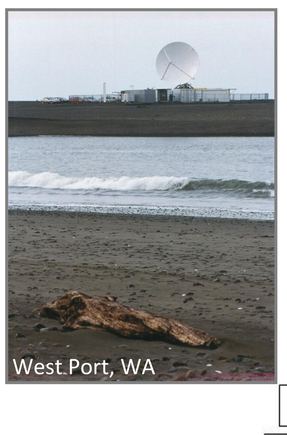
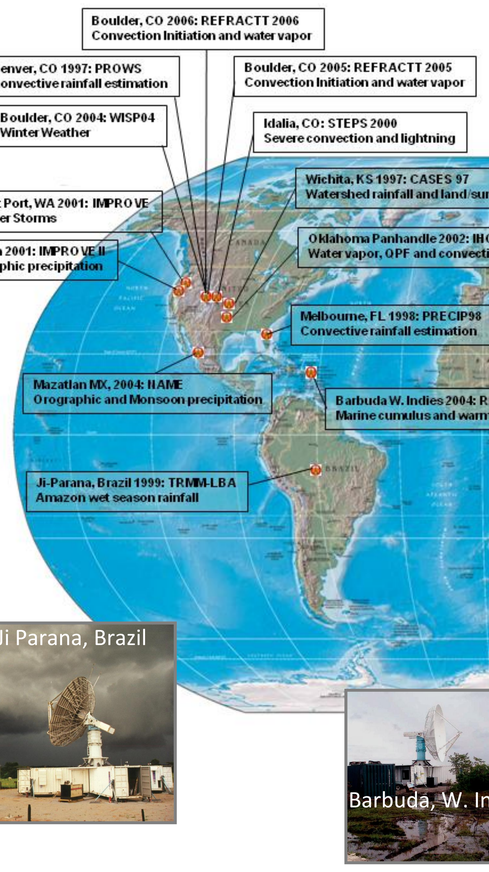
S-PolKa: S-band/K_a-band Dual-Wavelength, Dual-Polarization Transportable Research Radar

S-PolKa Provides Unique Research Quality Data in Remote Areas of the World





S-Pol Deployments through Summer 2012

✓ Self-Contained Design

- Simplifies transport
- Minimizes site requirements
- No concrete pad
- Generator power

✓ Supports World-Class Research

- More than 200 journal publications utilized S-Pol data
- More than 45 advanced degrees (M.S. and Ph.D.) used S-Pol data

S-band and Dual-Polarization Capability

✓ Real-Time Data Quality

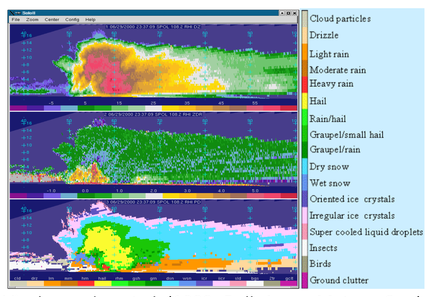
- Ground clutter identification
- Brightband identification
- Improved separation of noise and signal
- Attenuation correction

✓ Hydrometeor Classification

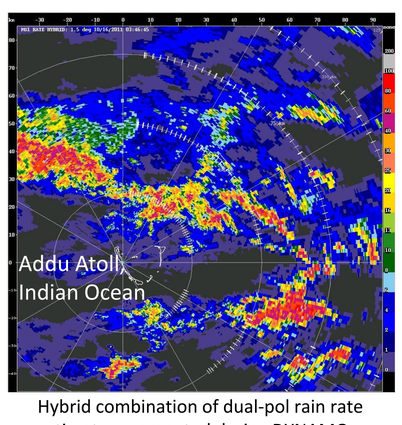
- Mixed phase precipitation
- Hail identification, etc.

✓ Improved Rainfall Estimates

- Drop size distribution information
- Partial beam blockage mitigation



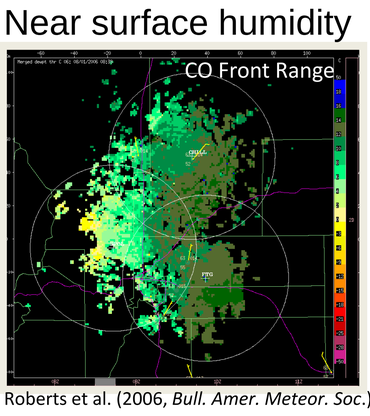
Vivekanandan et al. (1999, *Bull. Amer. Meteor. Soc.*)



Hybrid combination of dual-pol rain rate estimators computed during DYNAMO .

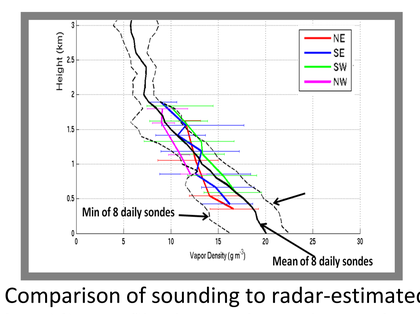
✓ Refractivity

- Near surface humidity



Roberts et al. (2006, *Bull. Amer. Meteor. Soc.*)

Dual-Wavelength Retrievals

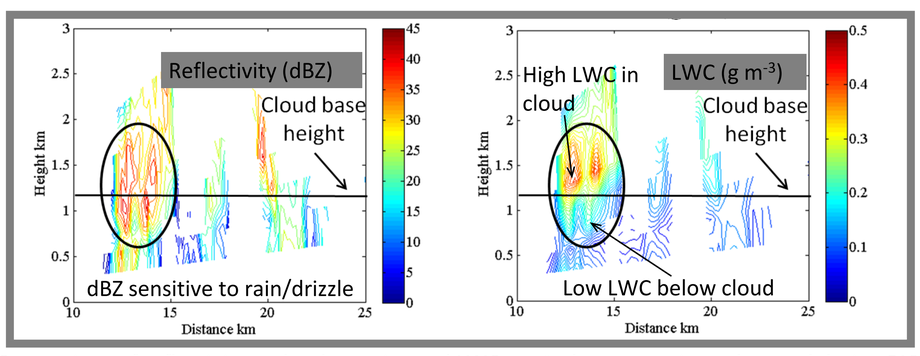


Comparison of sounding to radar-estimated humidity profiles by quadrant observed during DYNAMO.

✓ Humidity Retrieval

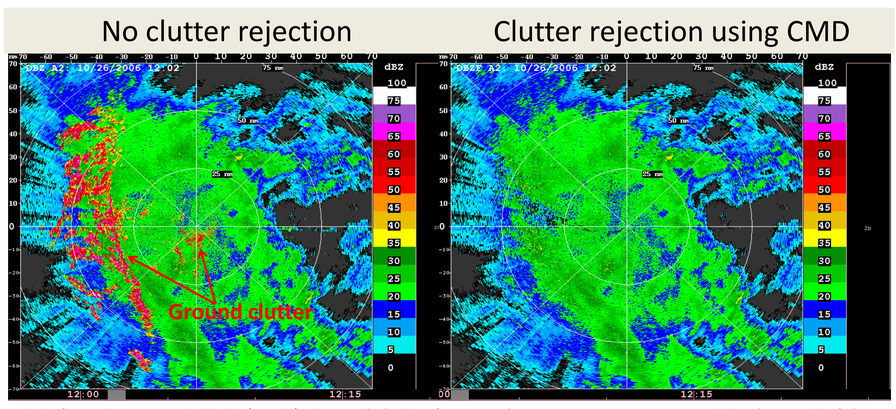
✓ Liquid Water Content Retrieval

- Attenuation based
- Independent of DSD



Comparison of reflectivity and radar-estimated LWC vertical cross-sections observed during RICO. Adapted from Ellis and Vivekanandan (2011, *Radio Sci.*).

WSR-88D Operational Testbed



Data from Denver WSR-88D (KFTG). Ground clutter from Rocky Mountains is prominent to the west of the radar in the unfiltered data. Adapted from Hubbert et al. (2009, *J. Atmos. Oceanic Technol.*).

✓ Algorithms Developed and Tested on S-Pol

✓ Ground Clutter Mitigation Decision (CMD)

✓ Range Velocity Ambiguity Mitigation

Versatile Polarization Switching for S-Pol

✓ Transmit Fast Alternating H and V (FHV)

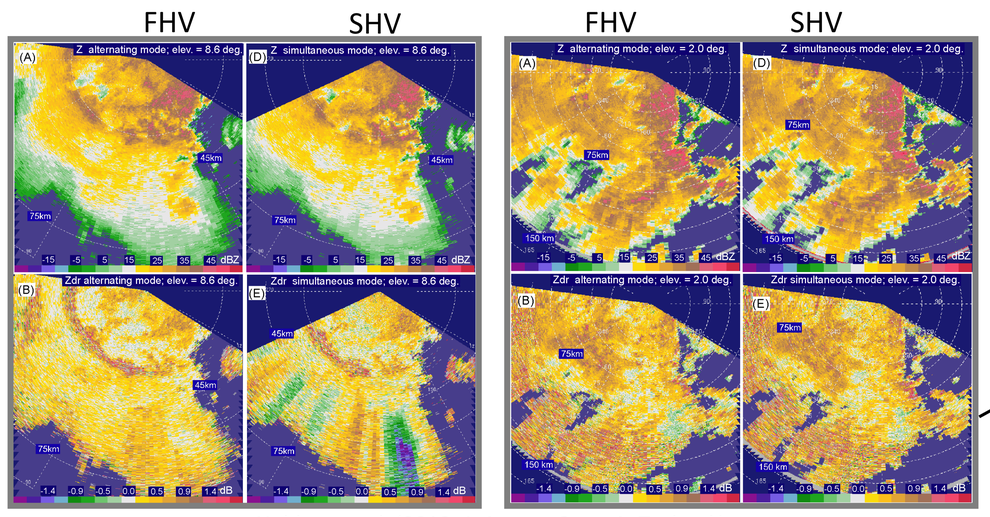
- Normal S-Pol operations
- Zdr relatively insensitive to depolarization

✓ Transmit Simultaneous H & V (SHV)

- Common radar configuration – e.g., WSR-88D
- Zdr sensitive to depolarization (particles & dish)

✓ Switch Quickly Between FHV and SHV

- Determine depolarization impacts on Zdr at SHV



Hubbert et al. (2010, *J. Atmos. Oceanic Technol.*)

For 20 dBZ < Z < 25 dBZ

Total ϕ_{dp}	Mean Zdr (dB) FHV	SHV
between 20 and 40 deg	0.17	0.16
between 40 and 70 deg	0.15	0.26
between 70 and 100 deg	-0.07	0.20