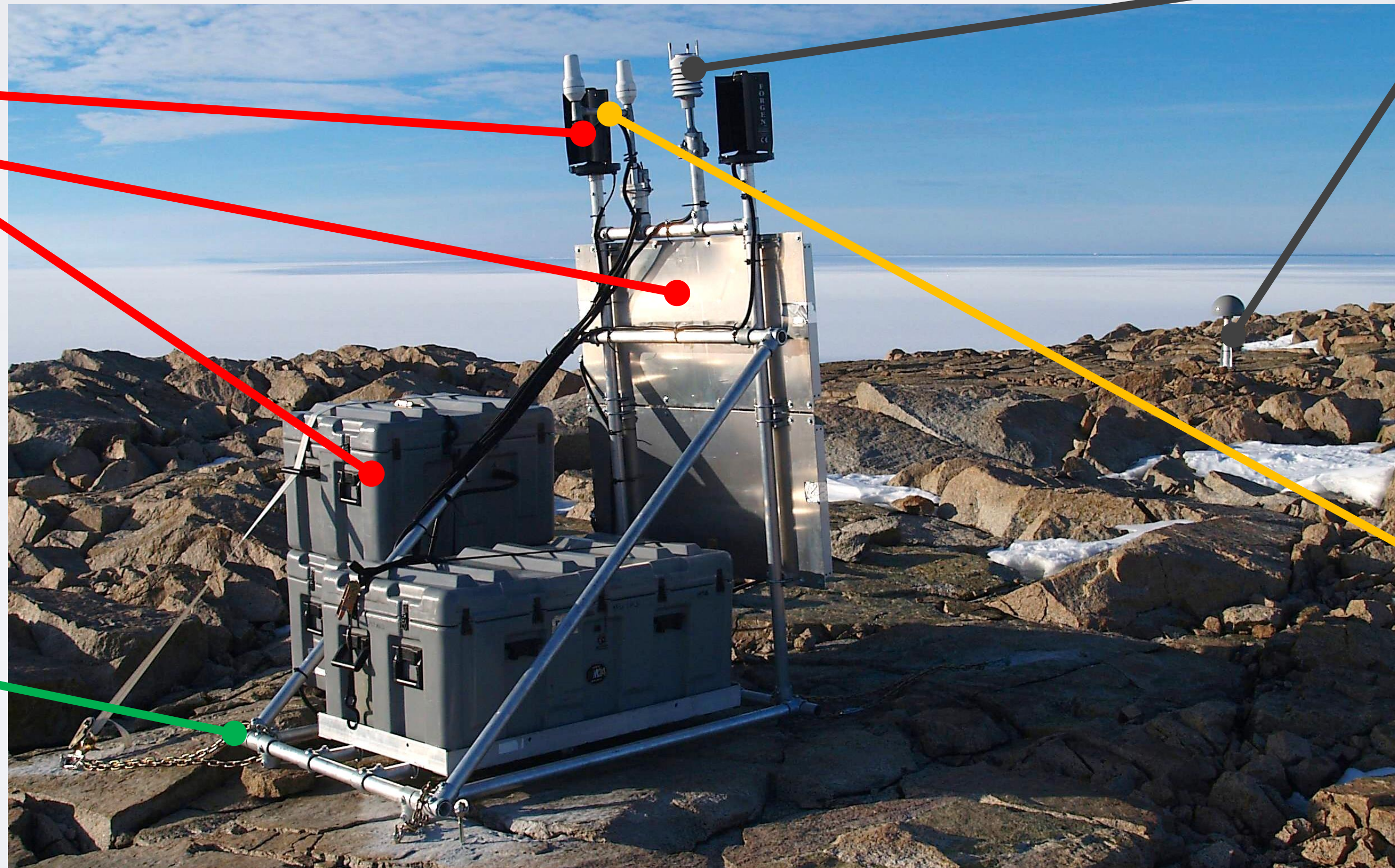
- Power Systems

**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

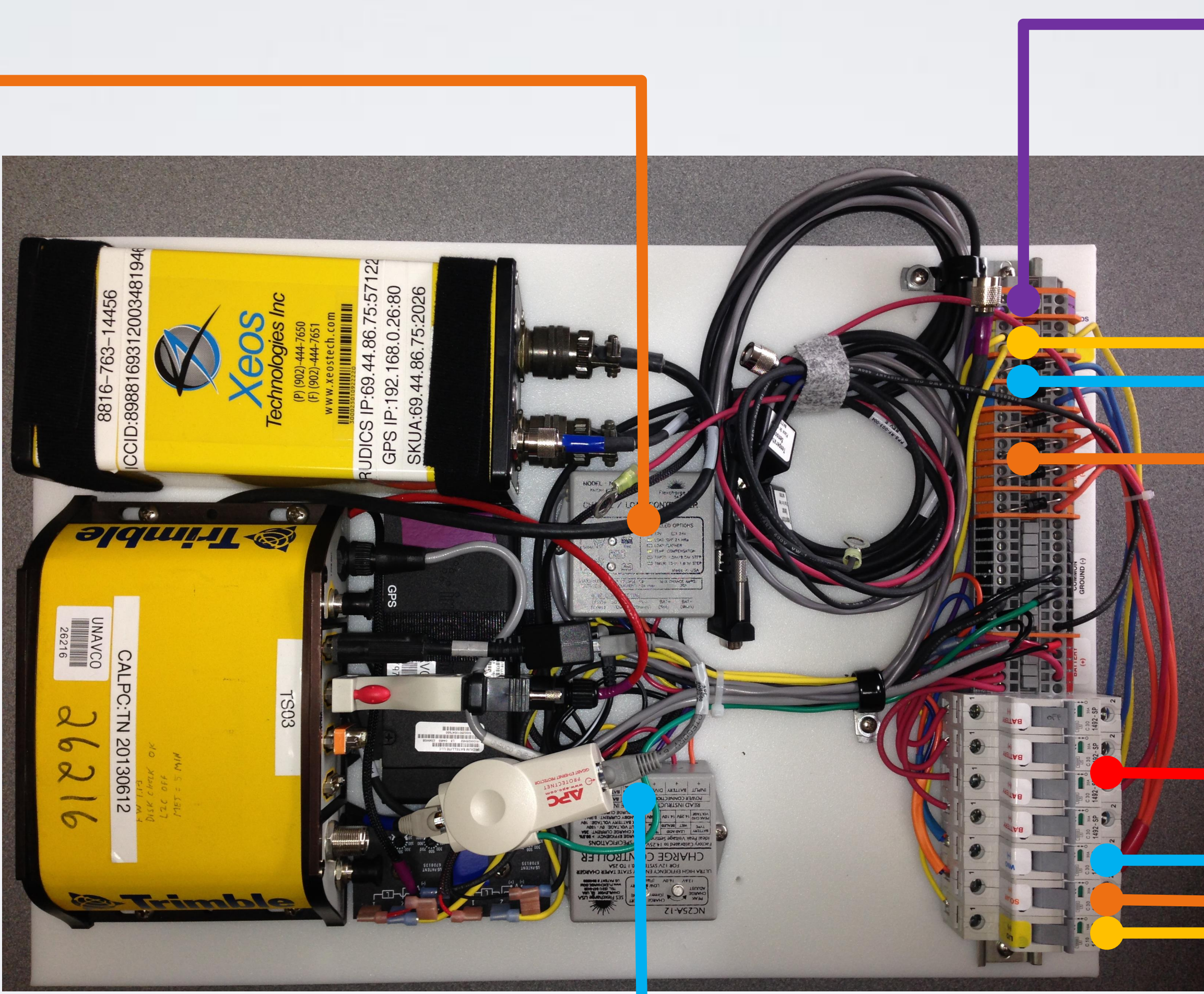
**Communications:**

- Iridium



- Power 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

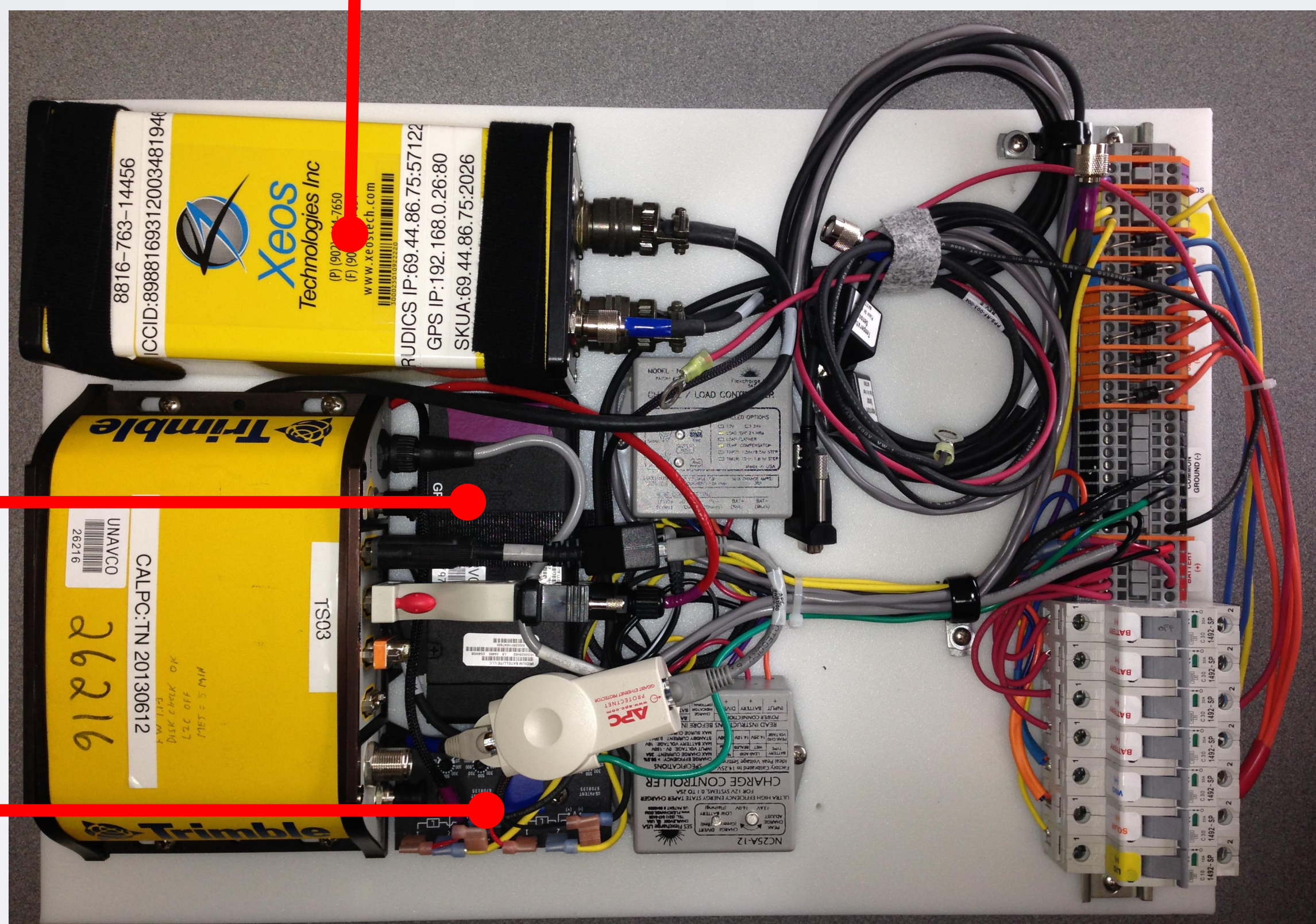


- Power Supply & Communication Board

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



- Communication Devices

<u><a href="#">Iridium 9522B</a></u>	<u><a href="#">Xeos Xi 100B</a></u>	<u><a href="#">Intuicom EB-6 Radio</a></u>
IRIDIUM Satellites Constellation		RADIO Link
Serial Connection	LAN Connection	LAN Connection
Point to Point Protocol	RUDICS	-
~1 W for 1Mb data download per day	<1 W for 1Mb data download per day	<1 W for 1Mb data download per day
		



# Current Development Projects

- Data Download Communications Hub

Used for data at risk of loss, challenging terrain, small networks

Pilot project on Helheim Glacier, Greenland for Dr. David Holland (NUY)

1 Data Download Hub

7 autonomous GPS sites on the glacier

Radio Link to retrieve data

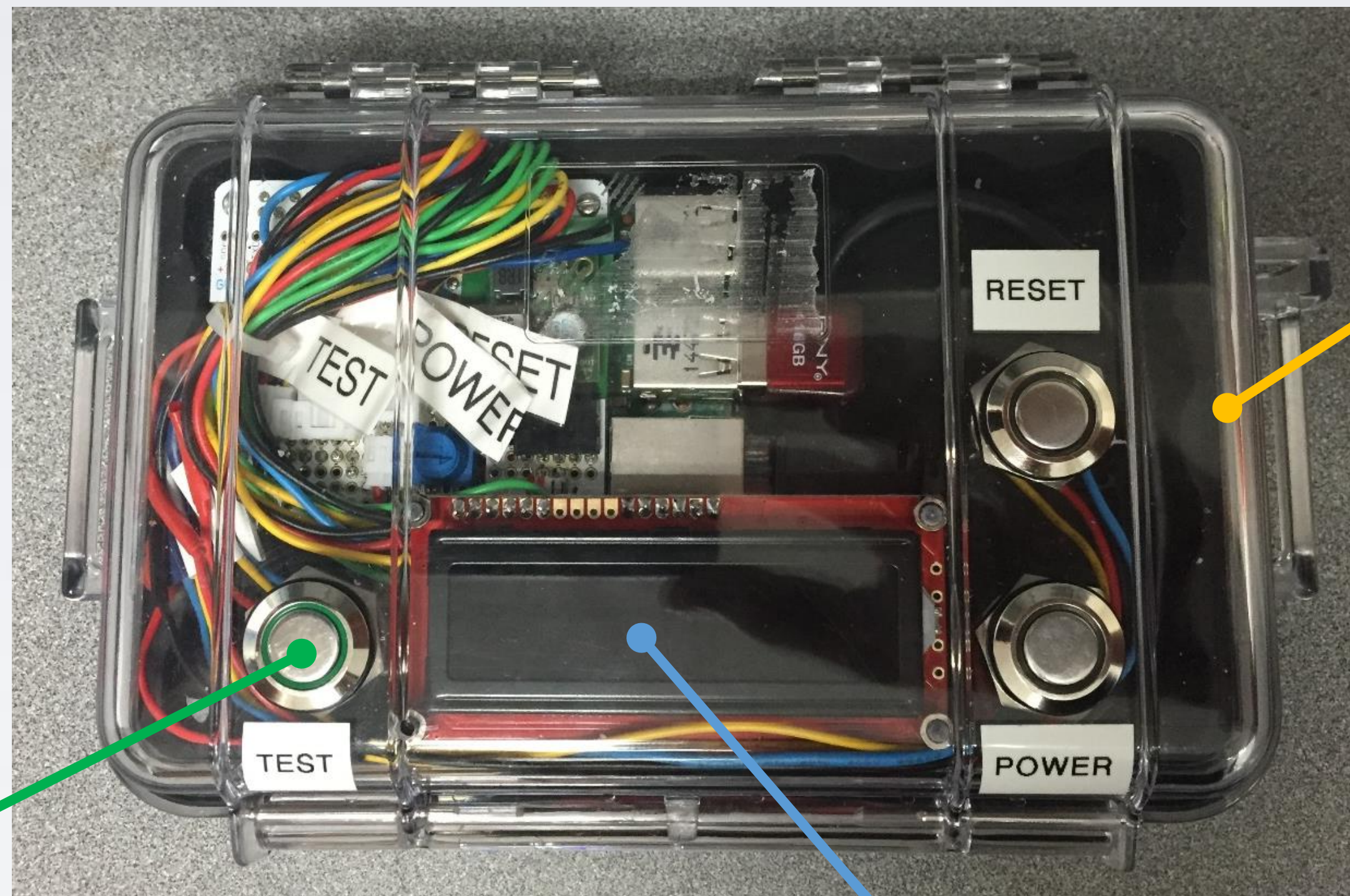
Summer only.





# Current Development Projects

- Data Download Communications Hub



**Weather Proof  
Case**

## Test Button

- Test connectivity
- Retrieves State of Health

**Display**

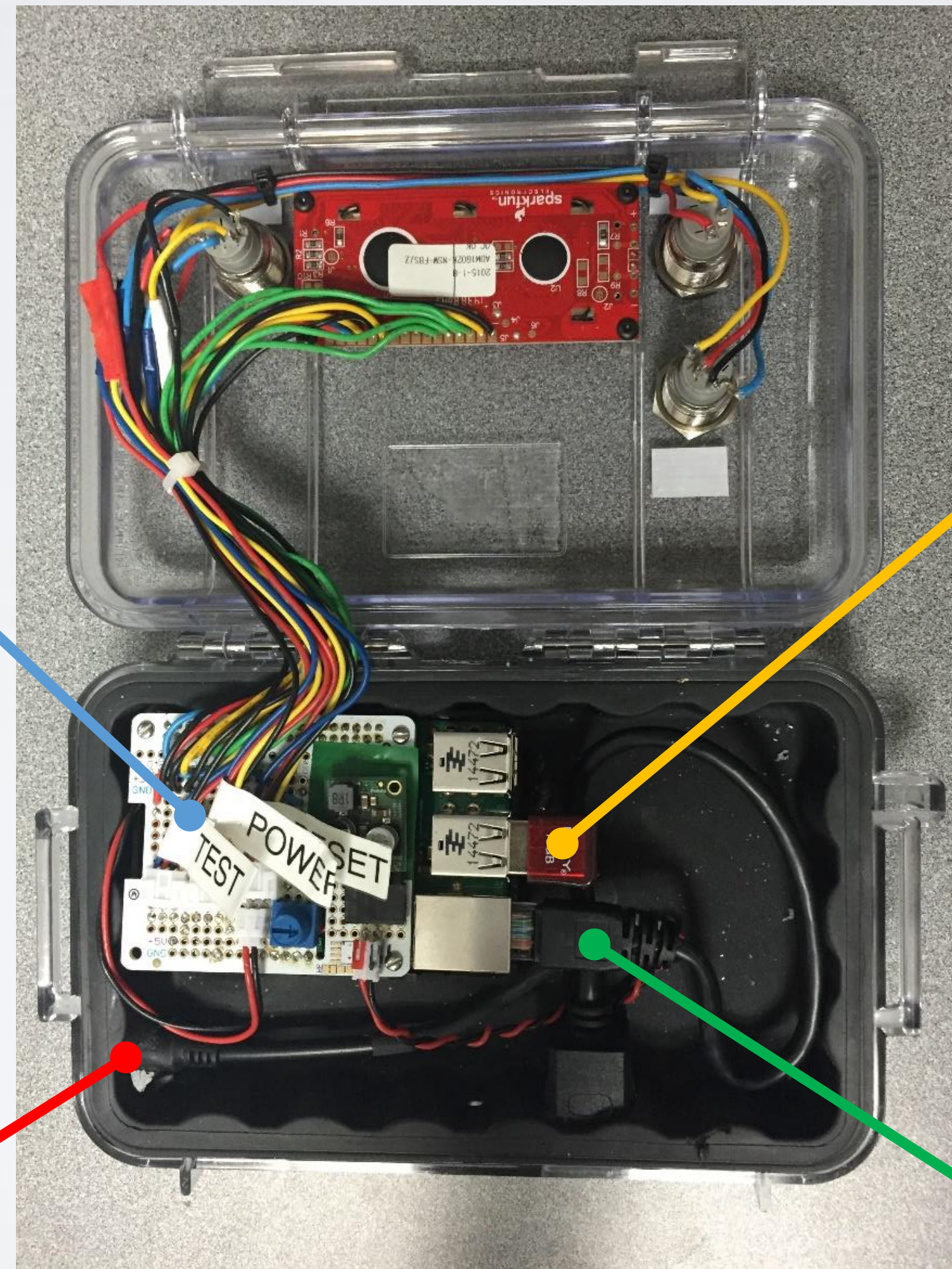


# Current Development Projects

- Data Download Communications Hub

## Raspberry Pi

- PiHat
- 12VDC to 5VDC



**Removable Storage (USB)**

**Ethernet Port**

**Power Port (12VDC)**



# Current Development Projects

- Data Download Communications Hub

**Radio Antennas**



**Autonomous GPS Station**

Deployed on Glacier



**Download Hub**

On Bed Rock



# Current Development Projects

- Data Download Communications Hub

Pilot project for Dr. David Holland

Only 1 GPS deployed...

30 sec and 1Hz Sample Rate GPS data





# Current Development Projects

- 24V/High Power System

Pilot Project for Dr. David Holland (NYU)

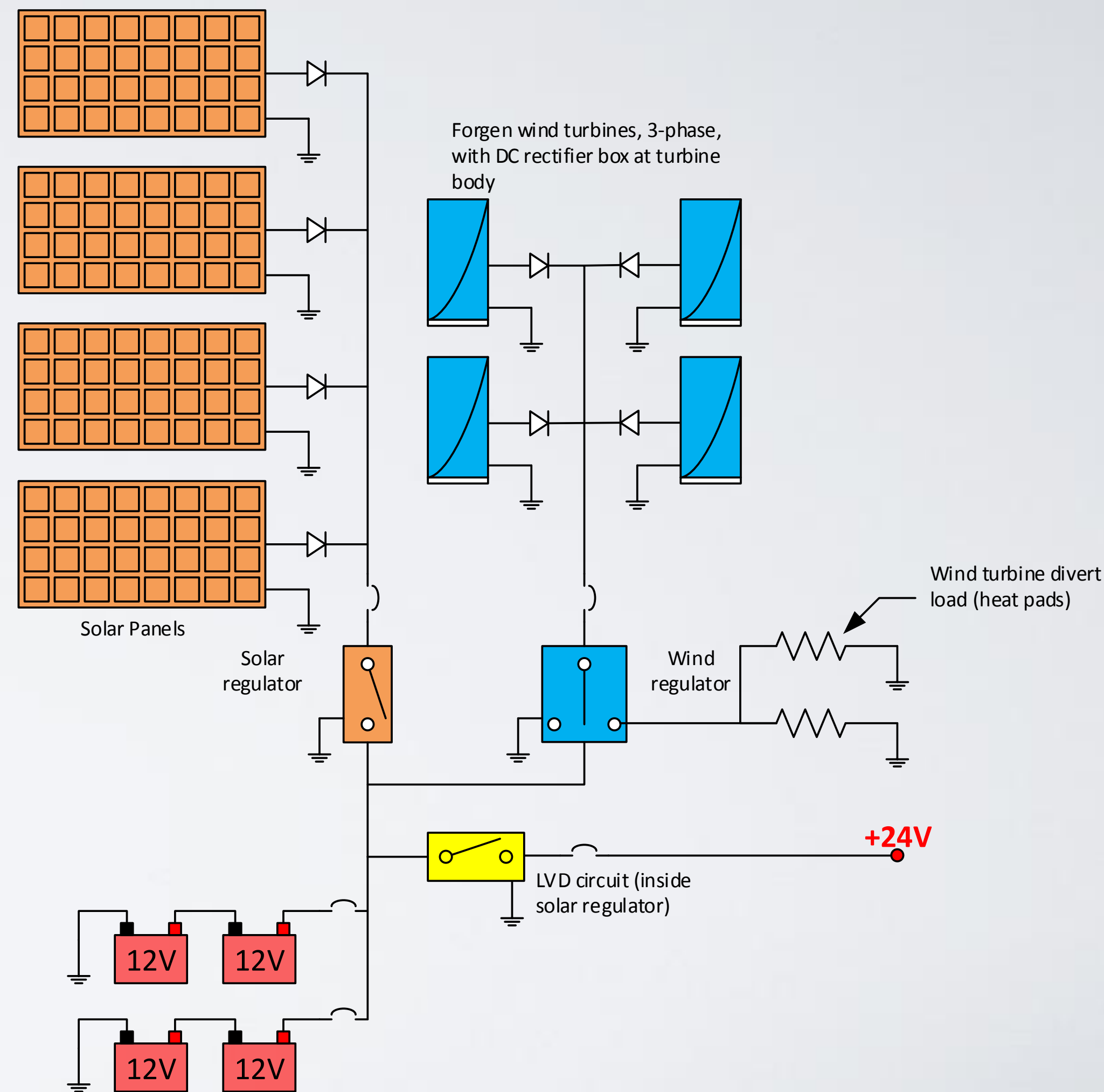
Powering Ground Based Radar Interferometer & Data Storage

Dual 24/12VDC

High Power (160W)

Wind & Solar

Summer Only (Greenland)







# Infrastructure GNSS Receiver

- [Septentrio PolaRx5](#)

Full GNSS

WiFi Connectivity

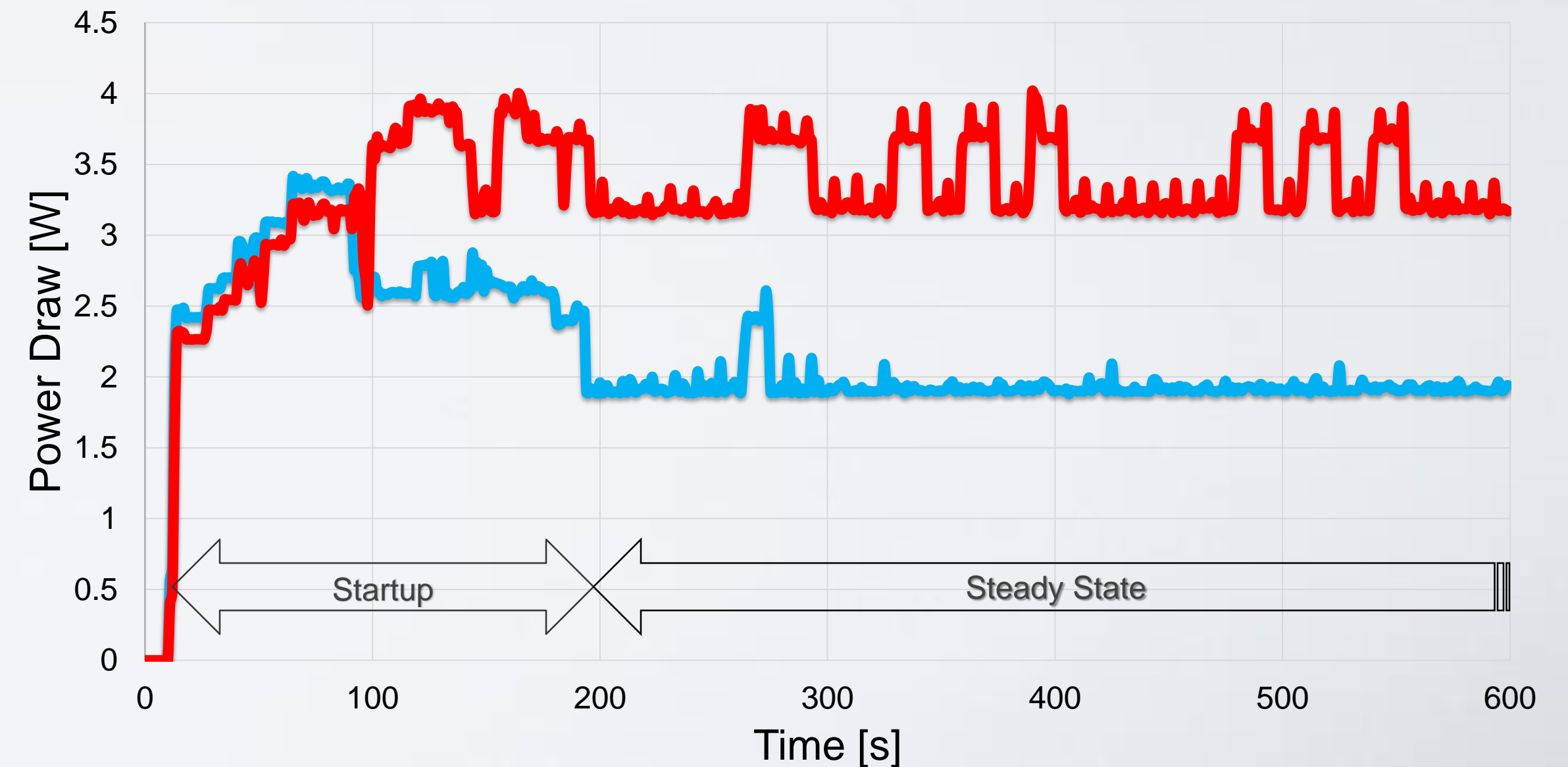
Handles External USB Drives

Full Control

**3.5W (Full GNSS w/o USB external drive)**



Power Draw Envelop

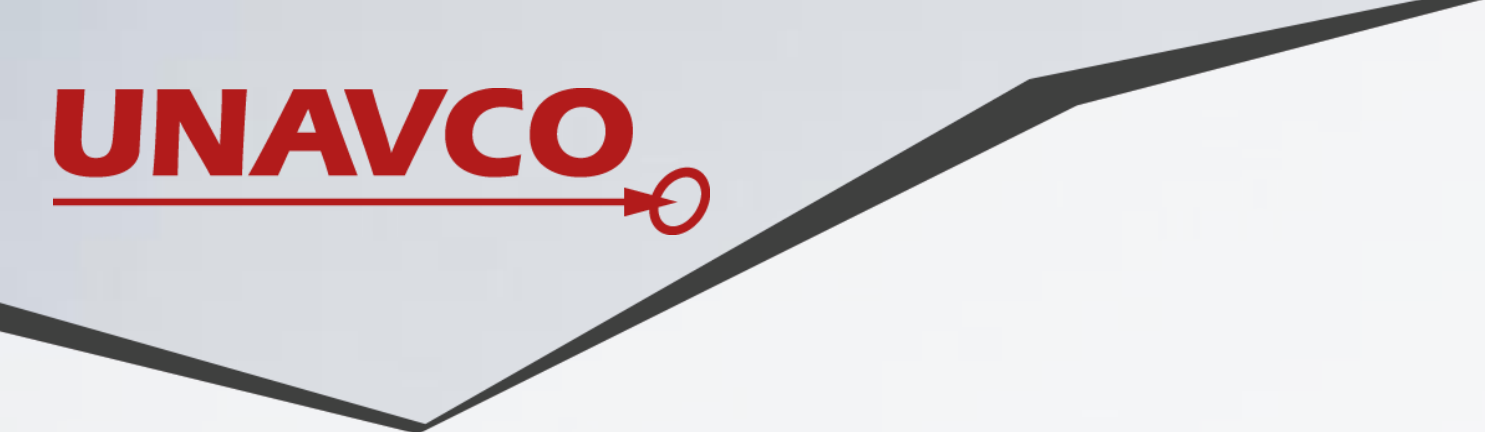




- Polar GPS Receiver RFQ

Low power focus (2W) and integrated coms  
Under Review





Thank You!

Questions?

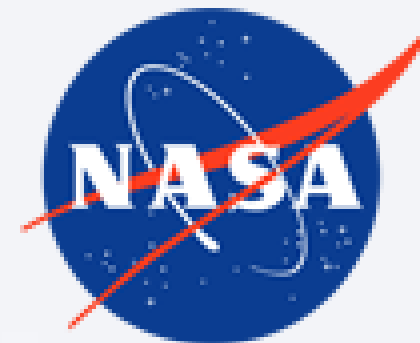


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National Science Foundation  
WHERE DISCOVERIES BEGIN