

Exploring the Costs of UHF Transmissions in the UW-Madison AWS Network

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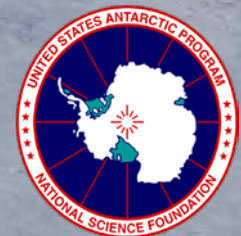
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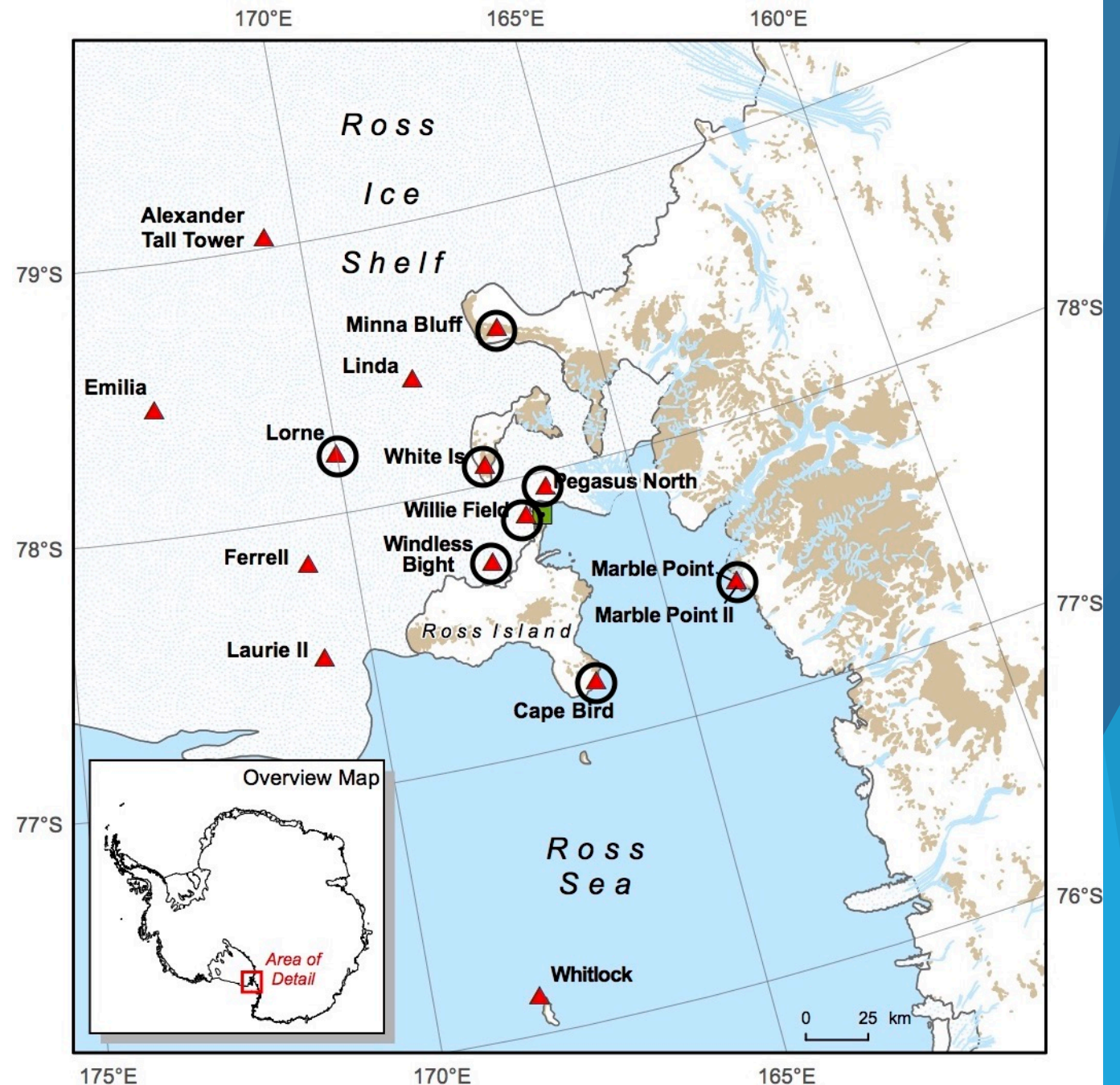
Outline

- ▶ UHF (Ultra High Frequency) Network
- ▶ Transmission method
- ▶ Programming work
- ▶ Power requirements
- ▶ Issues
- ▶ Solutions

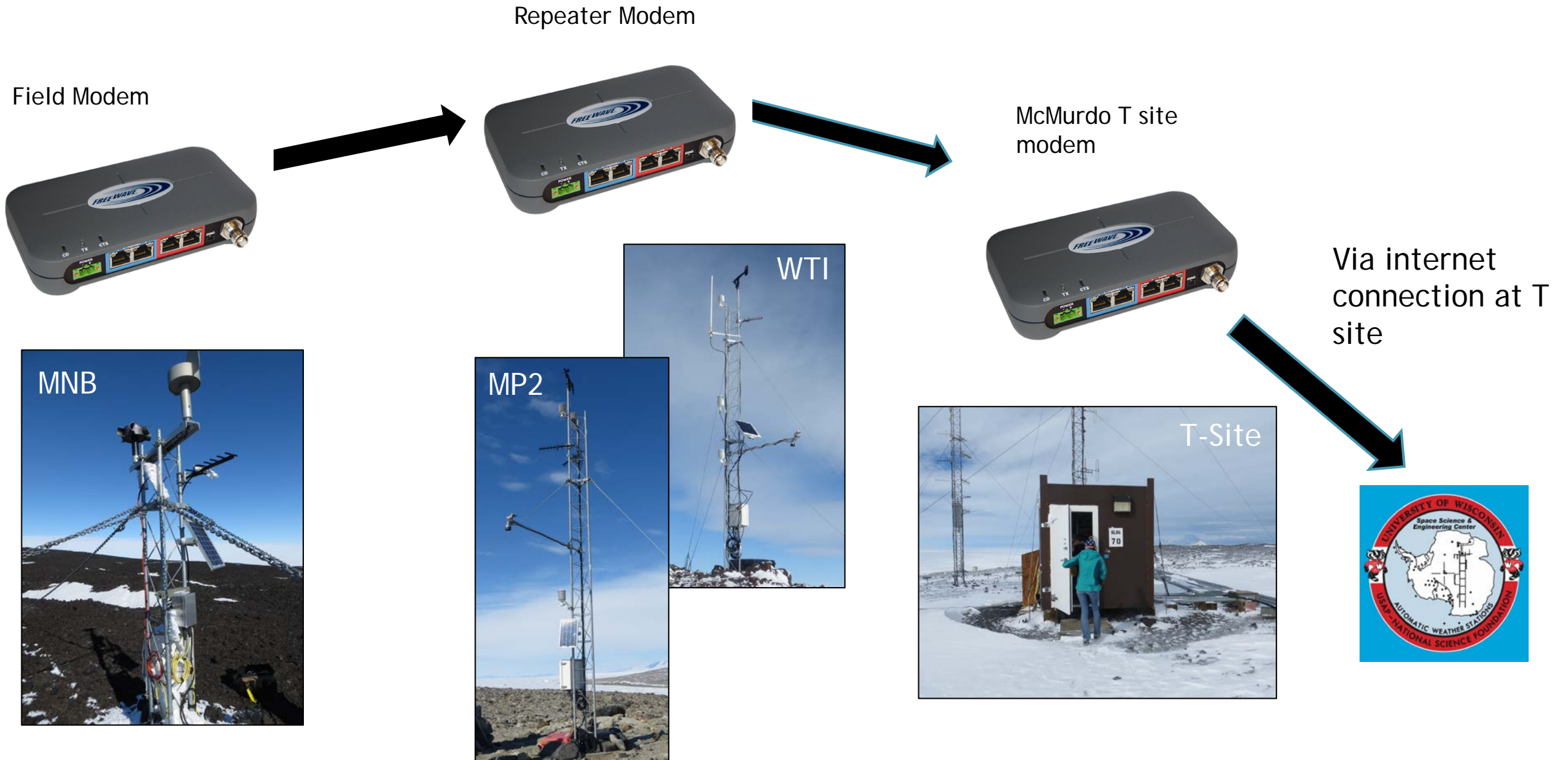


UHF Network

- ▶ 8 AWS in total
- ▶ 2 repeater sites
 - ▶ Marble Point
 - ▶ Cape Bird -> Marble Point II -> T-Site
 - ▶ White Island
 - ▶ Minna Bluff -> White Island -> T-site
 - ▶ Lorne -> White Island -> T-site
- ▶ Past Sites
 - ▶ Ferrell
 - ▶ Linda



UHF Network Design



Transmission Method

- ▶ FreeWave modem - 900 MHz
- ▶ Can transmit more data per transmission (~150 Kbps)
 - ▶ Ability to transmit backlog of data if needed
- ▶ Transmit 10-minute data, per usual, half-hourly during summer months, hourly during winter months
- ▶ Transmission route:
 - ▶ AWS to Howard, a computer at T-site
 - ▶ Data sent on Virtual Private Network to herbie and emperor in McM
 - ▶ Data sent via Local Data Manager to UW

Programming work at UW

- ▶ Goal: Structure data processing around historic Argos method
- ▶ Real-time observations
- ▶ Data into quality-control format



Power Draw

	FreeWave	Iridium SBD 9602	Argos
Transmission	6.6 W / 550 mA = 12 V applied	1 W / 190 mA = 5 V applied	0.8 W / 375 mA = 2.4 V applied
Sleep (idle)	70 mA	45 mA	1.12 mA
Transmitter power cycle	Powered for 10 minutes per half hour or hour	Powered for 1 minute per 10 minutes	Powered all the time (1 transmission per 10 minutes)

Power systems at AWS

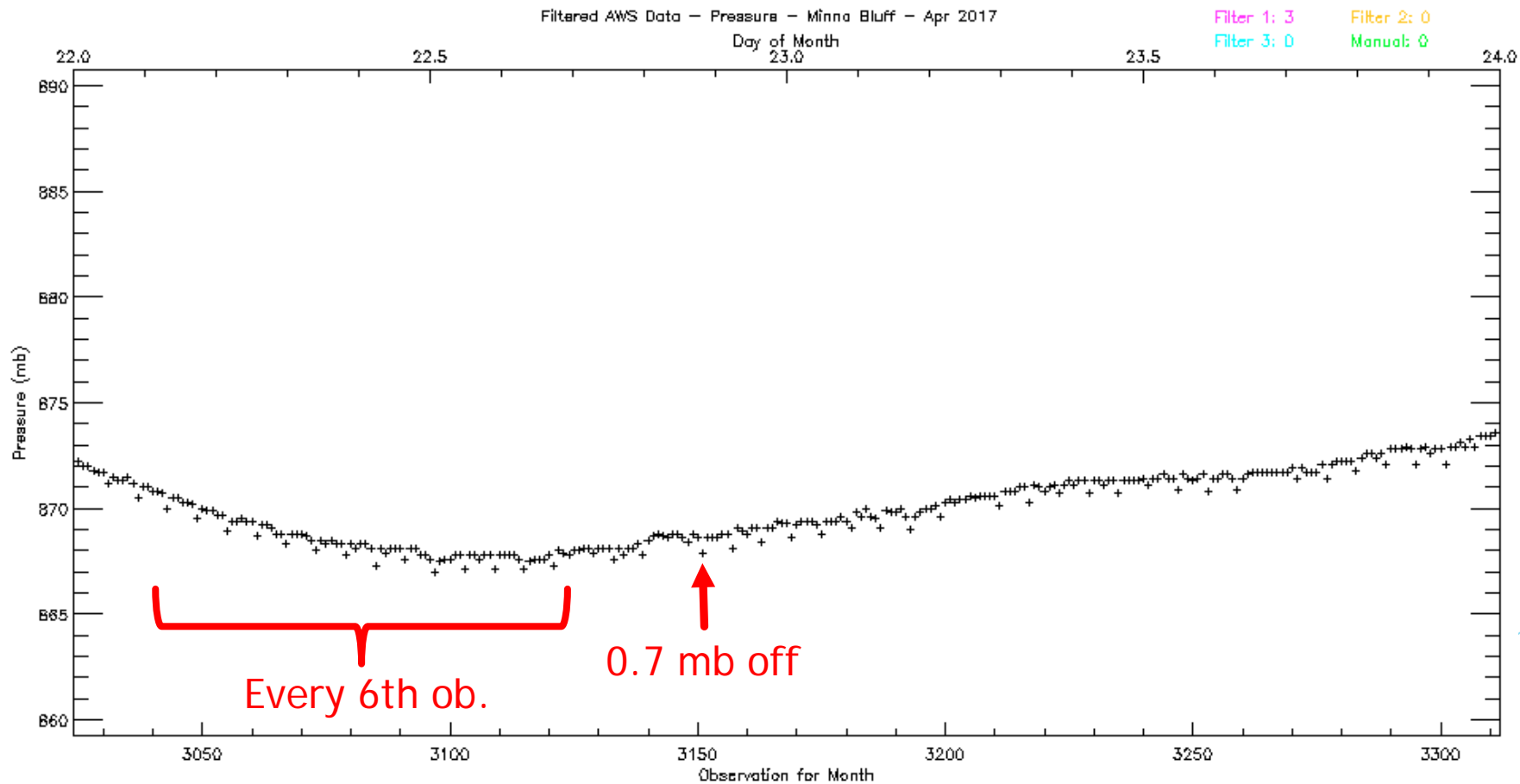
- ▶ FreeWave has significantly higher power draw than Iridium and Argos transmissions
- ▶ Due to high power draw during transmission, UHF AWS need 3 100-Ahr batteries
 - ▶ This took a few years to realize
 - ▶ Willie Field, Windless Bight, Linda, Lorne, Pegasus North have 3-battery power systems
- ▶ As a consequence, AWS turned off in winter months, leading to lost data

UHF issues: An Example of a Larger Problem

- ▶ UHF outage in May 2017 due to Howard reboot
 - ▶ Needed to be manually rebooted
- ▶ This leads to large gap in data
 - ▶ If problem not fixed quickly, gap becomes larger
 - ▶ The larger the gap, the more difficult, and time consuming, it is to backfill data
 - ▶ Compact flash cards on AWS are a backup but have proven semi-unreliable
- ▶ Timing issues also make it difficult to reduce the time the modem is powered on

Anomalous Pressure Observations

- ▶ Found at AWS with Vaisala pressure sensors (Minna Bluff, Willie Field, Windless Bight)
- ▶ Potentially caused by high power draw during transmission



Solutions

- ▶ Switch transmission method from UHF to Iridium, for example
 - ▶ Pros: Reliable connection, low-power option, sufficient bandwidth
 - ▶ Cons: Cost in buying modems/antennas, visiting AWS
- ▶ Argos is a reliable but dated option
 - ▶ AWS network uses Argos I
 - ▶ Low bandwidth, aging satellites
- ▶ Need to consider transmission costs
- ▶ Other community input is welcome





Thank you!

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