

# P11 ADAPTIVE MULTIPLE STORM-BASED SCANNING ON THE NATIONAL WEATHER RADAR TESTBED PHASED ARRAY RADAR

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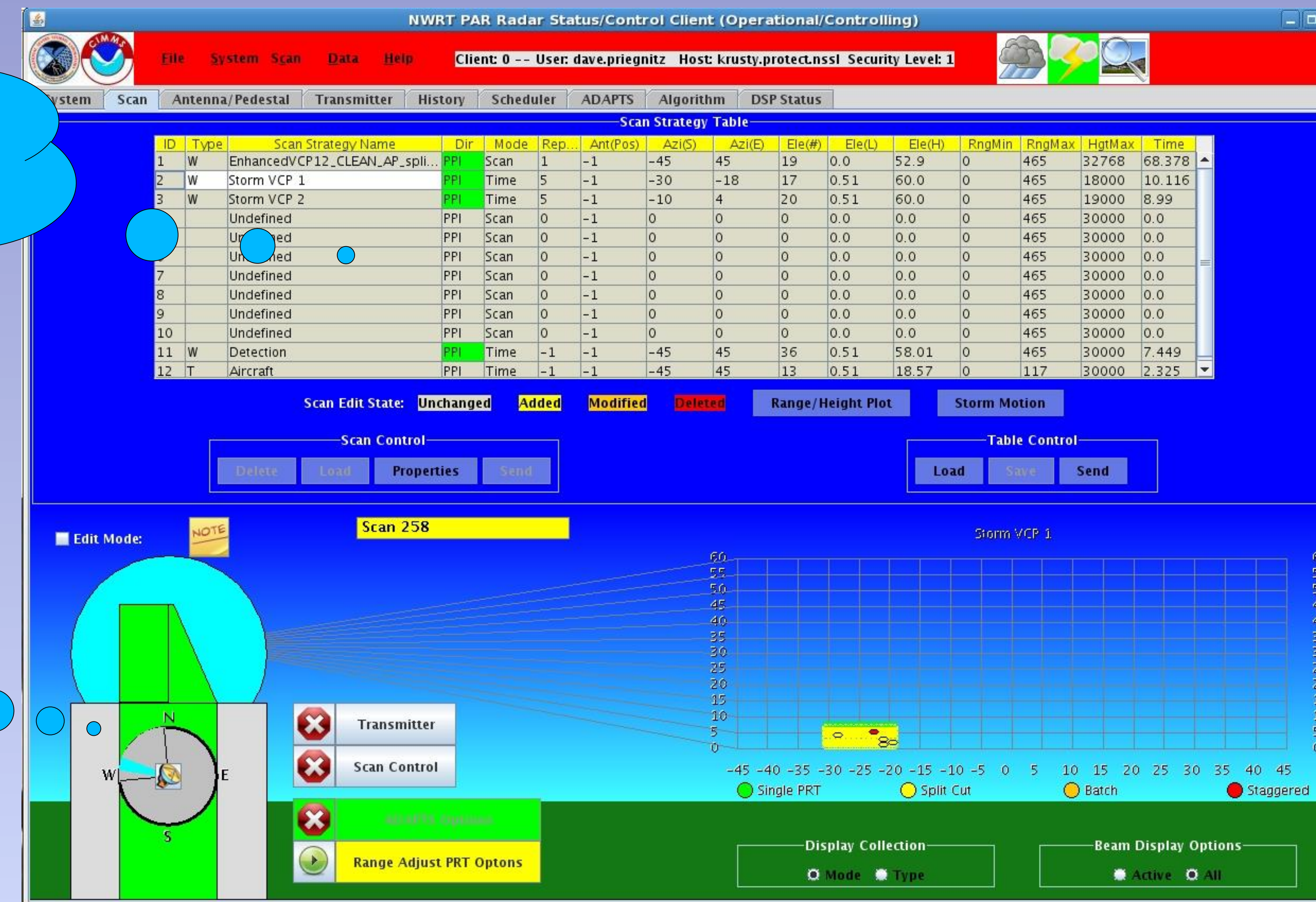
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Phased array antennas provide superior scanning ability over conventional mechanically rotating dish antennas. Electronic beam steering allows one to scan specific areas in space and time without being constrained by the physical position of the antenna. The capability to scan selected storm sectors has been demonstrated using the National Weather Radar Testbed (NWRT) Phased Array Radar (PAR). Storm sectors are identified using a cluster identification algorithm. A storm cluster is then selected by a human operator and the sector containing it scheduled for focused scanning. An adaptive range-based algorithm defines elevation angles such that there are at most 1 km vertical separations between adjoining angles starting with 0.5. The maximum storm height at storm range defines the highest elevation angle. To monitor regions outside the storm sector, less frequent "surveillance" scans are run to provide information about existing or newly developing storms that may be targeted for future focused scanning.

VCP processing at the NWRT PAR is performed in a round-robin fashion. Typically, a surveillance VCP is executed first followed by one or more storm VCPs. Unlike the surveillance VCP, storm VCPs are processed in a mode where they are repeated until a specific amount of time has elapsed. The number of times a storm VCP is repeated is dependent on the amount of time it takes to execute all pulses in the VCP. VCP time is also dependent on the width of the storm sector (storm sector width is inversely proportional to storm range). Until recently, focused scanning was limited to a single storm sector. VCP processing now allows multiple storm sectors to be scheduled with each storm VCP sharing the overall focused scanning time. For example, two storm sectors are targeted for focused scanning with 20 seconds allotted for the first and 10 seconds for the second. If 60 seconds are allotted for focused scanning, each storm sector will be scheduled twice, with the first scanned twice as long as the second. Assuming both storm VCPs take 10 seconds to complete, one complete pass through the scan table will consist of one surveillance VCP followed by 2 storm sector 1 VCPs, 1 storm sector 2 VCP, 2 storm sector 1 VCPs and 1 storm sector 2 VCP. Several examples of multiple storm scheduling are presented in this paper.

**Scan Table**  
10 slots reserved for weather, 1 slot for ADAPTS detection scan and 1 for aircraft tracking scan. The weather slots contain 3 VCPs: surveillance in slot 1 and focused storm VCPs in slots 2 and 3.

**Status**  
Antenna  
Transmitter  
Pedestal

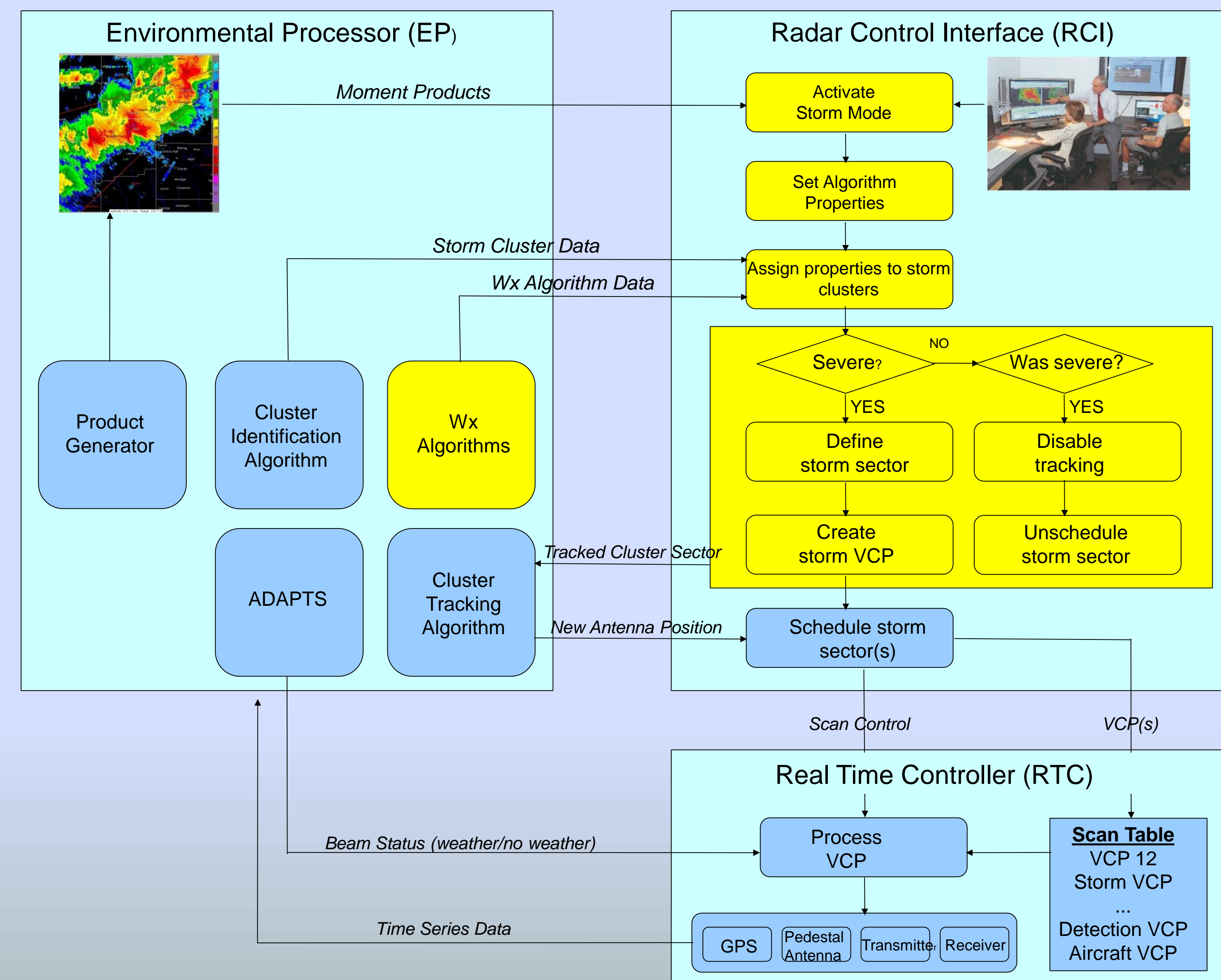


## One Pass Through Scan Table

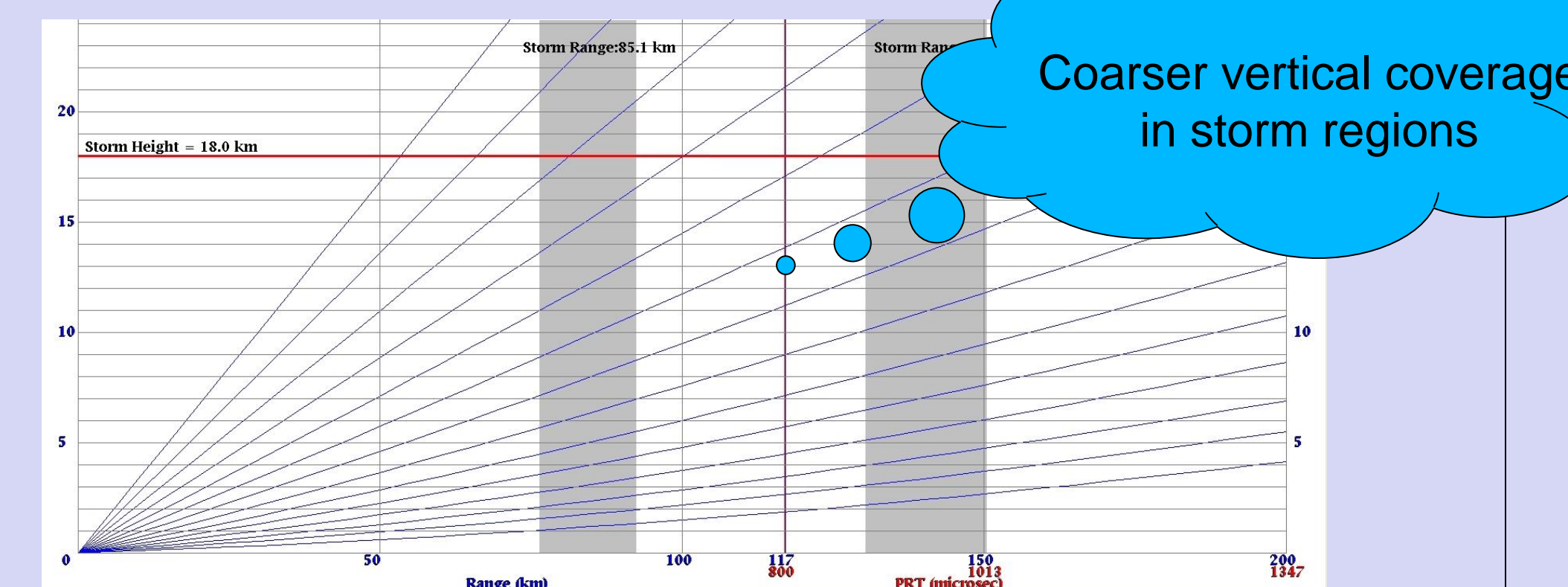
VCP	Scan Time	Storm Timer
Surveillance	68.4	0
Storm 1	10.1	10.1
Storm 2	9.0	19.1
Storm 1	10.1	29.2
Storm 2	9.0	38.2
Storm 1	10.1	48.3
Storm 2	9.0	57.3
Storm 1	10.1	67.4
Storm 2	9.0	76.4
Storm 1	10.1	86.5
Storm 2	9.0	95.5
Storm 1	10.1	105.6
Storm 2	9.0	114.6
Storm 1	10.1	124.7
Storm 2	9.0	133.7

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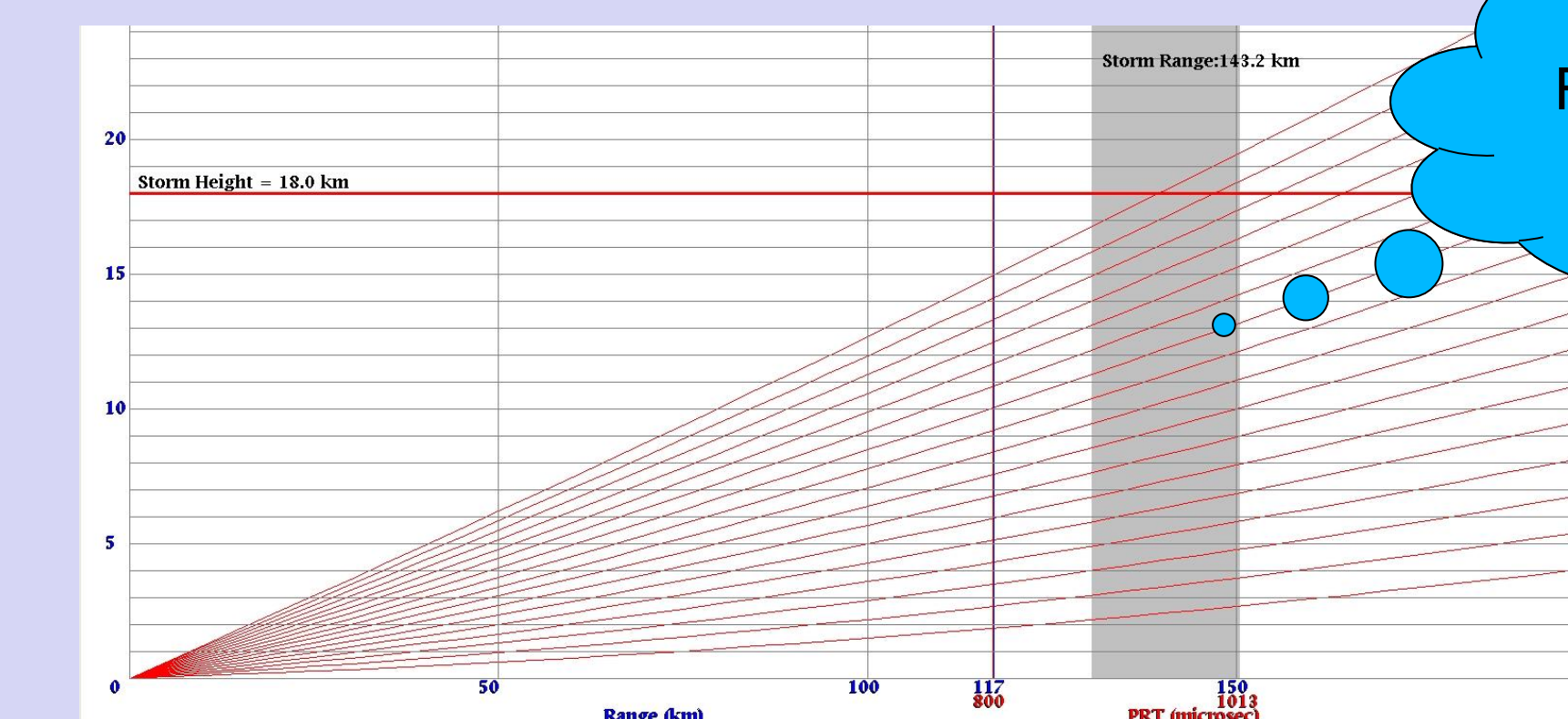
## NWRT Adaptive Scanning Functional Diagram



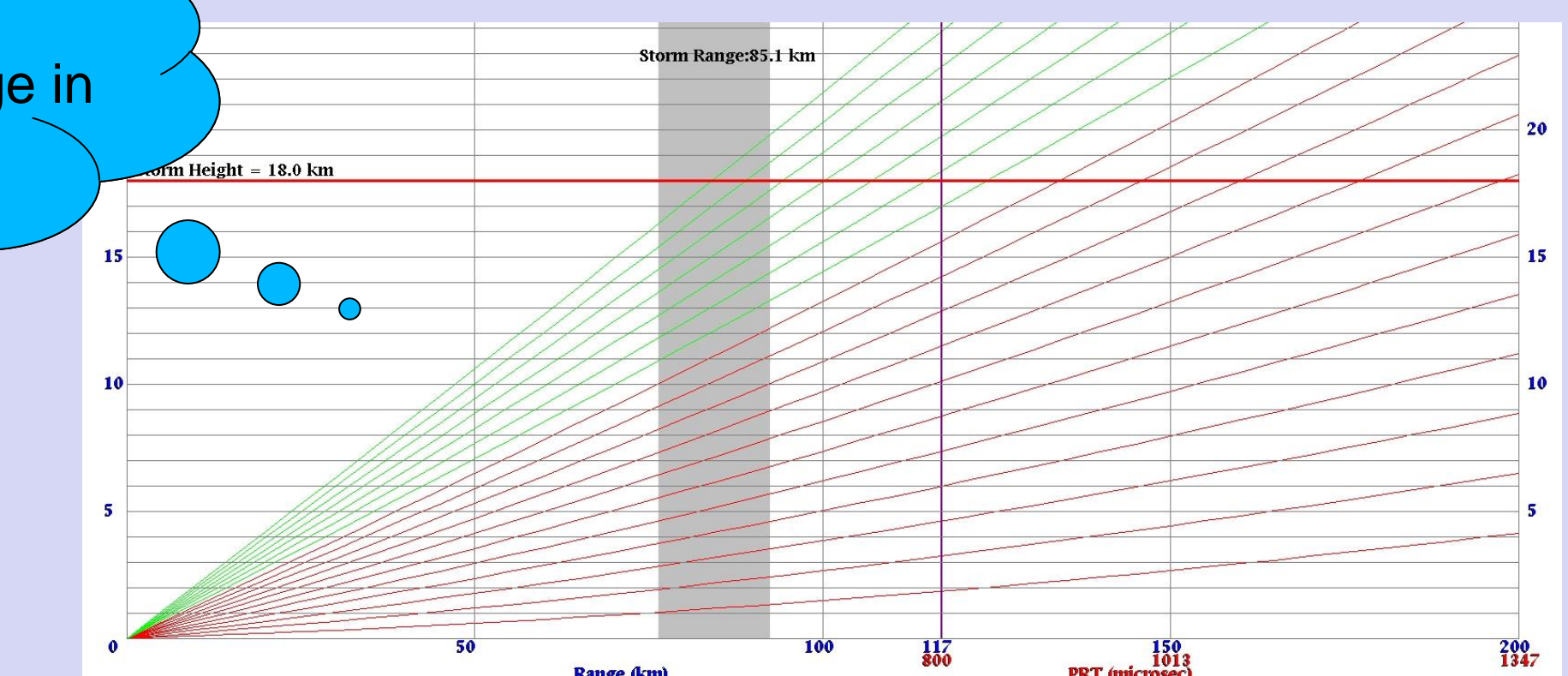
## Surveillance VCP (VCP 12)



## Storm 1 VCP



## Storm 2 VCP



Elevation map for surveillance VCP. Shaded regions indicate range coverage for storms selected for focused scanning. Coarser vertical coverage in storm regions than with focused scanning.

Elevation map for Storm 1 VCP. Shaded regions indicate range coverage for storm 1 inside scan sector.

Elevation map for Storm 2 VCP. Shaded regions indicate range coverage for storm 2 inside scan sector.

