Meteor Radar Observations at High Latitudes

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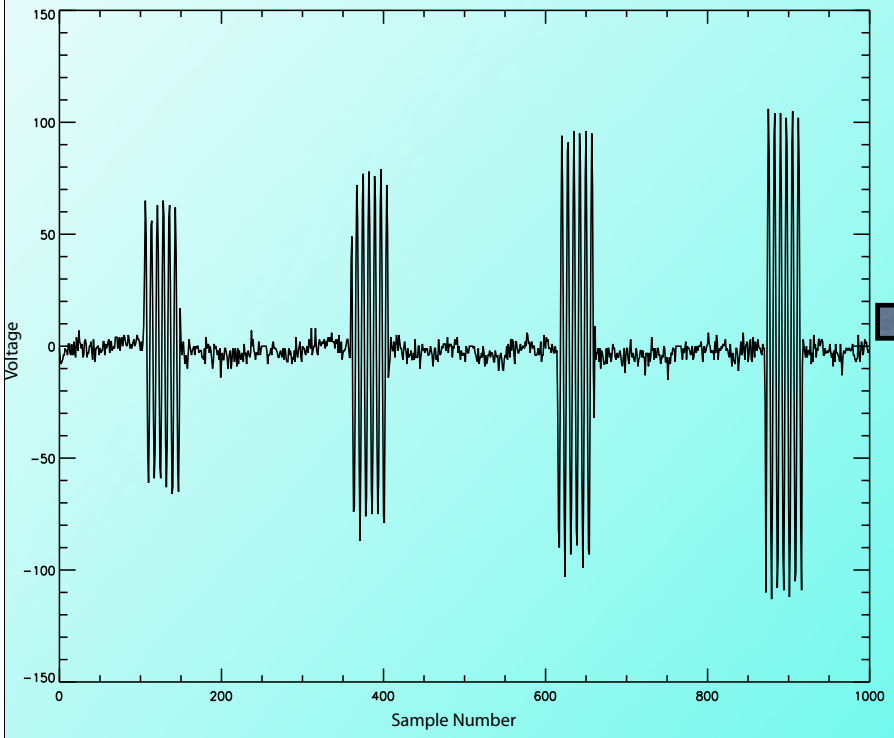
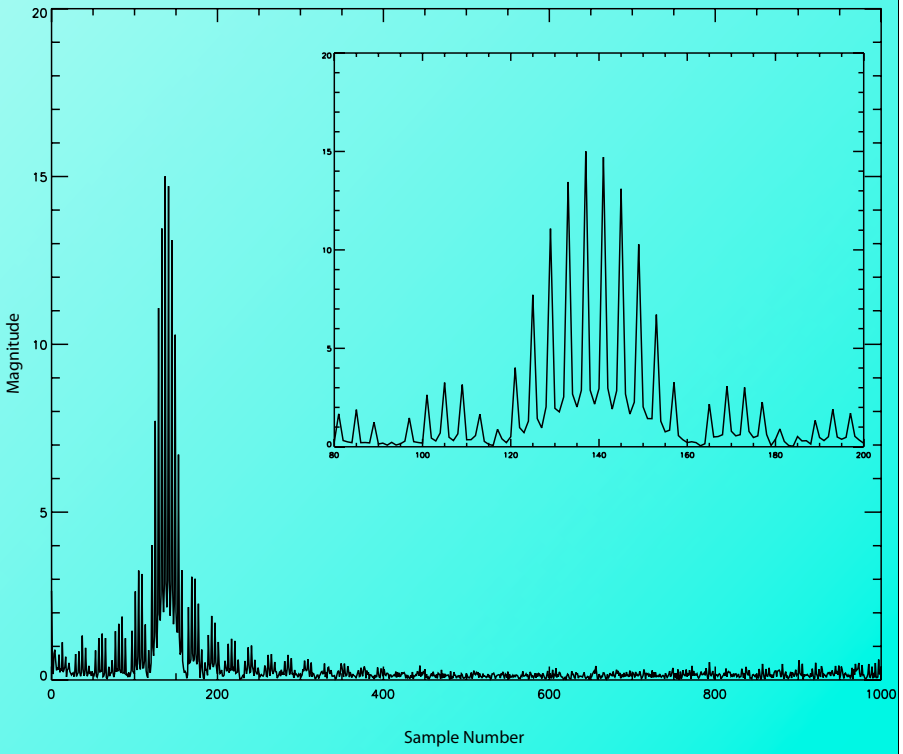
Scattering Theory

- Meteor "head-echo" scattering is theorized as highly frequency dependent
- Previous observations have been frequency AND latitude dependent
- AMISR at latitude similar to SRF and frequency comparable to AO

Periodic Searching Algorithm

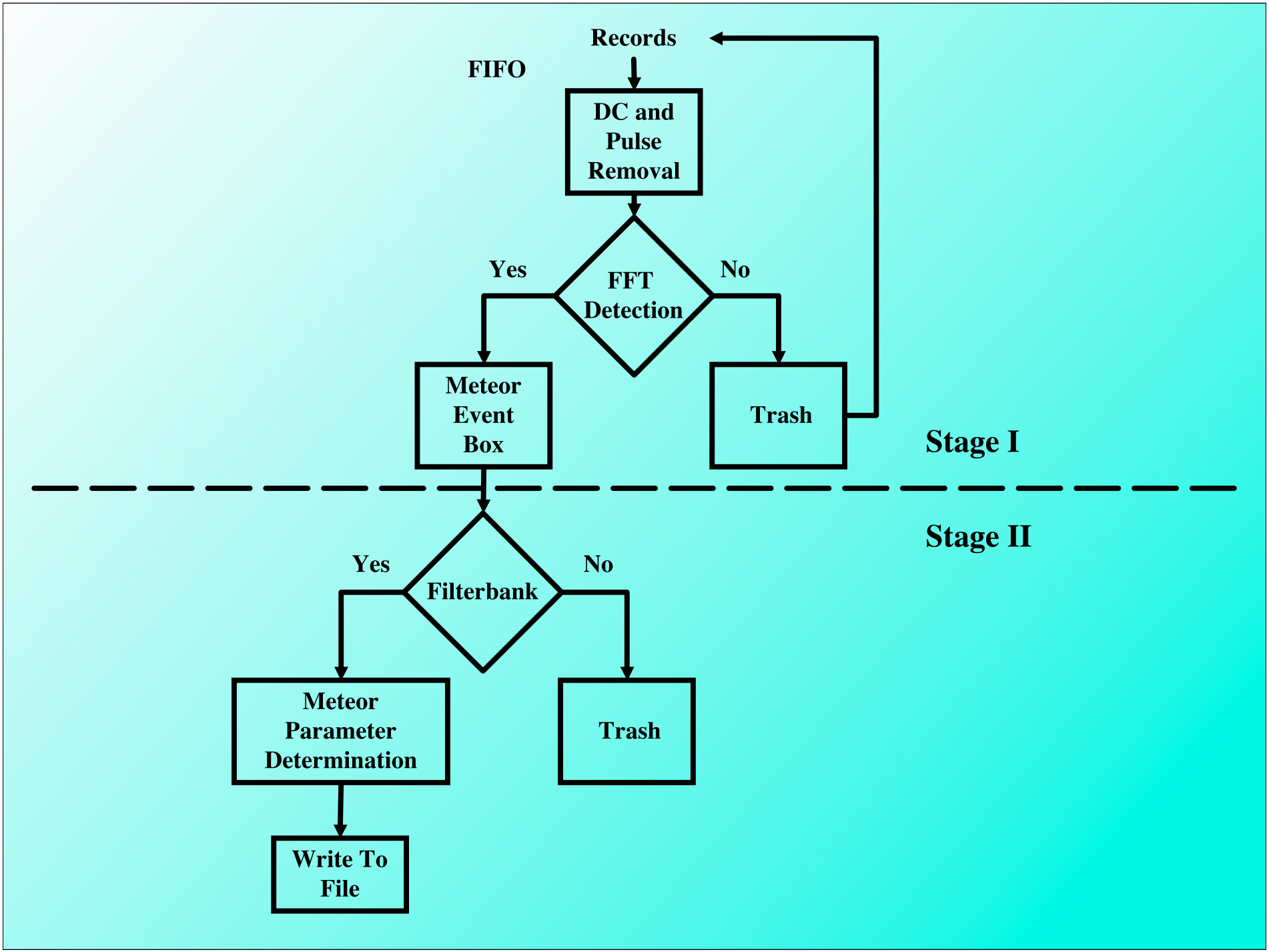


FFT

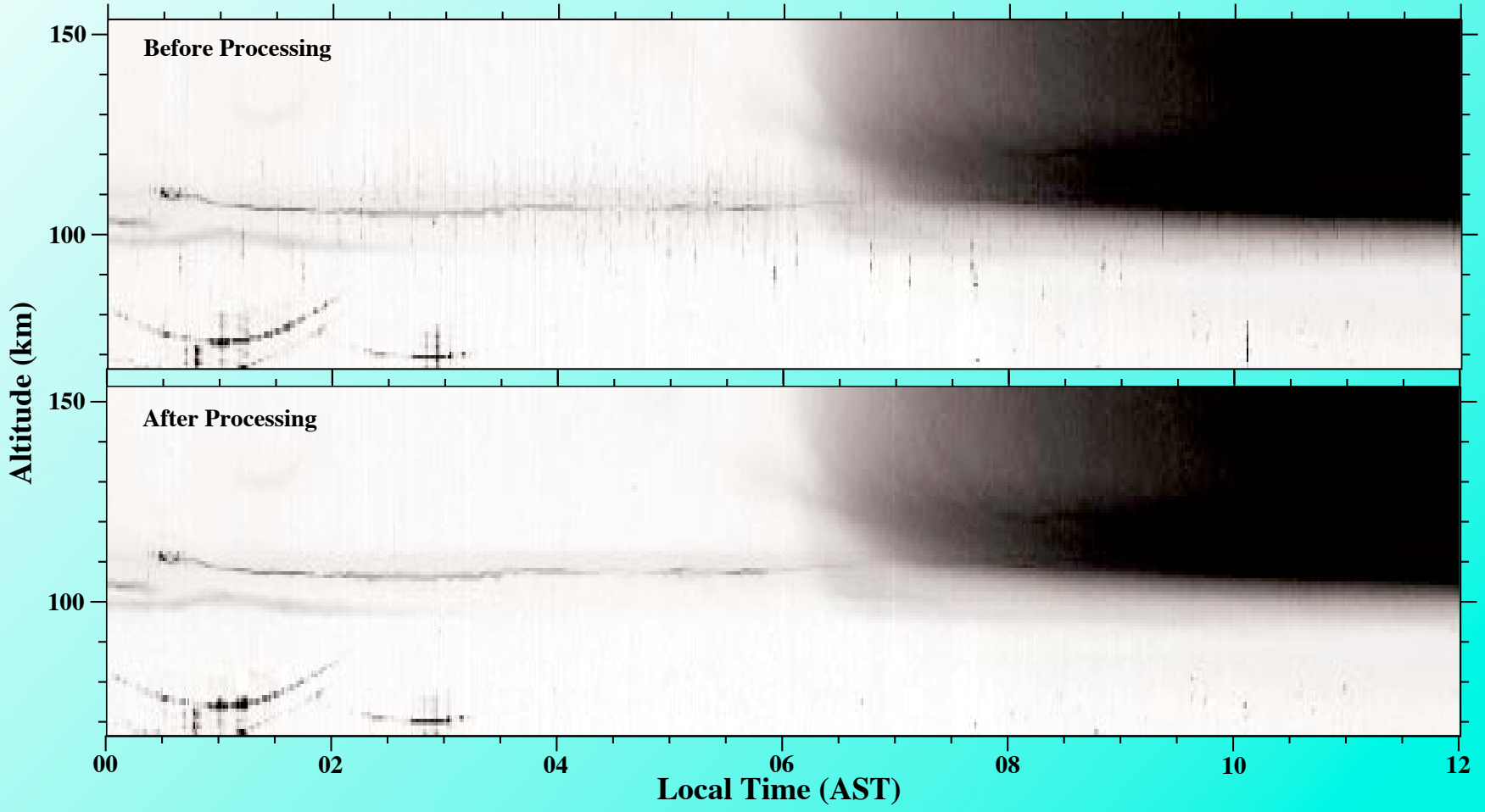


Time Domain

Frequency Domain


Records
FIFO
DC and Pulse Removal
FFT Detection
Yes
No
Meteor Event Box
Trash
Stage I
Stage II
Filterbank
Yes
No
Meteor Parameter Determination
Trash
Write To File

Meteor Removal



Poker Flat AMISR-32 Observations

- Transmit a 50 μs uncoded pulse
- Observe Doppler shifted returns between 84 and 140 km in range (near zenith)
- Eight hours of sporadic meteor observations conducted on the mornings of 01 and 02 Aug 2006

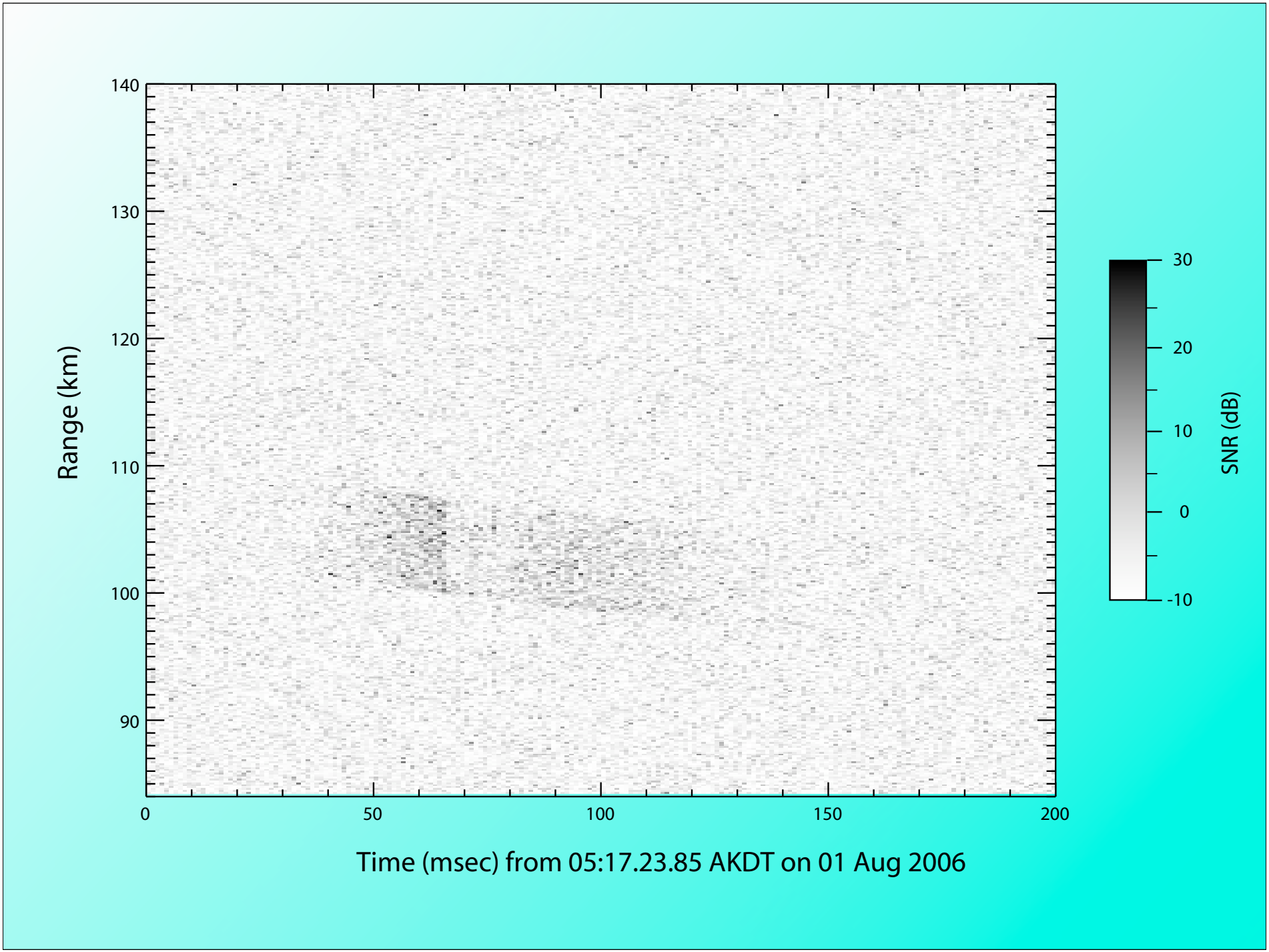

PHOTO BY C. HEINSELMAN

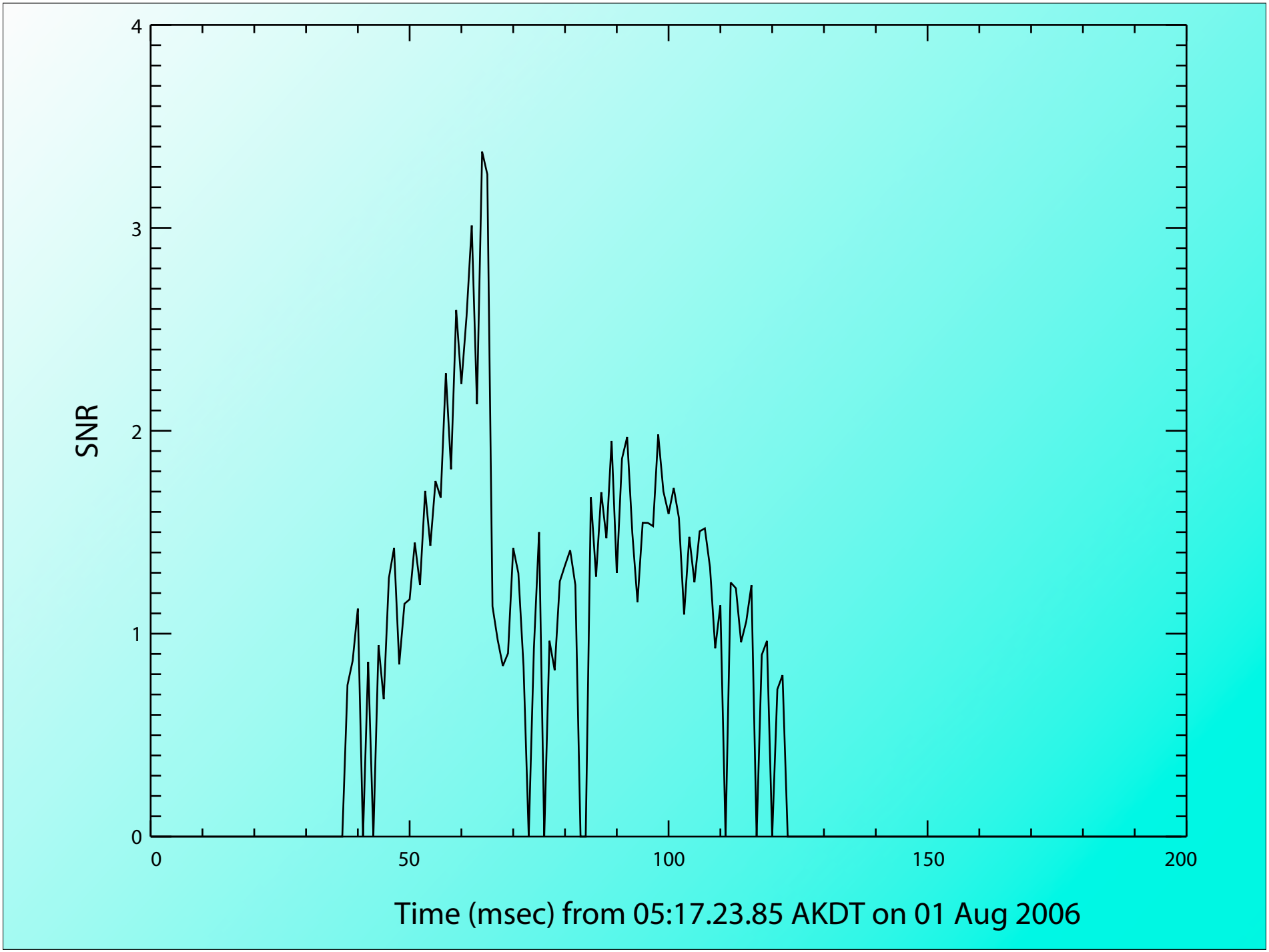
Radar Details

PF AMISR-32		Sondrestrom
65.12°N, 147.47°W	location	66.99°N, 50.95°W
449.3 MHz	operating frequency	1290 MHz
~2°	beamwidth	~1/2°
=0 MW	operating power	~2.6 MW
1 MHz	sampling frequency	1.25 MHz
1 ms	IPP	3.3 ms

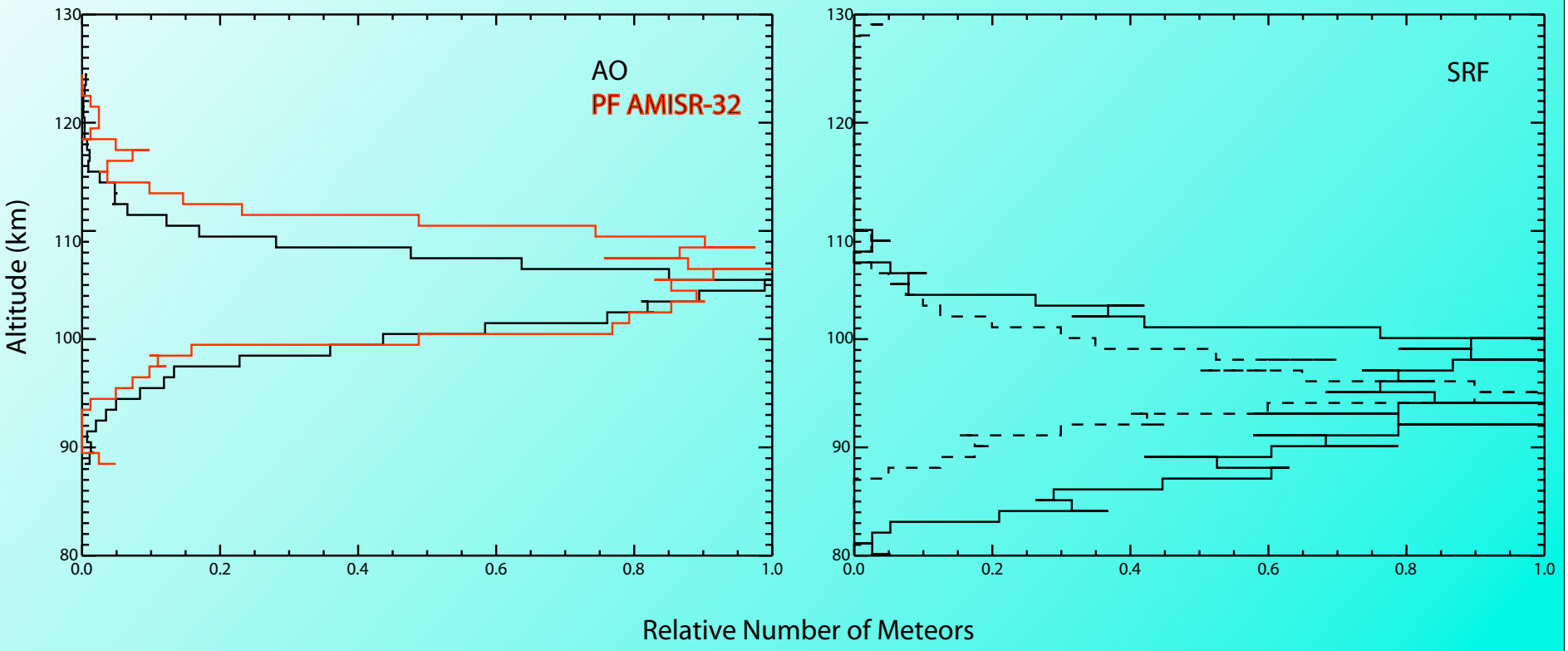
Results

- 443 Meteors Detected
- Flux rate ~ 1 event/minute
- PF AMISR-32 event rate ~ 2.5x that observed at SRF and much less than at AO
- The majority of detected events (>90%) are measurable for range and Doppler

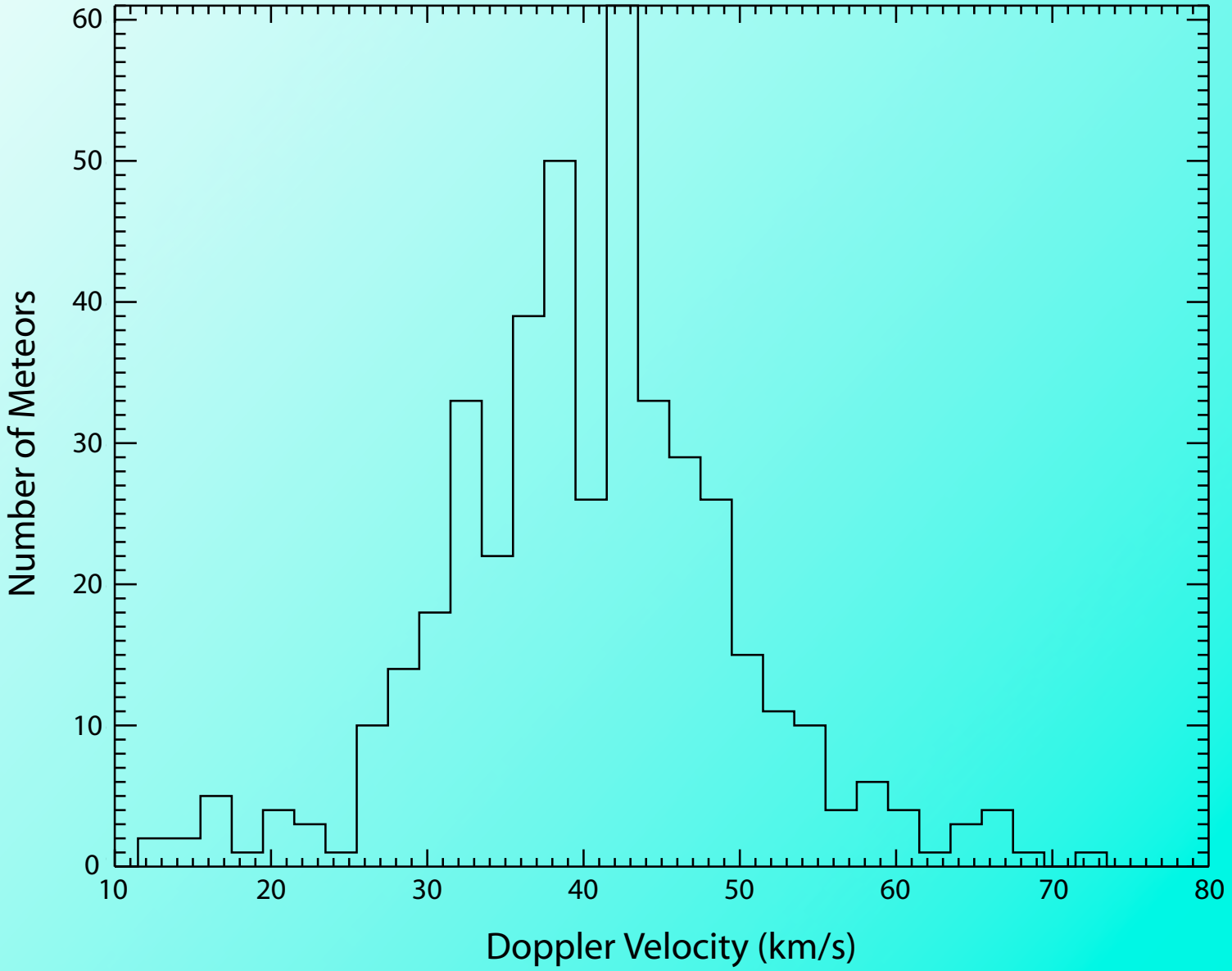

Range (km)
140
130
120
110
100
90
0
50
100
150
200
Time (msec) from 05:17.23.85 AKDT on 01 Aug 2006
30
20
10
0
-10
SNR (dB)


SNR
0
1
2
3
4
0
50
100
150
200
Time (msec) from 05:17.23.85 AKDT on 01 Aug 2006

Altitude Distributions



AMISR Doppler



Future Observations

- Use the full AMISR face
- Increased SNR leads to increased statistics
- Meteor decelerations and mass distributions
- Adapt the meteor searching code for interferometric capability

Conclusions

- The Poker Flat AMISR-32 radar has greatly improved our understanding of meteor "head-echo" scattering
- Further work is needed on developing a comprehensive scattering model