

- What current radar technologies are considered critical to answering the key current and emerging scientific questions?
 - Airborne radar with ELDORA-like capabilities
 - S-, C-, X-, Ka-, and W-band research radars
 - Multi-wavelength research radars
 - Integration of multiple instruments

Science objectives

- Landfalling TCs (ELDORA-like airborne Doppler radar and dropsondes)
 - Transition to inland flooding events
 - BL fluxes caused by hurricane rolls to parameterize structure
 - What controls the mode of convection as you go from ocean to land? And vice versa? Is it important?
- We need to do a better job of nowcasting/forecasting and understanding the dynamics of the evolution of storms using NWP and heuristic techniques
 - Measure 4D high-resolution winds, temp and moisture
 - Must integrate instruments together: lidars, surface networks, multiple radars, S-band Bragg scattering, PAR

Science objectives

- Winter storms (Need airborne and ground-based, Doppler dual-pol radars and thermodynamic profiling)
 - Ice to rain transition is unknown
 - Cause of banding in snow storms
 - Miso and meso vortex generation in snow bands
- Clouds and climate impacts (need cloud radars)
 - Need to measure particle sizes and radiative transfer
- Nocturnal convection (multiple-wavelength radars; thermodynamics)
 - Nested strategy of radars designed to use their strengths is essential to understand interplay between different scales

Science objectives

- Tropical convection and tropical cyclogenesis (ELDORA-like airborne Doppler radar)
 - Must measure updraft/downdraft to get vertical mass fluxes and momentum transport
 - Convection in MJO
 - How do easterly waves work?
 - TC intensification
 - Understand the asymmetry of TCs
- Aeroecology research (Any radars will do)
 - How does weather drive biological movements?
 - Can observe with any wavelength
- Oceanic shallow convection (ELDORA-like radar and buoy radar network)
- Upper-level fronts (Need currently non-existing scanning radar)
- Convection initiation (Multiple instruments, especially S-band for Bragg, also thermodynamic instruments)
- Severe storm dynamics (mobile C, X, W and Ka-bands, mobile rapid scanning radars, thermodynamic measurements)

Science objectives

- NWP
- Air pollution
- Mixed-phase clouds (e.g., riming) (Need dual-pol)
- Orographic precipitation measurements (Radar networks in mountainous regions to measure precipitation and winds)
 - Dynamics and microphysics of orographic precipitation require better understanding and forecasting skill
- Chemical transport
- Flash flooding

- What are strengths and weaknesses of the technologies that are currently implemented?
 - CASA weaknesses
 - no clear-air data collection in present strategy
 - need improvements in adaptive scanning strategy
 - S-Band would be desired to get Bragg scattering
 - S-Pol strength
 - Humidity gradients due to Bragg scattering (e.g., DYNAMO)

- What emerging radar technologies would be most helpful in answering the key scientific questions?
 - Fast response, multi-agency, multi-platform capability
 - CASA-like networks (mountainous regions, urban areas, clear-air, etc.)
 - PAR (it was not really discussed which PAR-related efforts are needed most by the scientists)
 - Software to produce (e.g., next-generation REORDER/CEDRIC as suggested by results of Yuter exercise) and integrate diverse gridded datasets together

*** Vector winds are needed, not just Doppler winds*

- What gaps, if any, exist in radar observing technologies? (a gap can mean the absence of a critical technology or a lack of access by the general research community to an existing technology)
 - Radars on buoys
 - Ship- and airborne Doppler radars
 - Deployable radar networks
 - 3D temperature and moisture observations
 - Ability to mobilize mobile (ground-based and airborne) radars and other assets for a potentially historic target-of-opportunity
 - PARs for NSF community
 - Wind and thermodynamic observations above BL
 - Ability for community to access non-deployment-pool instruments
 - Maintained listing of all non-deployment-pool instruments and their contacts (at least those instruments for which there's interest in making the instrument available to others)
 - Refractivity operationally on the WSR-88Ds
 - Need better software tools for radar data display and analysis