Abundance and Diel Migrations Of Demersal Mesozooplankton And Small Reef Fishes And Their Trophodynamic Contribution to the Coral Reef Ecosystem: A Pilot Study.

Peter B. Ortner and Shailer R. Cummings, OAR/AOML
Sharon L. Smith and Peter Lane, UM/RSMAS
John Lamkin, Cynthia Yeung and Dave Jones, NMFS/SEFSC

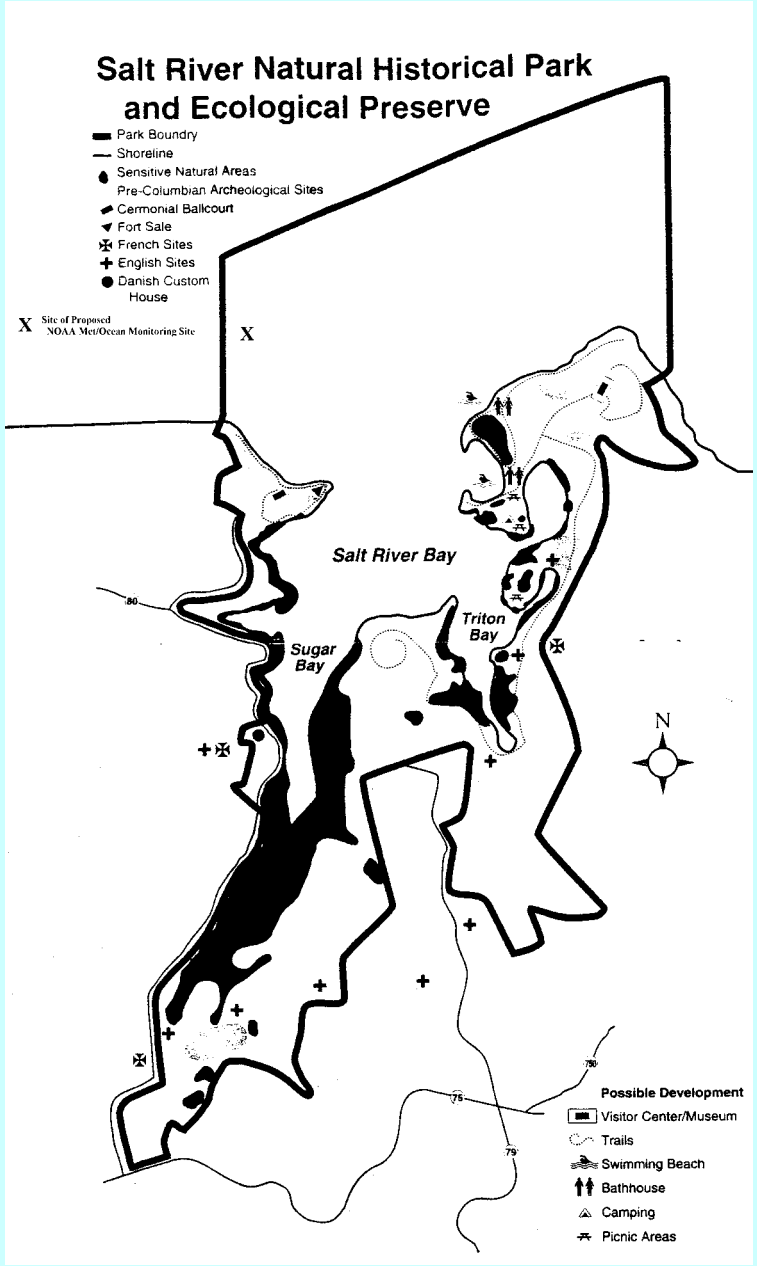
Scientific Objectives

- ***Assessing diel abundance variability of demersal populations***
- ***Assessing food availability and potential utilization by sessile coral reef invertebrates***
- ***Assessing food availability to local predators (energy transfers from the coral reef ecosystem into the surrounding deeper waters)-***
- ***Assessing the utilization of water column planktonic food resources by demersal mesoplankton and small fishes***

Strategy

- CREWS opportunity/context
- Time Series Information
- Two Month-long High Resolution Experiments
- Nested within Longer Term (>6 mo) Data Set
- Utilization of Available Biological Oceanographic Sampling Methodologies (new context)

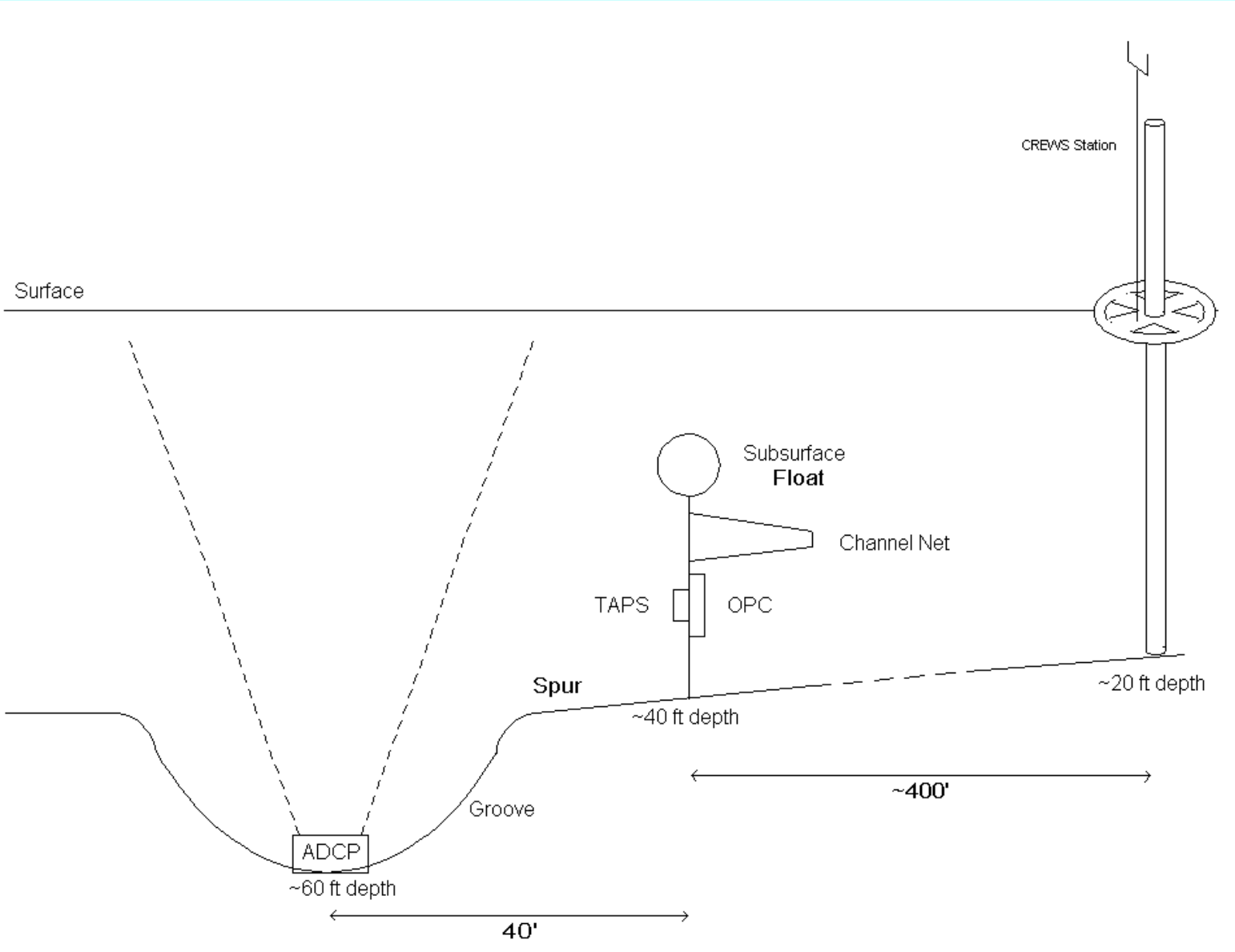
Experimental Site ca. 400 ft
Due north of CREWS station



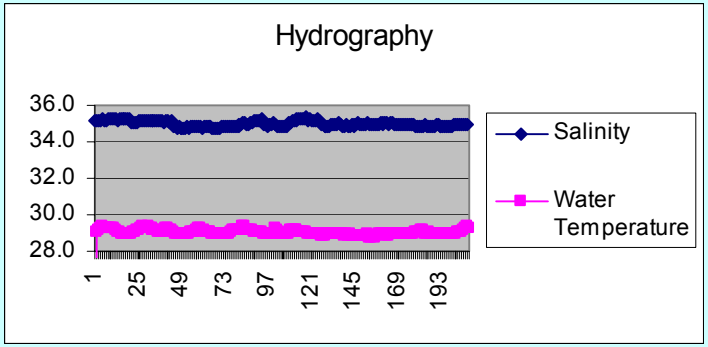
SAMPLING METHODS

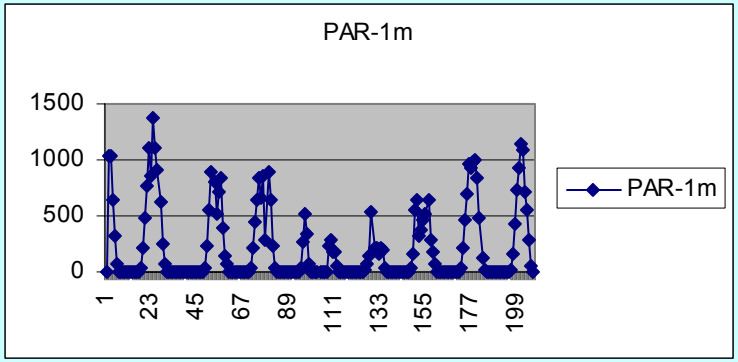
- **Acoustic Doppler Current Profiler (ADCP)**
  Synoptic Biomass / Currents
- **Tracor Acoustic Profiling System (TAPS)**
  Plankton Abundance and Size
- **Optical Particle Counter (OPC)**
  Plankton Abundance and Size
- **Channel Nets and Towed Nets**
  Plankton/Fish Species

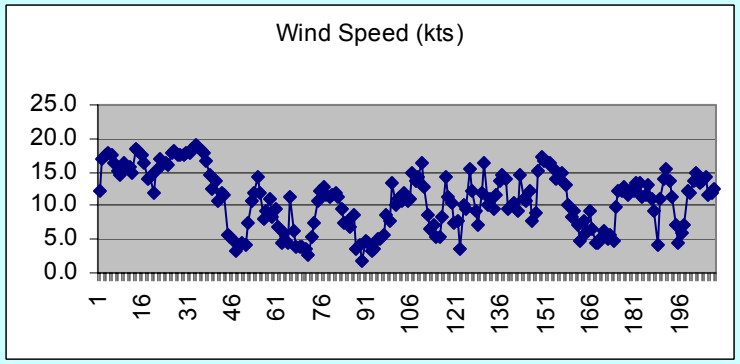
Sampling Design

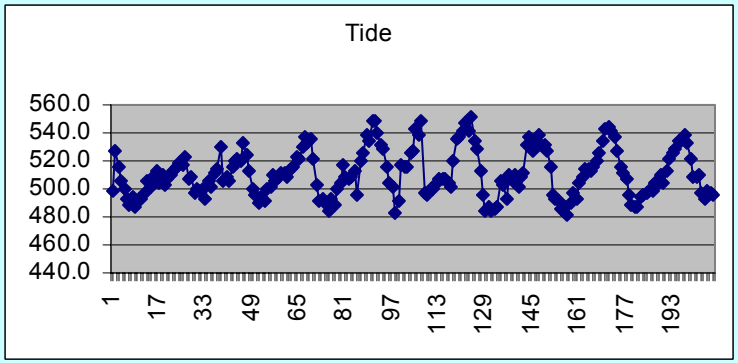


CREWS Environmental Context

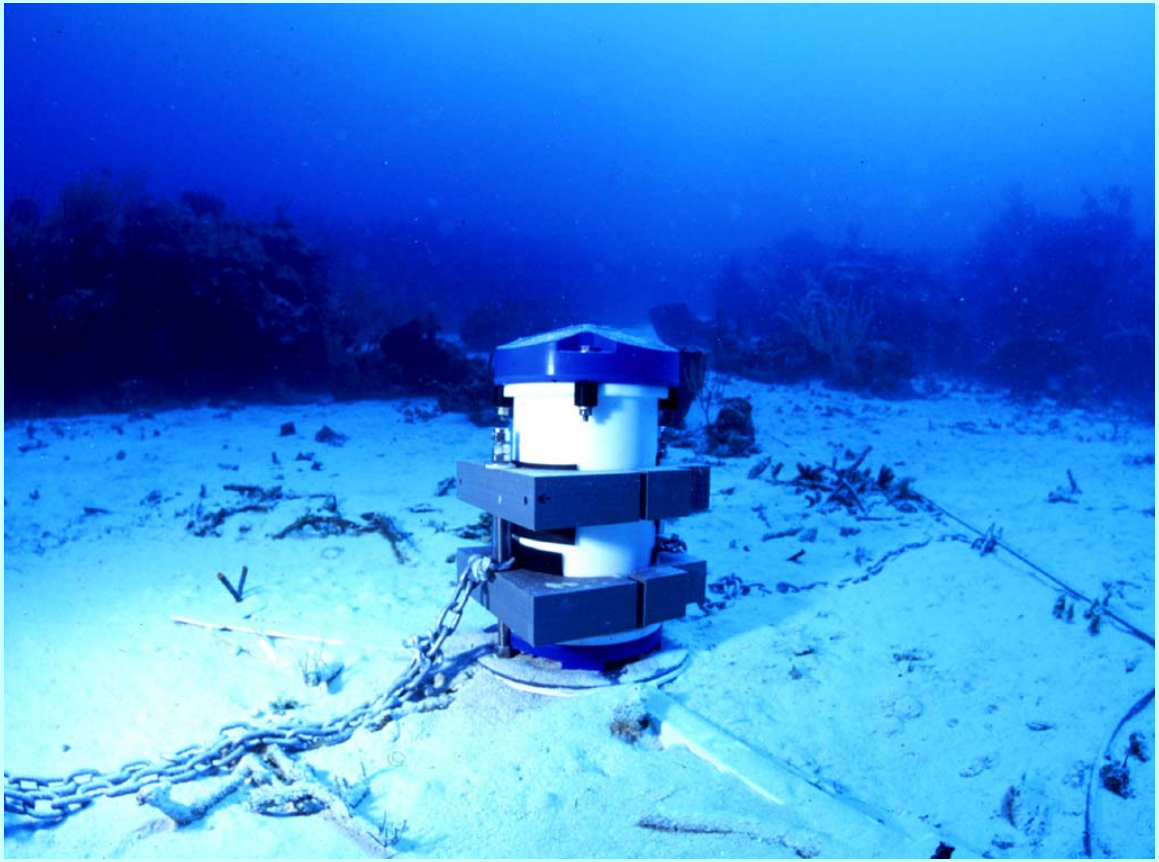


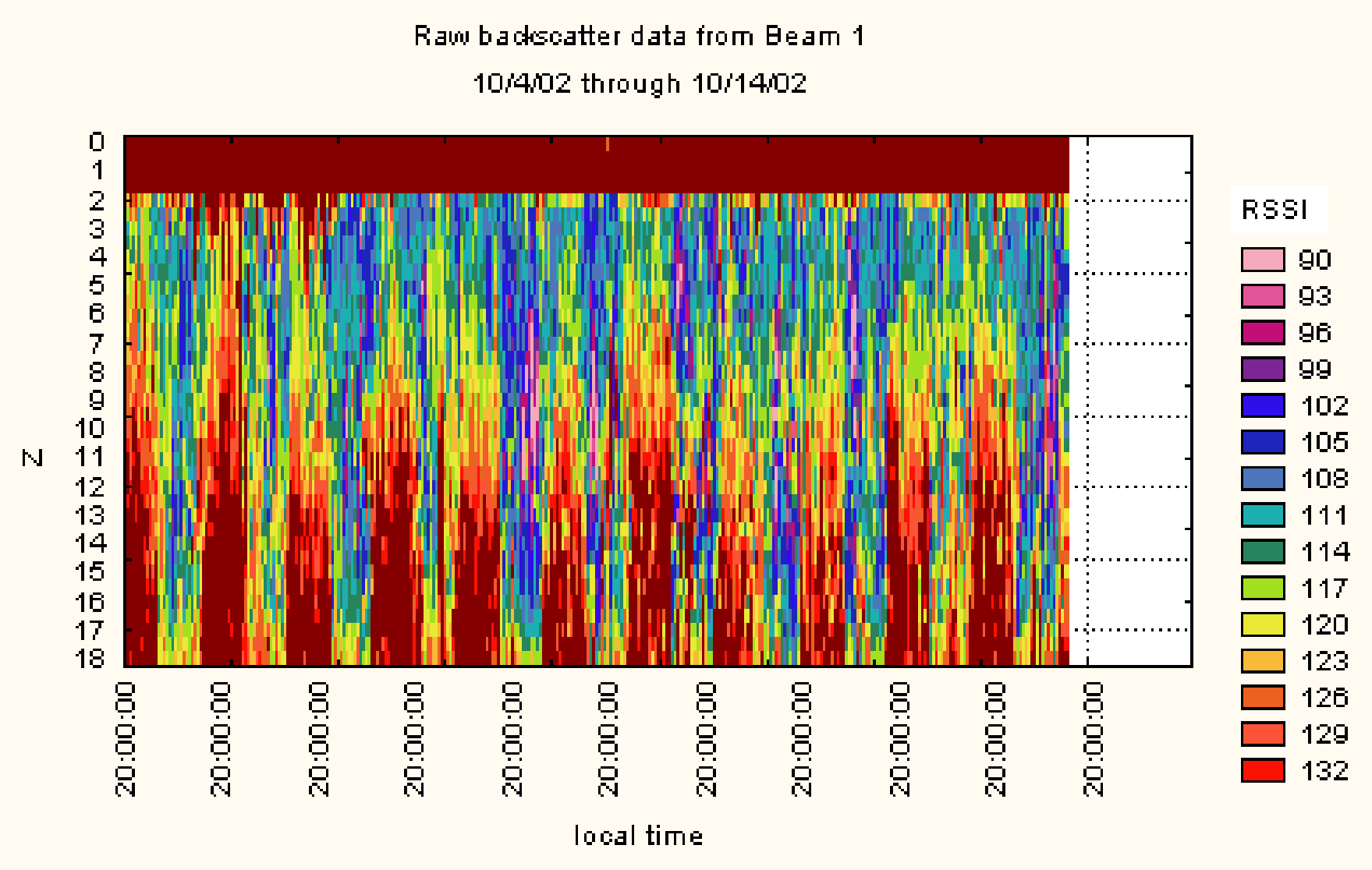


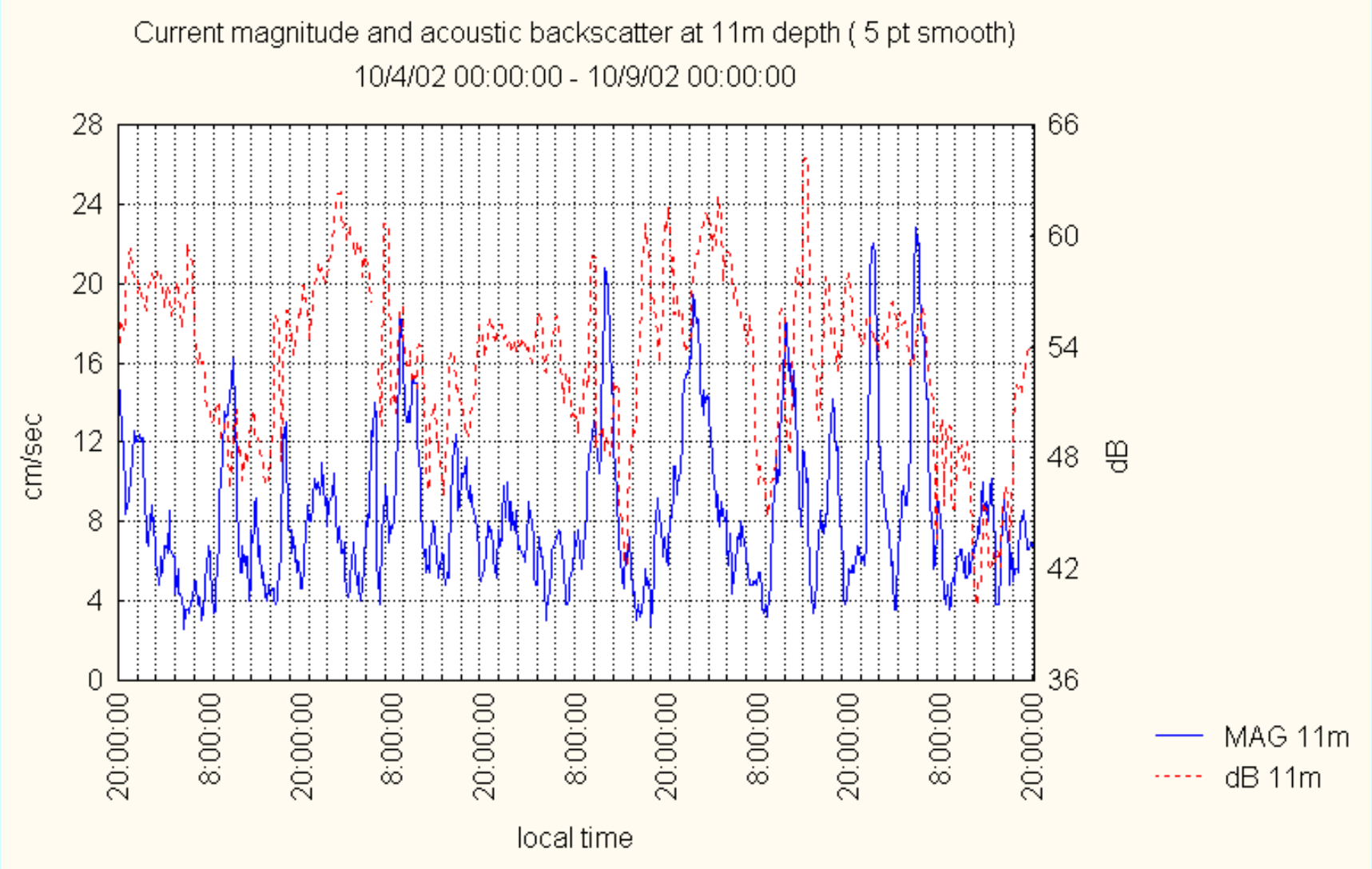


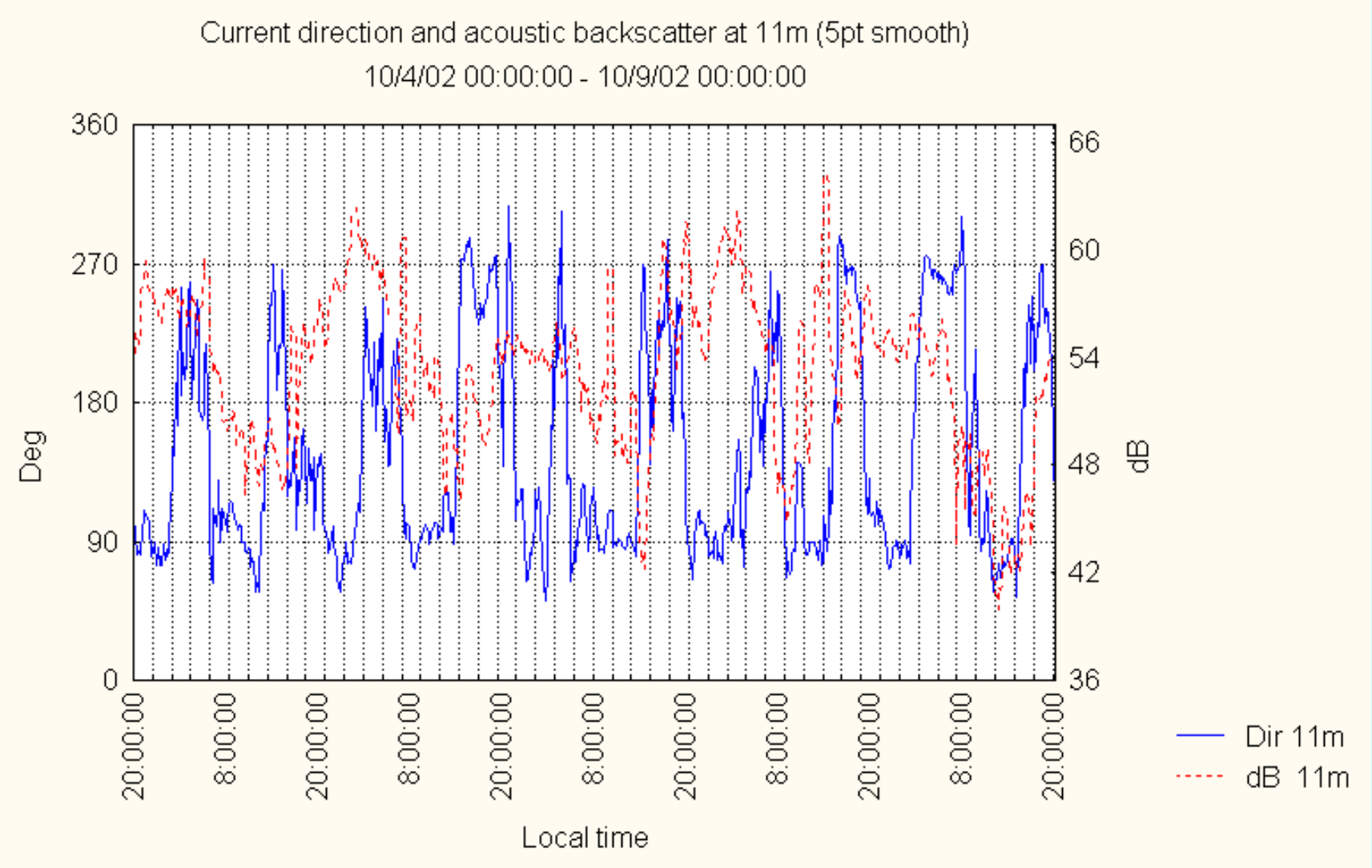


300 kHz Bottom-mounted ADCP

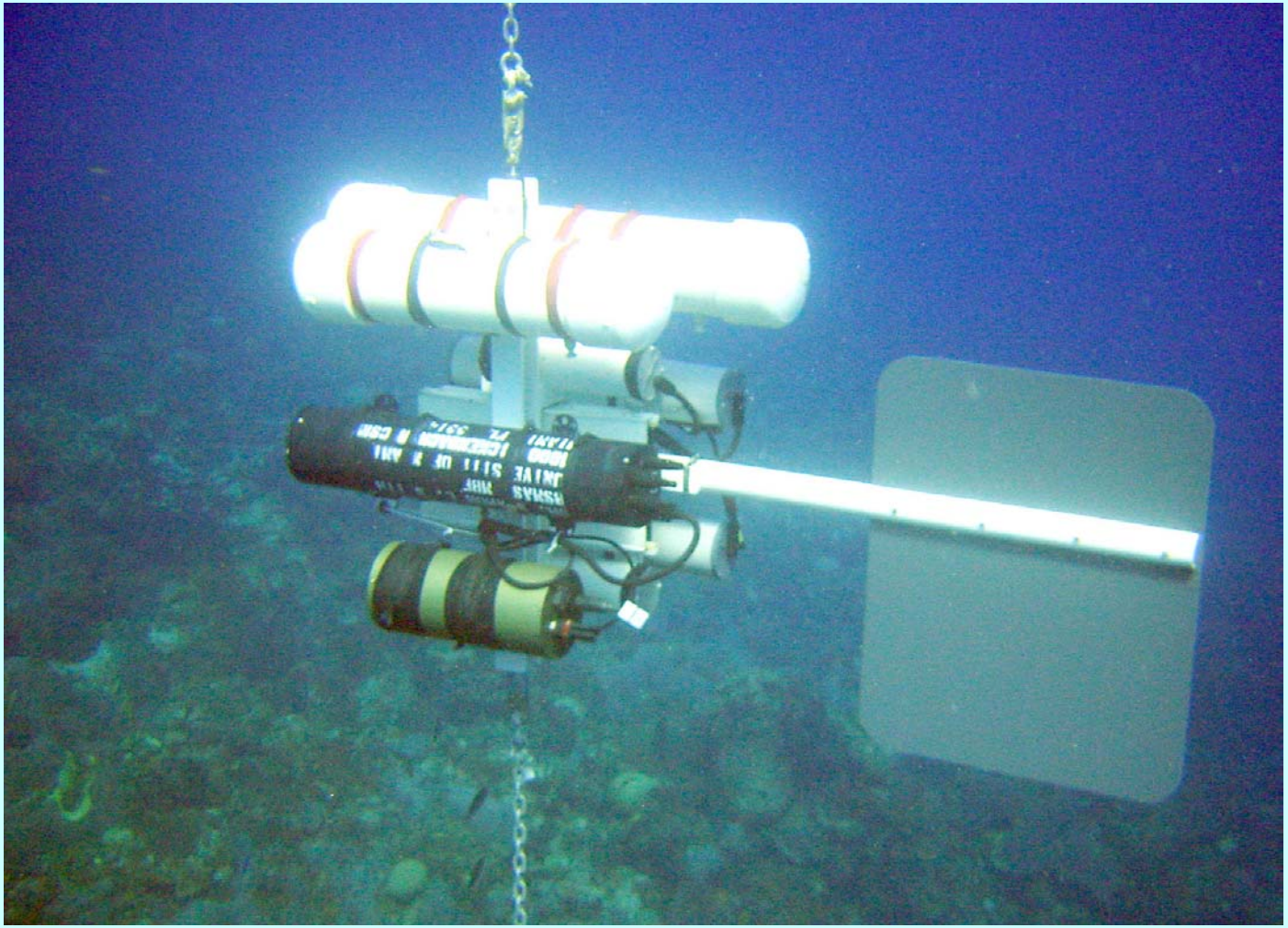



Raw backscatter data from Beam 1
10/4/02 through 10/14/02
N
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
20:00:00
local time
RSSI
90
93
96
99
102
105
108
111
114
117
120
123
126
129
132

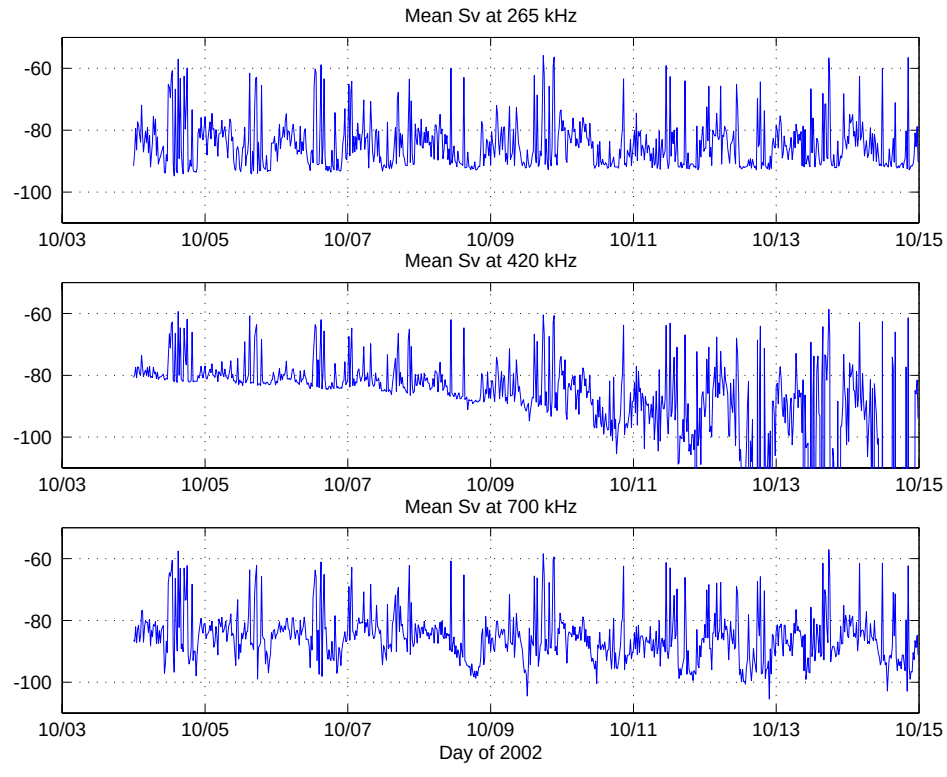

Current magnitude and acoustic backscatter at 11m depth (5 pt smooth)
10/4/02 00:00:00 - 10/9/02 00:00:00
cm/sec
dB
local time
28
24
20
16
12
8
4
0
66
60
54
48
42
36
20:00:00
8:00:00
MAG 11m
dB 11m


Current direction and acoustic backscatter at 11m (5pt smooth)
10/4/02 00:00:00 - 10/9/02 00:00:00
360
270
180
90
0
Deg
66
60
54
48
42
36
dB
20:00:00
8:00:00
20:00:00
8:00:00
20:00:00
8:00:00
20:00:00
8:00:00
20:00:00
8:00:00
20:00:00
Local time
Dir 11m
dB 11m

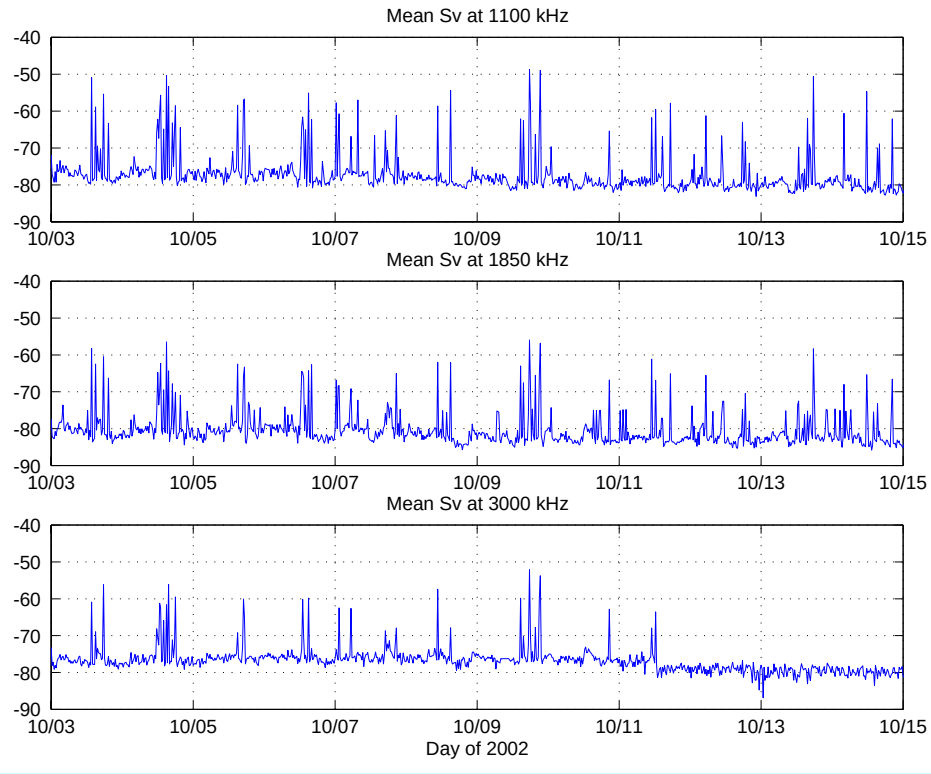
Moored TAPS-OPC



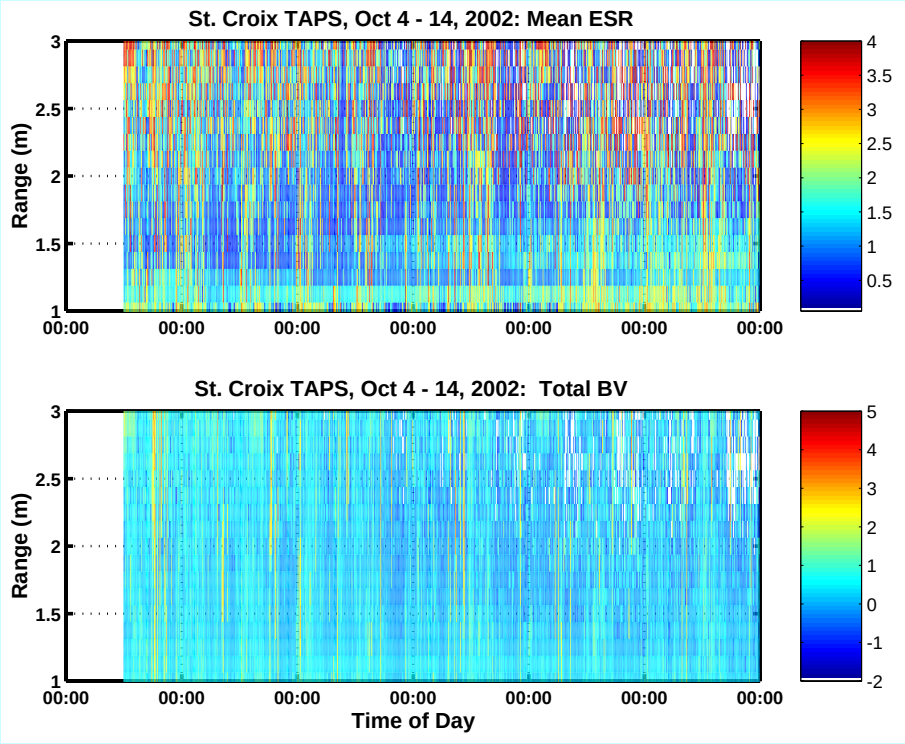
Lower TAPS frequency set

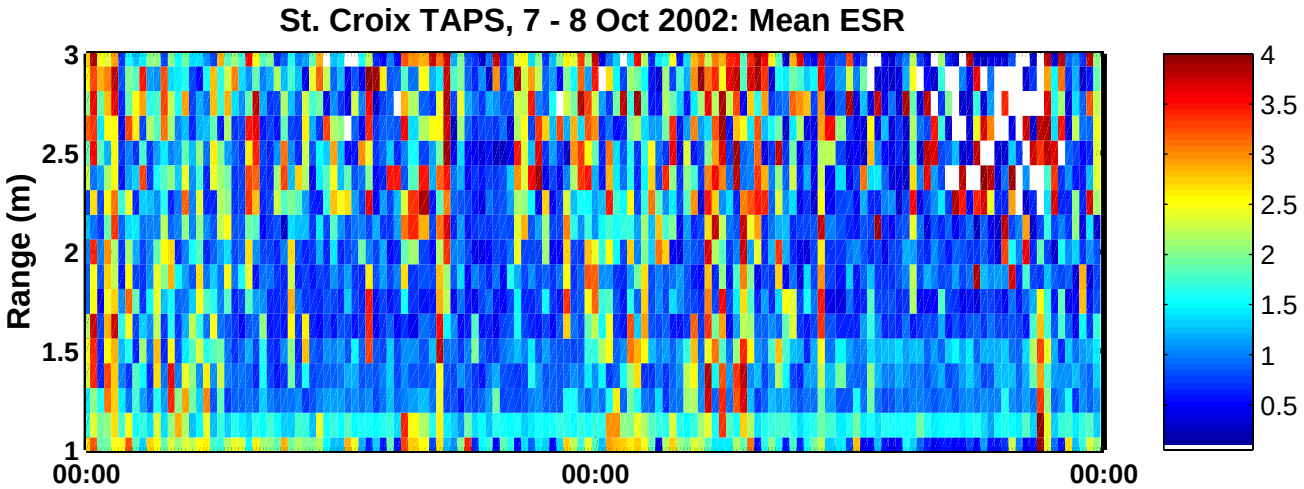


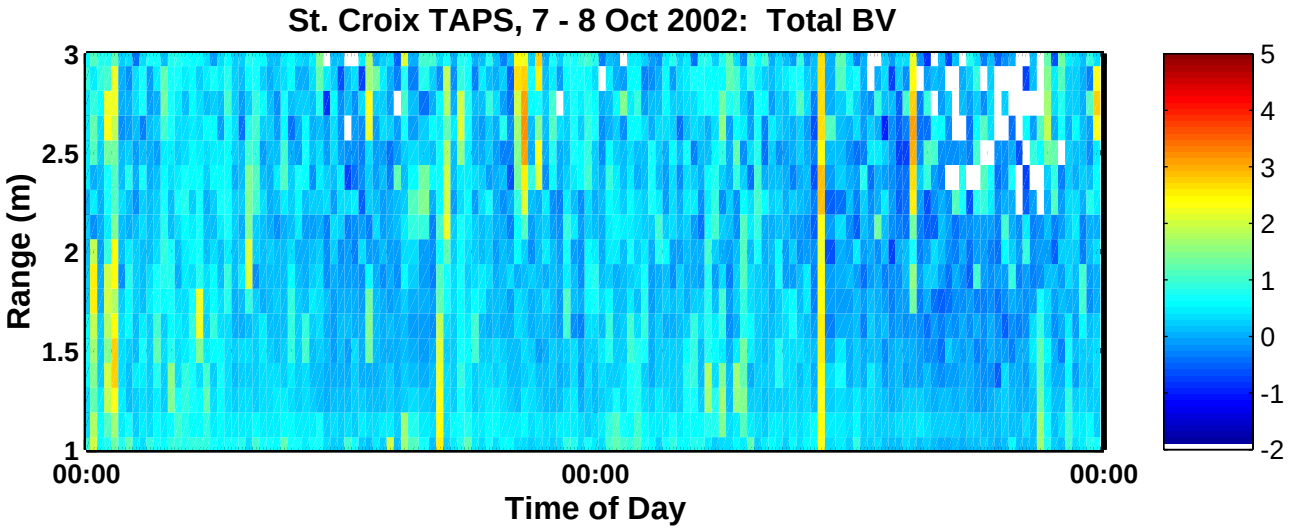
Upper TAPS frequency set

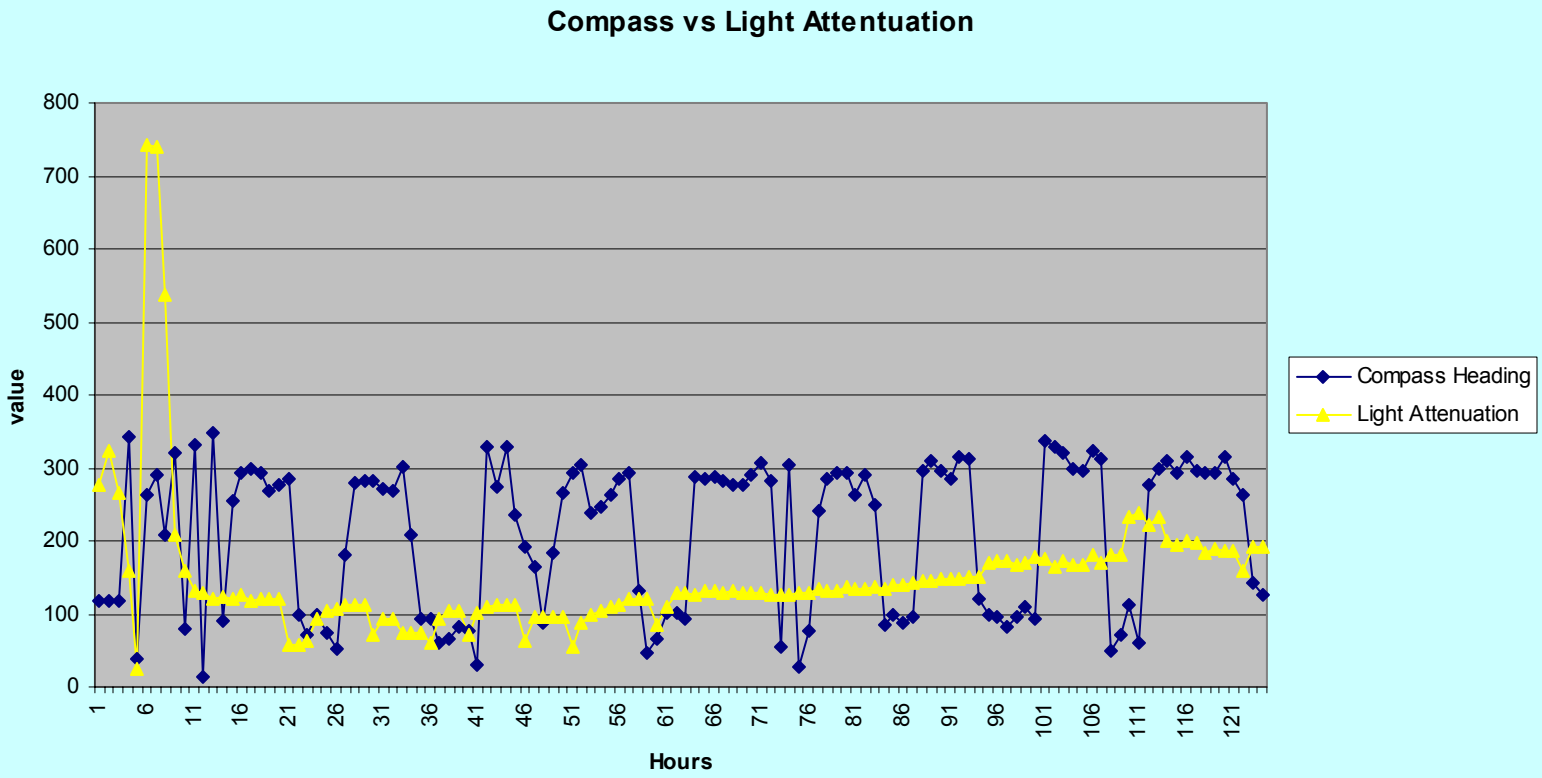


Inversion from multiple non-linear non-monotonic Amplitude vs. ESR for different frequencies: Analogy to wave Fourier deconvolution

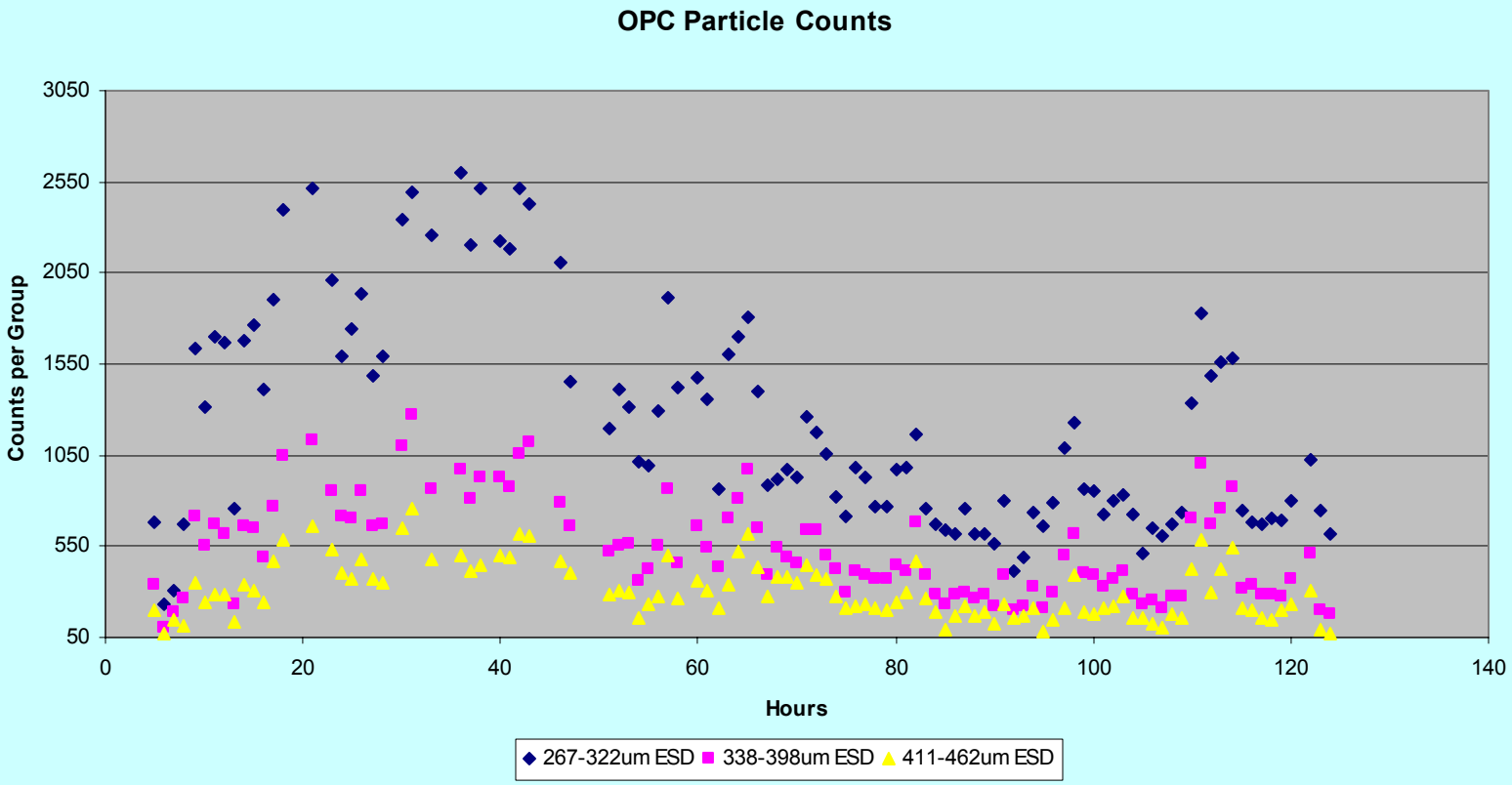



St. Croix TAPS, 7 - 8 Oct 2002: Mean ESR
Range (m)
3
2.5
2
1.5
1
00:00
00:00
00:00
4
3.5
3
2.5
2
1.5
1
0.5


St. Croix TAPS, 7 - 8 Oct 2002: Total BV
Range (m)
3
2.5
2
1.5
1
00:00
00:00
00:00
Time of Day
5
4
3
2
1
0
-1
-2

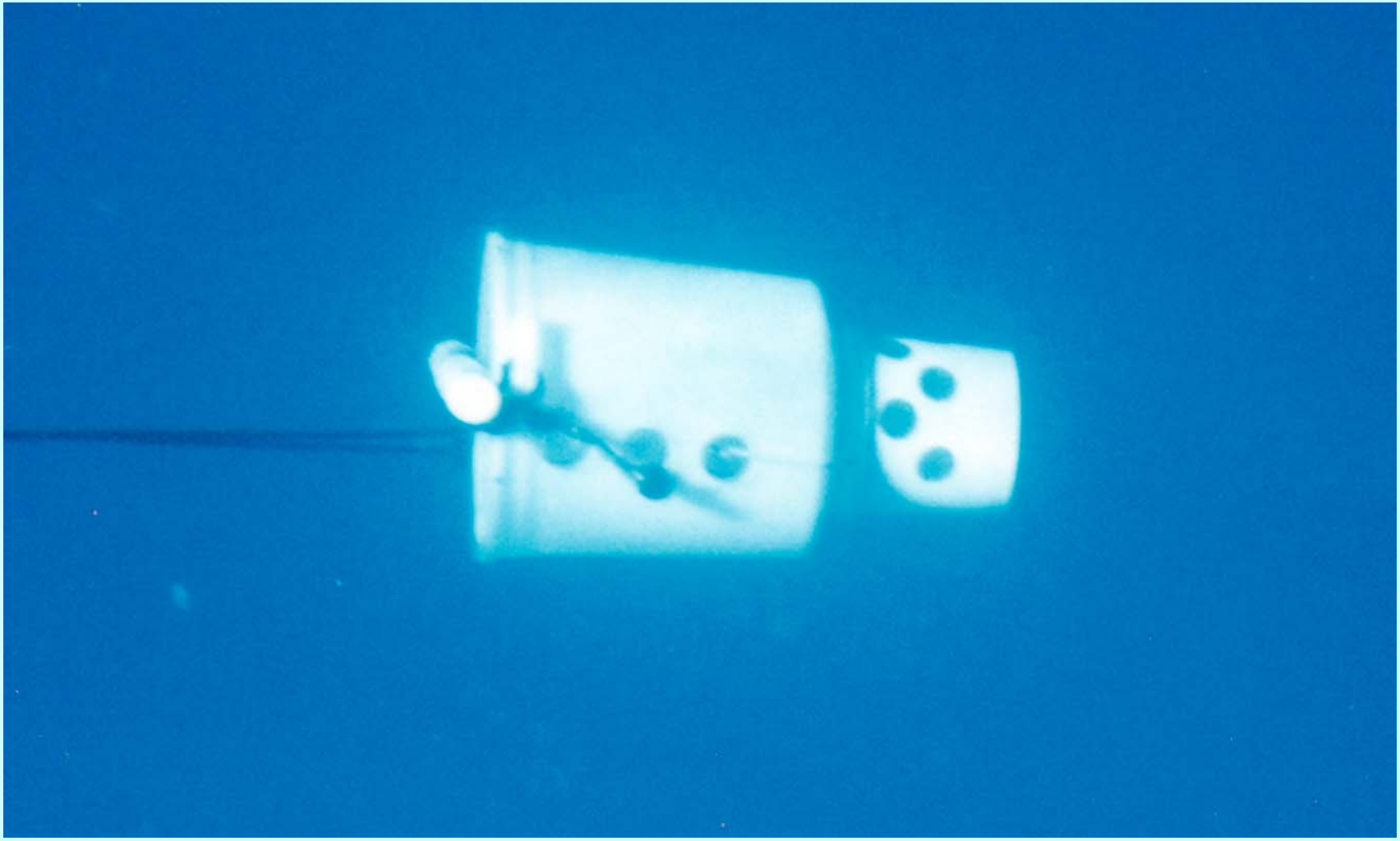

Compass vs Light Attentuation
value
Hours
Compass Heading
Light Attenuation
0
100
200
300
400
500
600
700
800
1
6
11
16
21
26
31
36
41
46
51
56
61
66
71
76
81
86
91
96
101
106
111
116
121

Corrected Light Occlusion (optical ESD vs acoustic ESR)



Icthyoplankton Channel Net

Light Trap



PRELIMINARY OBSERVATIONS

- Diel Variability – Zooplankton and Icthyoplankton
- Strong Secondary Tidal Current Effects
- Longer Scale Processes Evident
- Site Specific Issues (proximity to embayment!)
- Good First Try – Can Do Better Technically/Site

????? FOLLOW-UPS ??????

NEXT PHASE – May03

- Multiple Frequency ADCP's (300/1200)
- Upward Looking TAPS Profiling
- Improved Plankton Net fixed/diver
- Realtime Video Feed/Record
- Additional CREWS Optical Data
  Fluoresence/Transmittence
- With luck/copepodite swarm