What we want:

- Targetable
- Affordable
- Long-Wavelength
- Fine-Scale
- Fast
- Dual-Polarization
- Vector-Winds
**What we have:**

**Big Stationary Radars**
- Targetable
- Affordable
- Long-Wavelength
- Fine-Scale
- Fast
- Dual-Polarization
- Vector-Winds

**Mobile Radars (X,C,Rapid)**
- Targetable
- Affordable
- Long-Wavelength
- Fine-Scale
- Fast/Rapid
- Dual-Polarization
- Vector-Winds

**Quickly-Deployable COW**
- Targetable
- Affordable
- Medium-Wavelength
- Fine-Scale
- Fast
- Dual-Polarization
- Vector-Winds

**APAR (will have)**
- Targetable
- Affordable
- Medium-Wavelength
- Fine-Scale
- Fast
- Dual-Polarization
- Vector-Winds (slow, pseudo)
We built the COW

It sets up (and tears down) in 2 hours
3 people

COW works great:

1-degree beam
C-band

Pretty fast scanning

• RELAMPAGO (2018)

---- COVID ----

• PERILS (2022)

• WINTRE-MIX (2023)

• PERILS (2023)

• CONVECT (proposed 2025)

• ICE-CHIP (proposed 2025, 2026)

Figure 8. COW assembly. COW as transported, antenna being assembled, antenna lifted onto pedestal, deployed.
S-band On Wheels (SOW)

Truck-1 carries antenna
Truck-2 carries pedestal

4-6 hours
4 people (1 “skilled”)

Crew can set up 1 SOW/day

Full SOW-NET setup takes 4 people for 1 week

Zero site prep
SOWs closer to targets than stationary radar.
Resolution is comparable ... or better ... throughout domain.

Volumetric resolution 1.5 degrees @ 44 km ~ 1.0 degrees @ 100
Horizontal resolution 1.5 degrees @ 65 km ~ 1.0 degrees @ 100

Examples of how 4x SOW could replace 1x big S-Band

Size/Beamwidth Doesn’t Matter -- Resolution at Targets Matters
More flexible coverage configurations:
(triangle, linear, overlapping or spread out)
(Single S-band radar coverage is rigidly a circle)

1, 2, 3, … N could be requested for small, medium, and large projects

Multiple-Doppler vectors from coordinated scanning network

~< ¼ cost to deploy whole network compared to big S-band
   No big pedestal, dish, trailers, site prep, power to maintain … quicker

1-Day set up and tear down time, each. 1-week for full network. 4 crew total.

Same or better scientific capability in nearly all deployments
   equal or better spatial resolution
   2x scan rates with dual-frequency
   better sensitivity with 2x 1MW transmitters
   but only 2/3 resolution far out to sea (if 1.5 deg S-band. Same resolution if COW-NET Network of 1.50 S-Band SOW (or 1° C-band COW)
If one radar fails, rest of network is still up and providing dual-Doppler over broad area.

Radars break sometimes.

SOW-NET retains much capability even if one breaks.

Even if 2 fail, there’s still coverage.
Vector Winds

Inherent to SOW-NET

Look at all those dual-Doppler Lobes!
Bistatic Adaptable Radar Network (BARN)

Passive remote receivers measure Doppler = Vector Winds

We all want those vectors
The key features of BARN are: (other than too many words)

- **Multiple-Doppler vector wind measurements over targeted regions.**
- While **SOWNET** is providing moderate-resolution vectors, **BARN** provides finer-scale and/or customized vectors over smaller domains.
- **BARN** units connect to **SOWS**, **COW**, or **DOWs**.
  
  Only the receiver front ends and antennas are frequency-specific.
- **BARN** units stationary or mobile.
- **Stationary BARN** units unattended, low power, and logistically similar to deployable weather stations.
- Highly redundant **BARN** units provide extreme reliability of multiple-Doppler operations.
- **BARN** units are cheap to build and deploy
Extreme Overdetermination

With >> faster computer power than 1990’s bistatic networks, can use extremely over-determined voting/variational/etc. methods

Lots (more than several) bistatic receivers

100 km
What the FARM SOW-NET with BARN could provide:

- Targetable
- Affordable
- Long-Wavelength
- Fine-Scale
- Fast
- Dual-Polarization
- Vector-Winds