ENVIRONMENTAL
SCIENCE
DIVISION

RADAR WIND PROFILER ADAPTIVE SAMPLING

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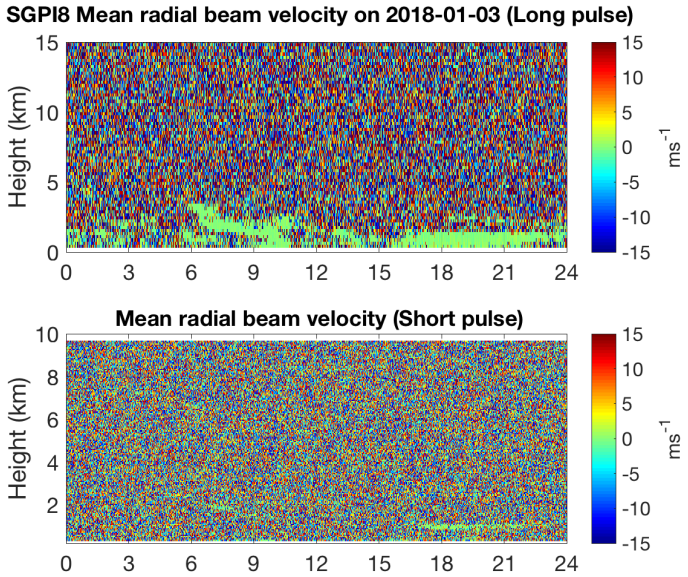
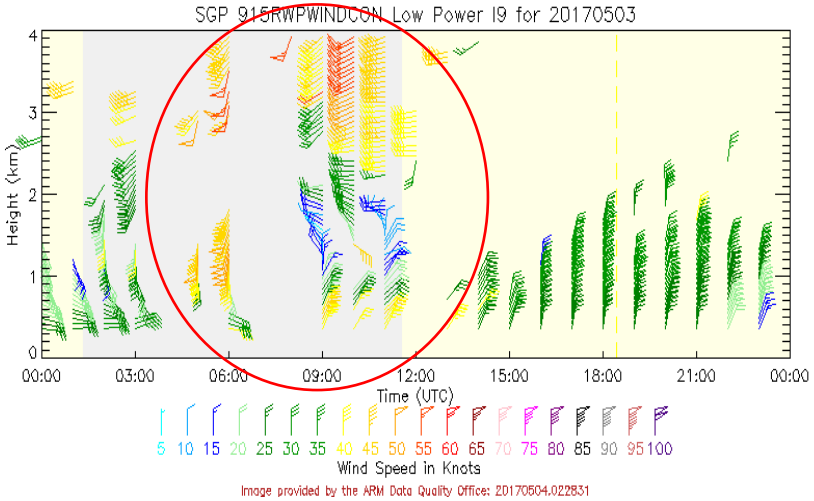
MOTIVATION FOR THE “ADAPTIVE” SAMPLING



Precipitation from ~03:45 to 13:40



During non-precipitating conditions the RWP is essentially measuring noise in Precipitation mode

During precipitation the BL mode wind measurements are adversely affected

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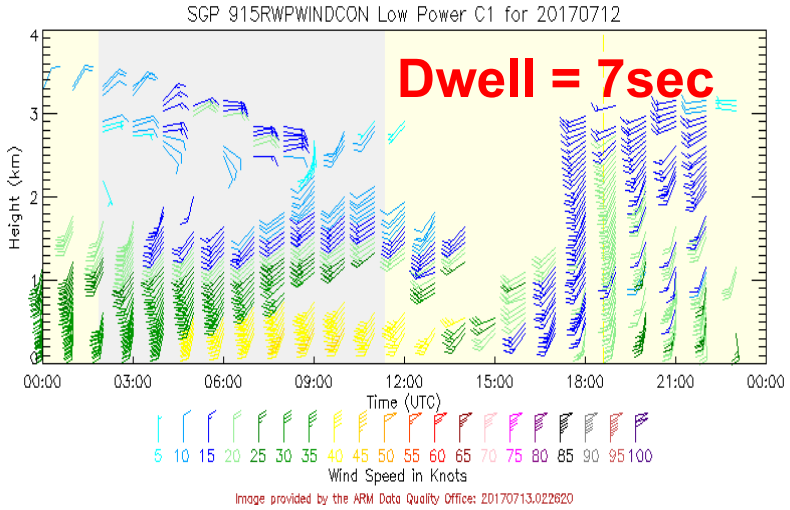
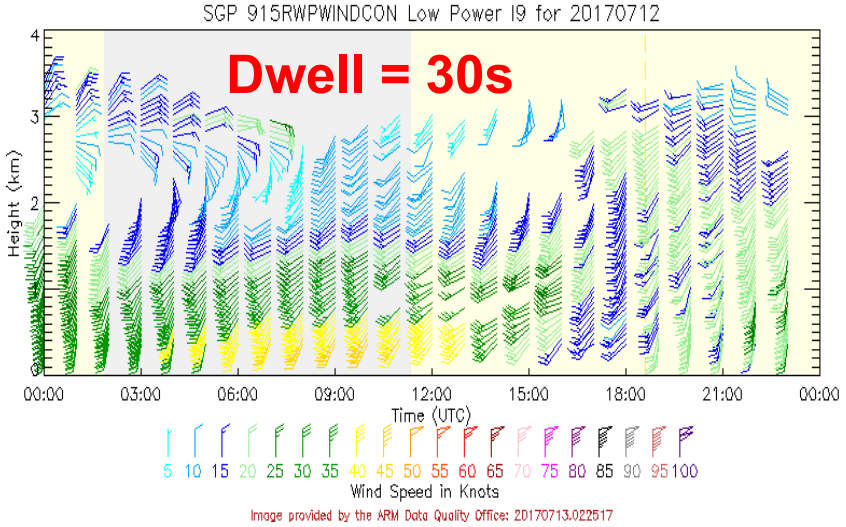




“Adaptive” = Better utilization of sampling periods

- Back to “classic” low-and high- power wind modes
  - Longer spectral averaging resulting in improved SNR and better-defined winds
  - High-power wind mode with pulse coding (higher sampling range compared to BL mode for fair weather days while retaining the high vertical resolution)
- Higher temporal resolution vertical measurements during precipitation events

“ADAPTIVE” SAMPLING CONFIGURATION

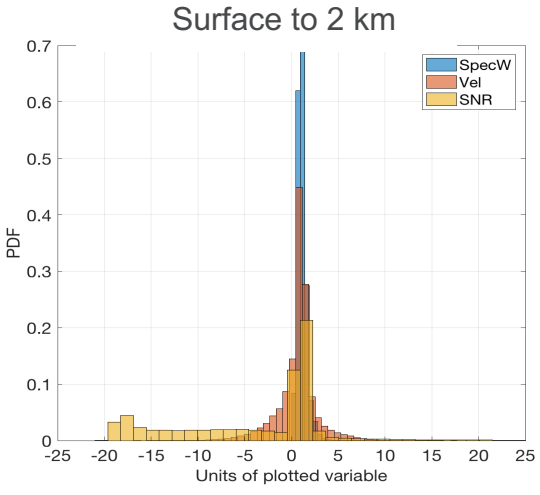
SGP CF	Mode	Pulse Width (ns)	IPP (us)	NTDI	NFDI	NFFT	#Gates	Hmin (km)	Hmax (km)	Res (m)	Dwell	Nyquist (m/s)
	BL	708	41	200	12	64	60	0.36	3.9	60	7	10
	Precip	417/2833	100/123	56/34	3/4	128/128	150/75	0.316/0.4	9.3/16.4	60/200	3/3	14.6/19.6

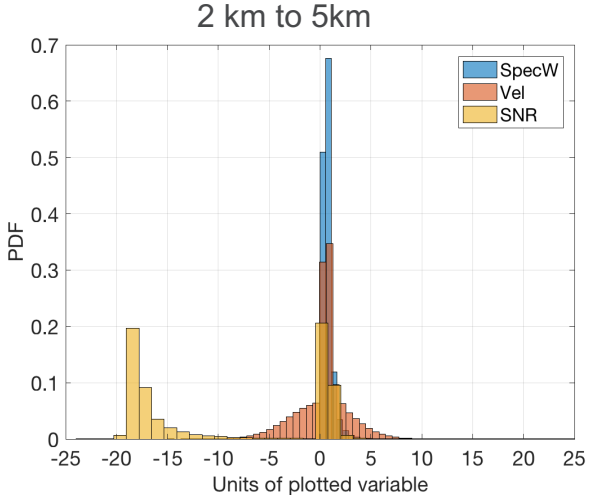
SGP Adaptive	Mode	Pulse Width (ns)	IPP (us)	NTDI	NFDI	NFFT	#Gates	Hmin (km)	Hmax (km)	Res (m)	Dwell	Nyquist (m/s)
	Wind	417/2833	37/100	160/80	50/50	64/64	75/35	0.08/0.4	4.5/7.4	60/100	19/26	14/10
	Precip	**Precipitation mode parameters are unchanged**										

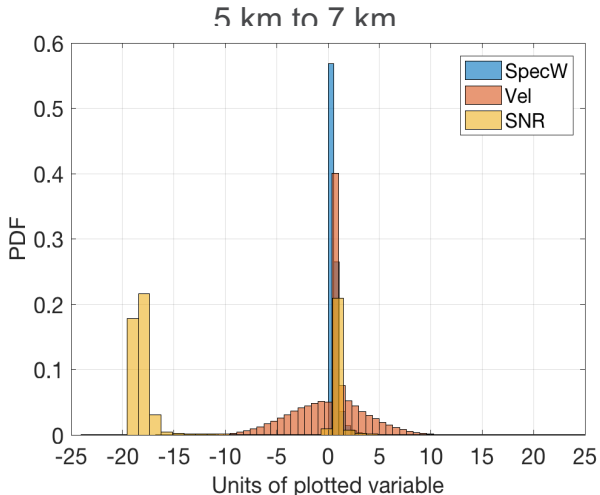
METHOD

- Based on real-time monitoring of vertical velocity (Vel), SNR and spectral width (SpecW)
- Vel, SNR and SPecW thresholds determined analyzing 1 year moments data at SGP I8

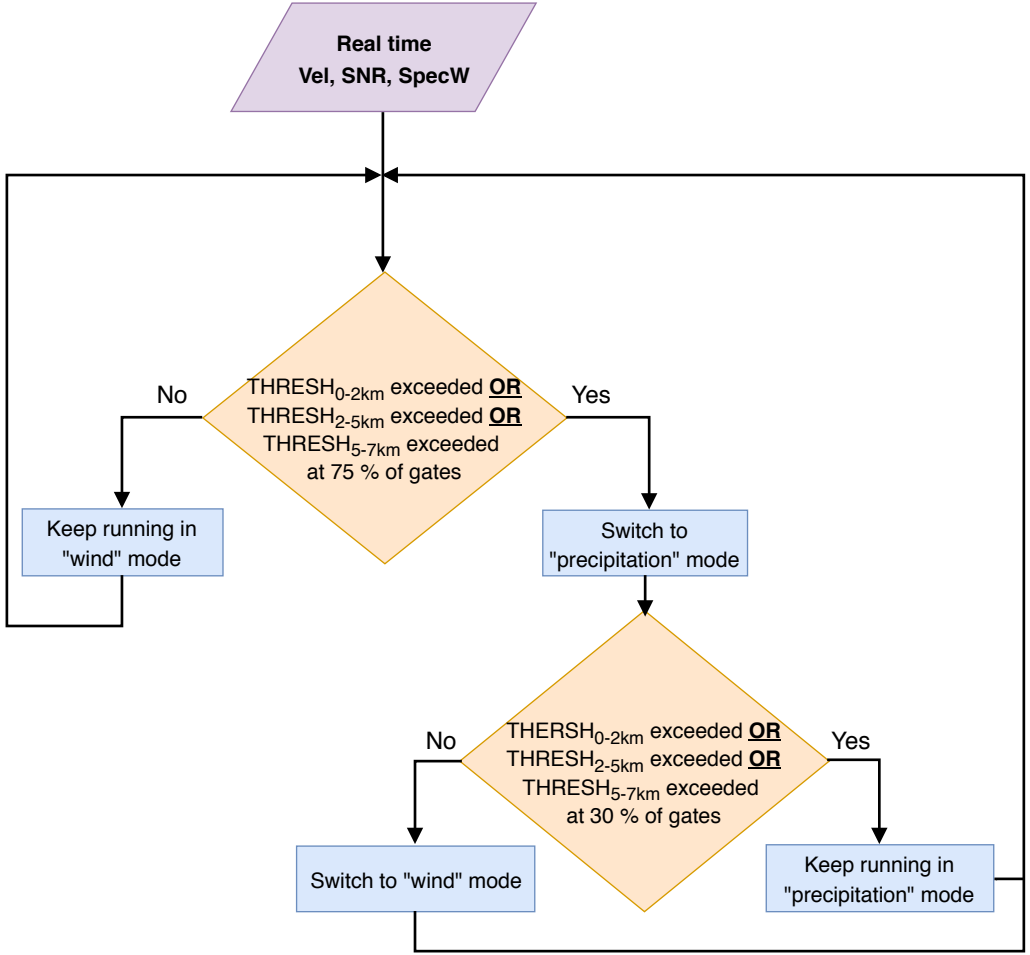
Long Pulse	Surface to 2 km	2 km to 5 km	5 km to 7 km
Thresholds	Vel > 1.5 m/s SNR > 1.5 dB SpecW > 1.0 m/s	Vel > 1.5 m/s SNR > -5.0 dB SpecW > 0 m/s	Vel > 0 m/s SNR > -10.0 dB SpecW > 0 m/s



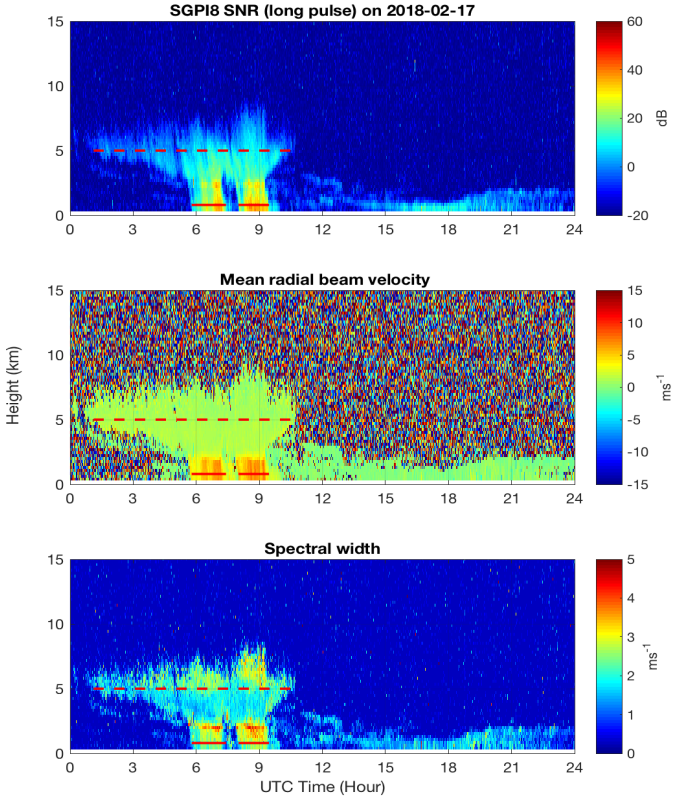




METHOD

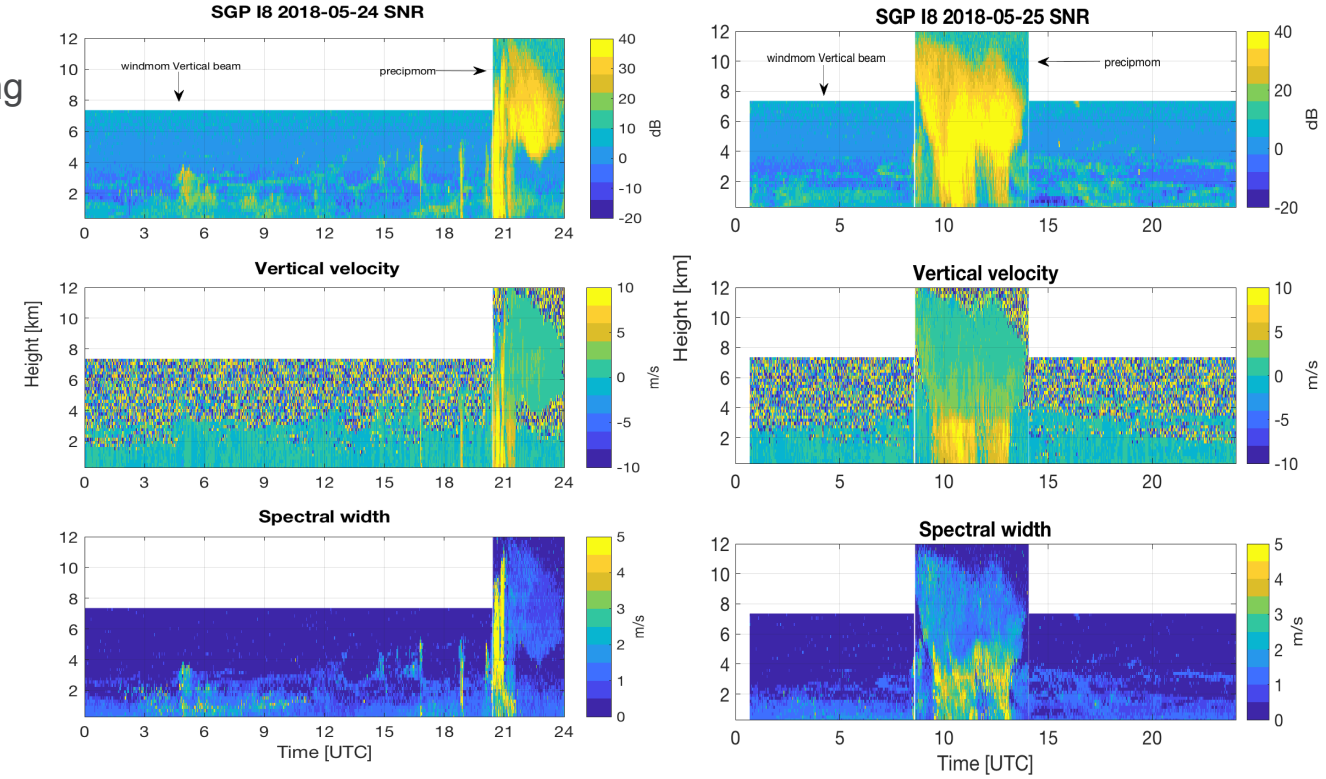


- Captures precipitation at the surface
- Captures convective anvil signatures
- Initial tests in post-processing mode

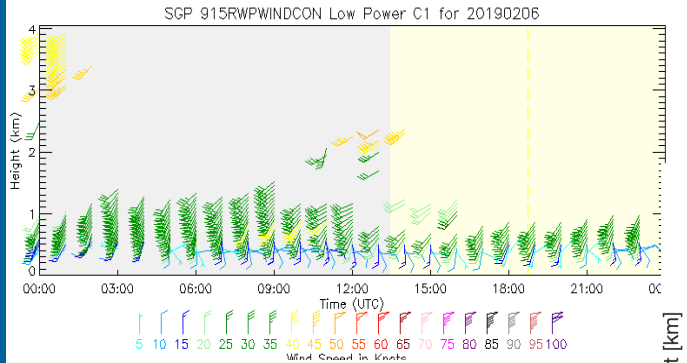


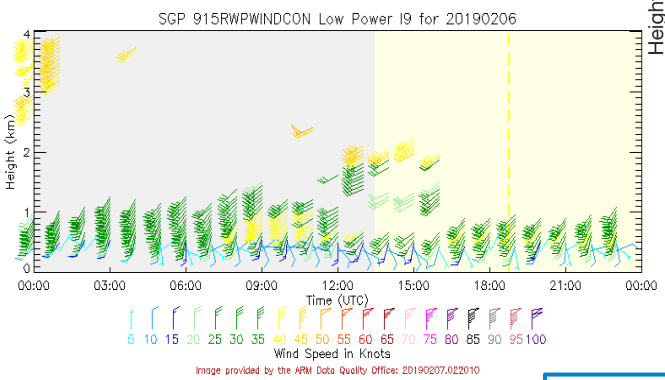
RESULTS: IMPLEMENTATION

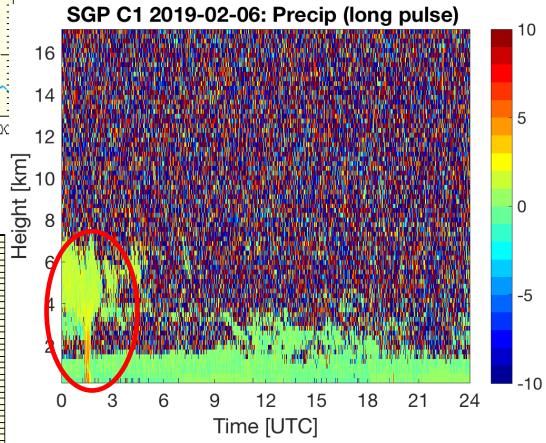
- Tested and successfully implemented at SGP I8 in spring 2018
- High-temporal resolution vertical beam measurements collected and archived only during precipitation events at SGP I8 since May 2018
- Implemented at CF, I9, and I10 in April 2019 for an IOP at SGP
- Implementation of the algorithm on different RWP systems

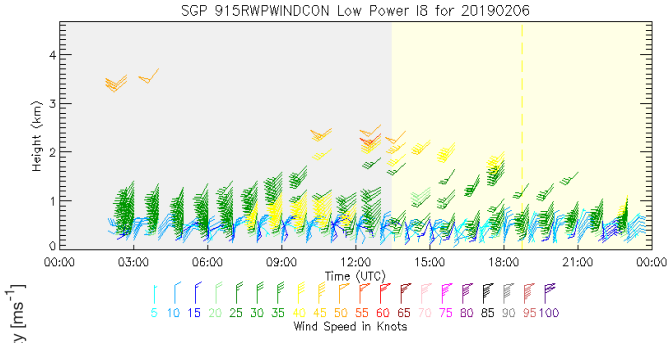


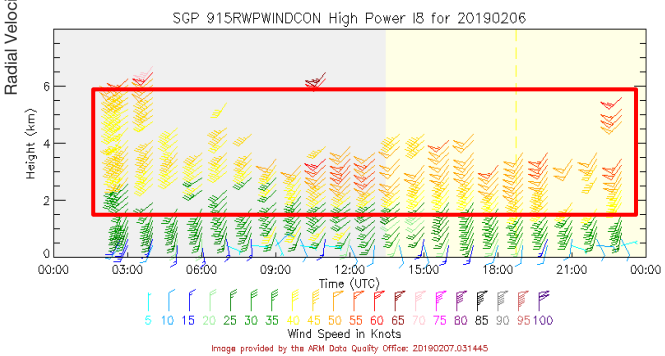
RESULTS: WINDS











- Precip mode by 2:40 am captured at SGP I8
- Low power mode: Similar performance
- High power mode: Range is extended >4 km

Process driven sampling strategy

- Uniformity and compromise -> Lost opportunities to answer key science questions
- RWP adaptive sampling:
  - Targeted high temporal resolution sampling of convective cores, anvils
  - Better defined winds
  - No extra cost to ARM: Mentor effort and minor tweaks to ingest (resolved by a single email!)
- Co-located radars can benefit from communication of the adaptive sampling's real-time analysis of atmospheric conditions