Simultaneous Assessment of Particles, Including Plankton, in the North Pacific by Use of the SOLOPC

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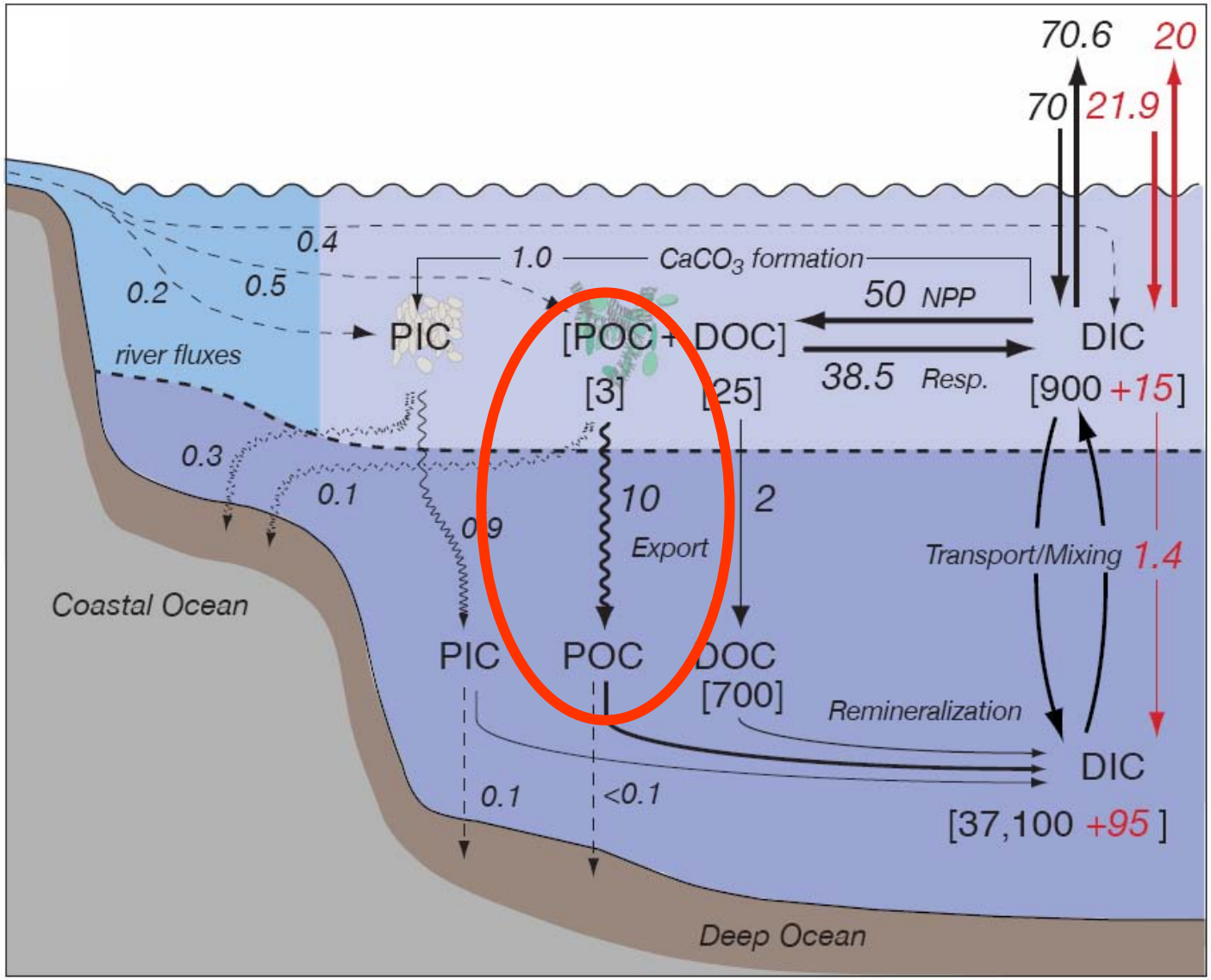
Acknowledgements

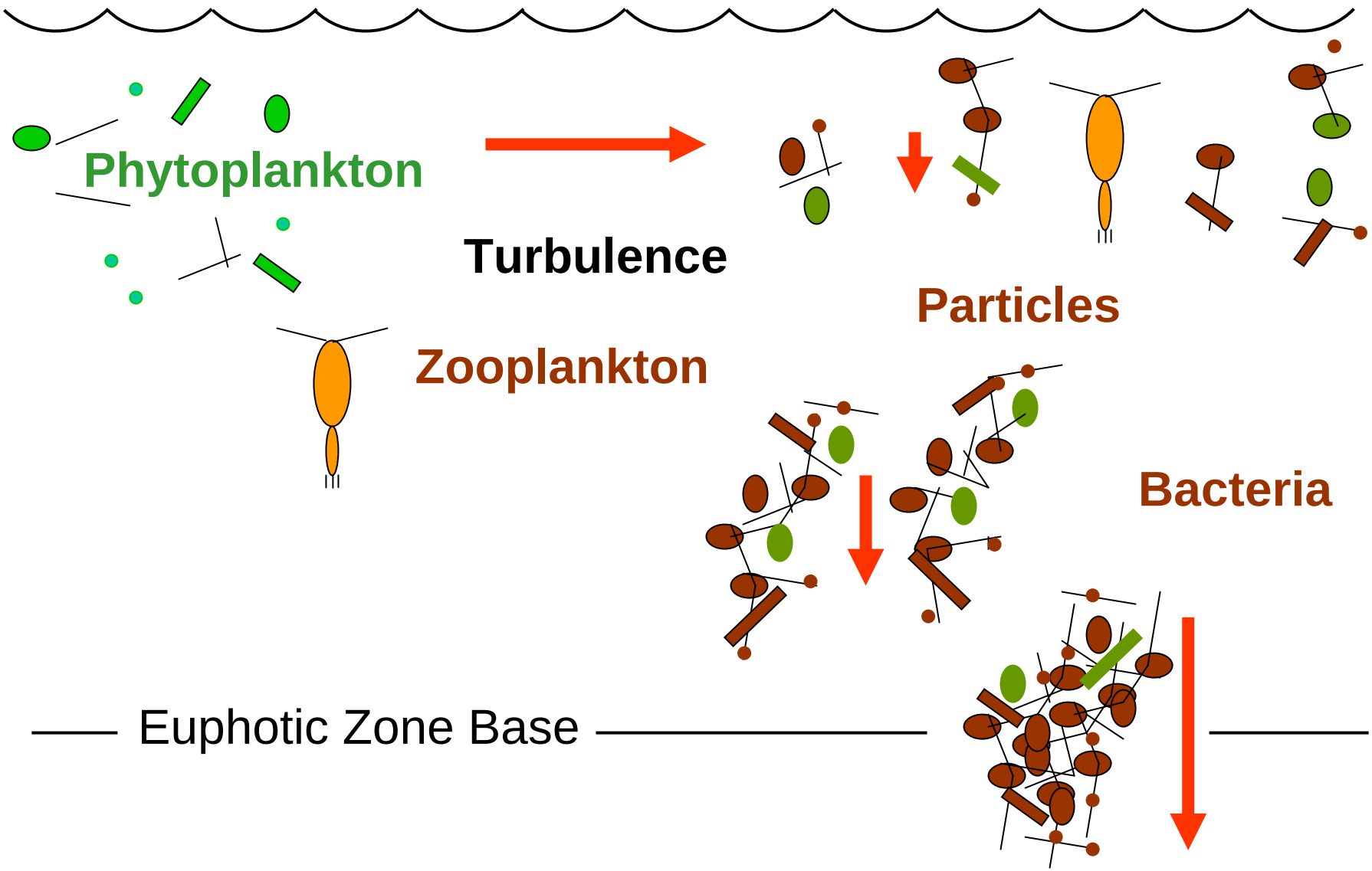
Pete Davison
NSF Major Research Instrumentation Program
CCE LTER

The Biological Pump



(Sabine *et al.* 2003)

Conceptual Model



SOLOPC

SOLO

(Sounding Oceanographic Lagrangian Observer)

+

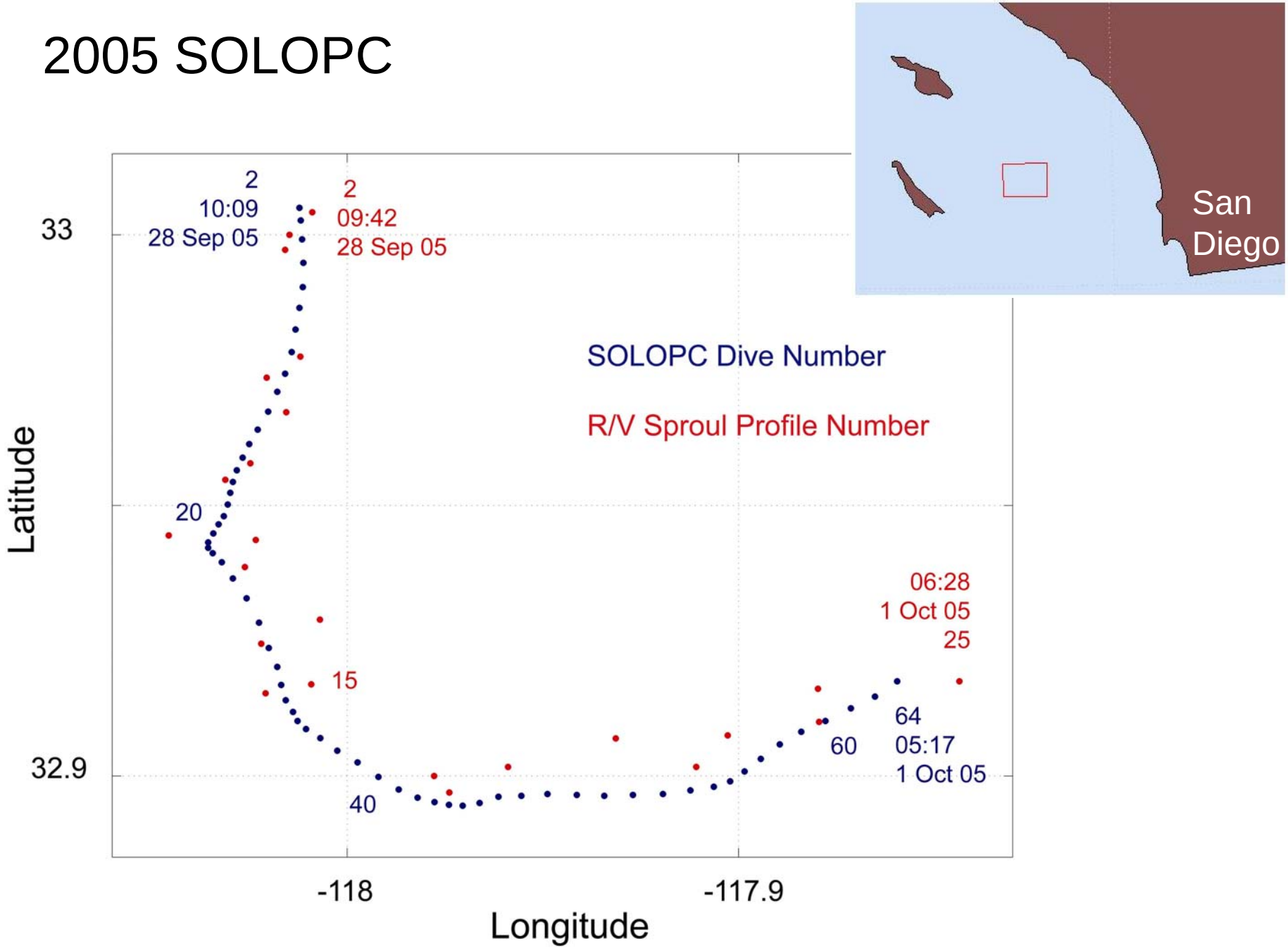
LOPC

(Laser Optical Plankton Counter)

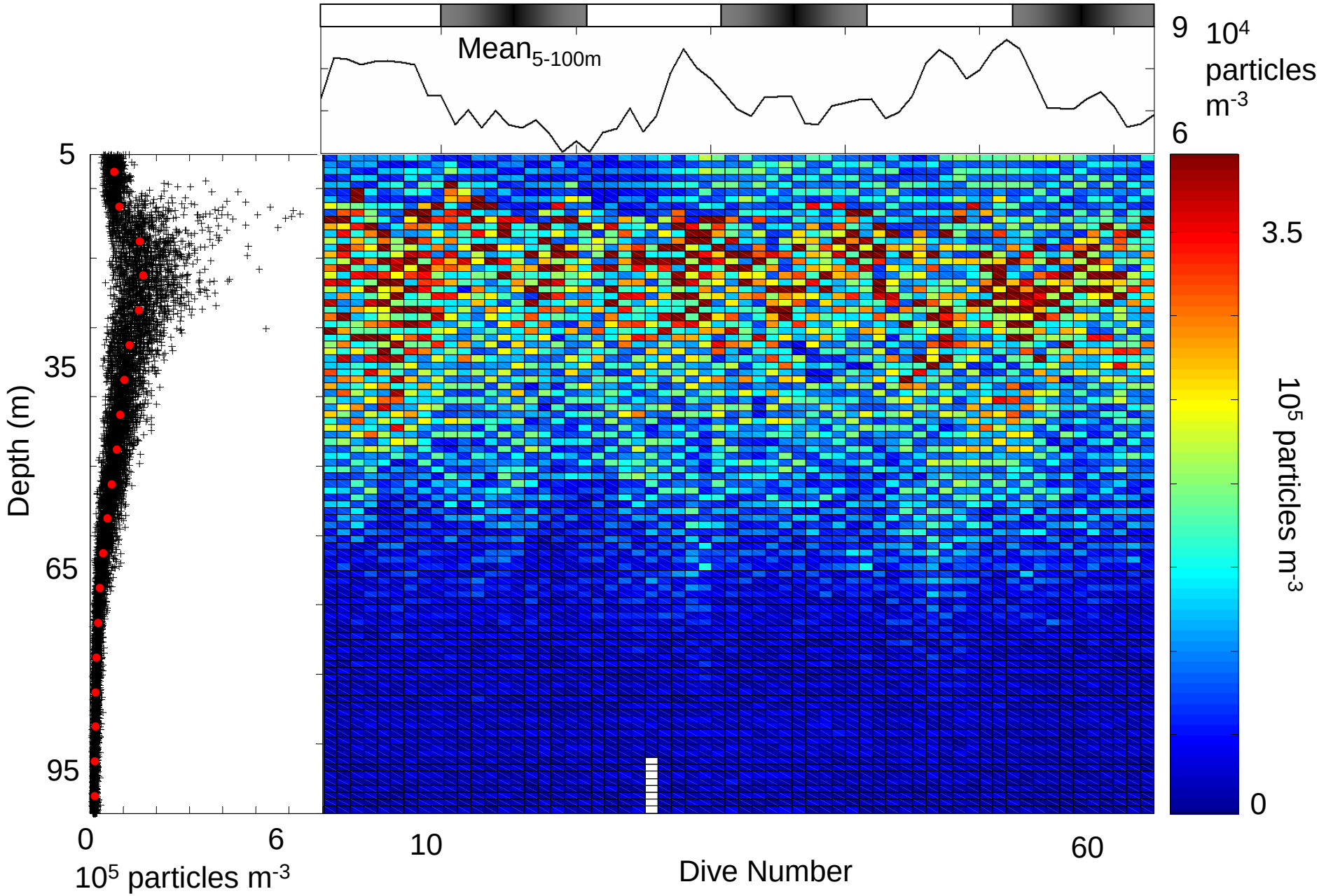
SOLOPC

Length	255 cm
Diameter	17 cm
Weight	36 kg (air) 0 ± 100 g (water)
Speed	23 cm sec^{-1} (descent) 15 cm sec^{-1} (ascent)
Depth range	0 - 600 m
Number of dives	≥ 390 to 100m ≥ 190 to 300m
Telemetry	Iridium
Position	GPS
Sensors	SeaBird CTD Brooke Ocean Technology LOPC WET Labs ECO Puck
LOPC cross section	49 cm^2
LOPC volume filtered	0.49 m^3 per 100-m profile
Cost (Components)	$54,000

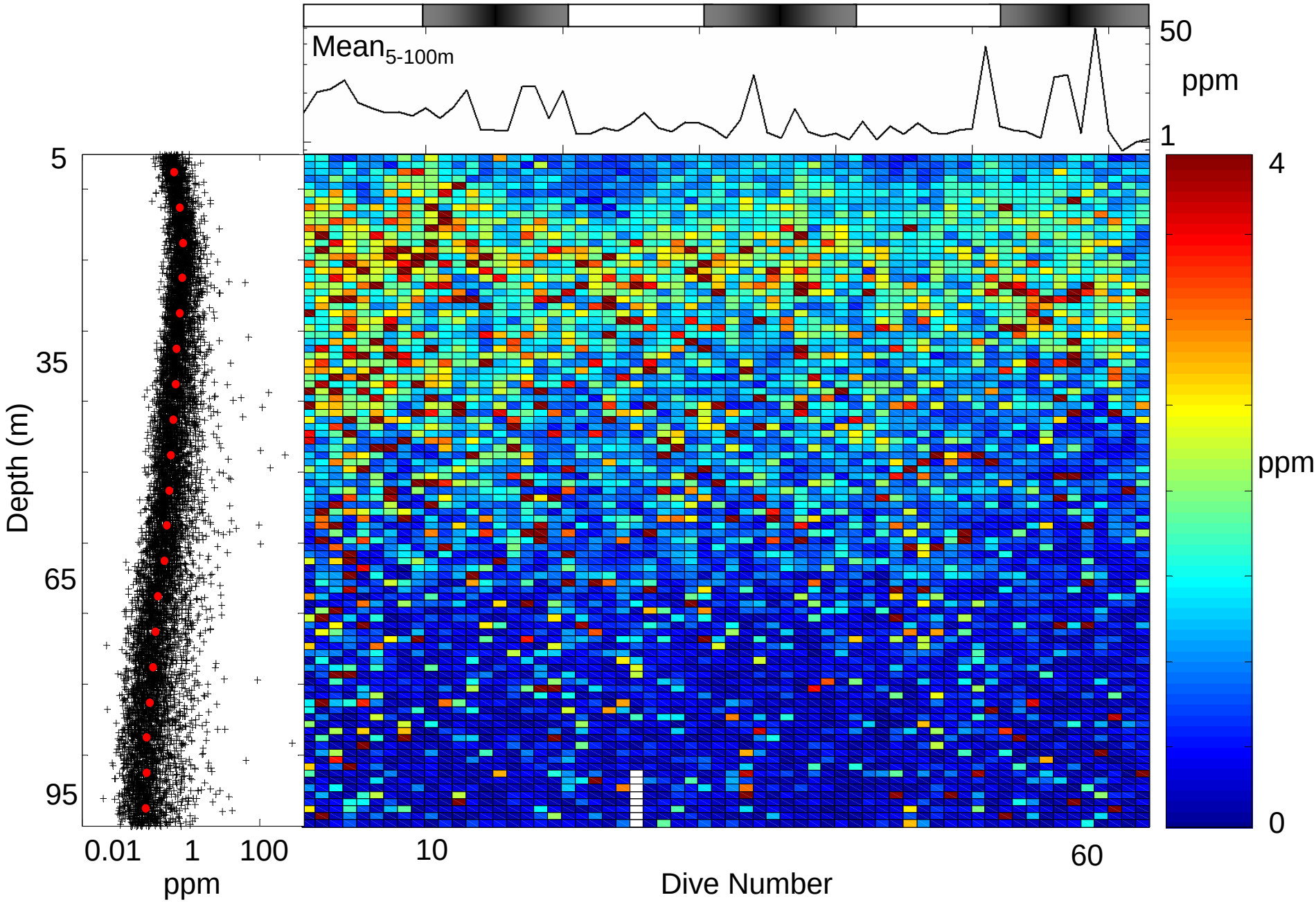
2005 SOLOPC


San Diego
SOLOPC Dive Number
R/V Sproul Profile Number
2
10:09
28 Sep 05
2
09:42
28 Sep 05
20
15
40
60
64
05:17
1 Oct 05
06:28
1 Oct 05
25
33
32.9
Latitude
-118
-117.9
Longitude

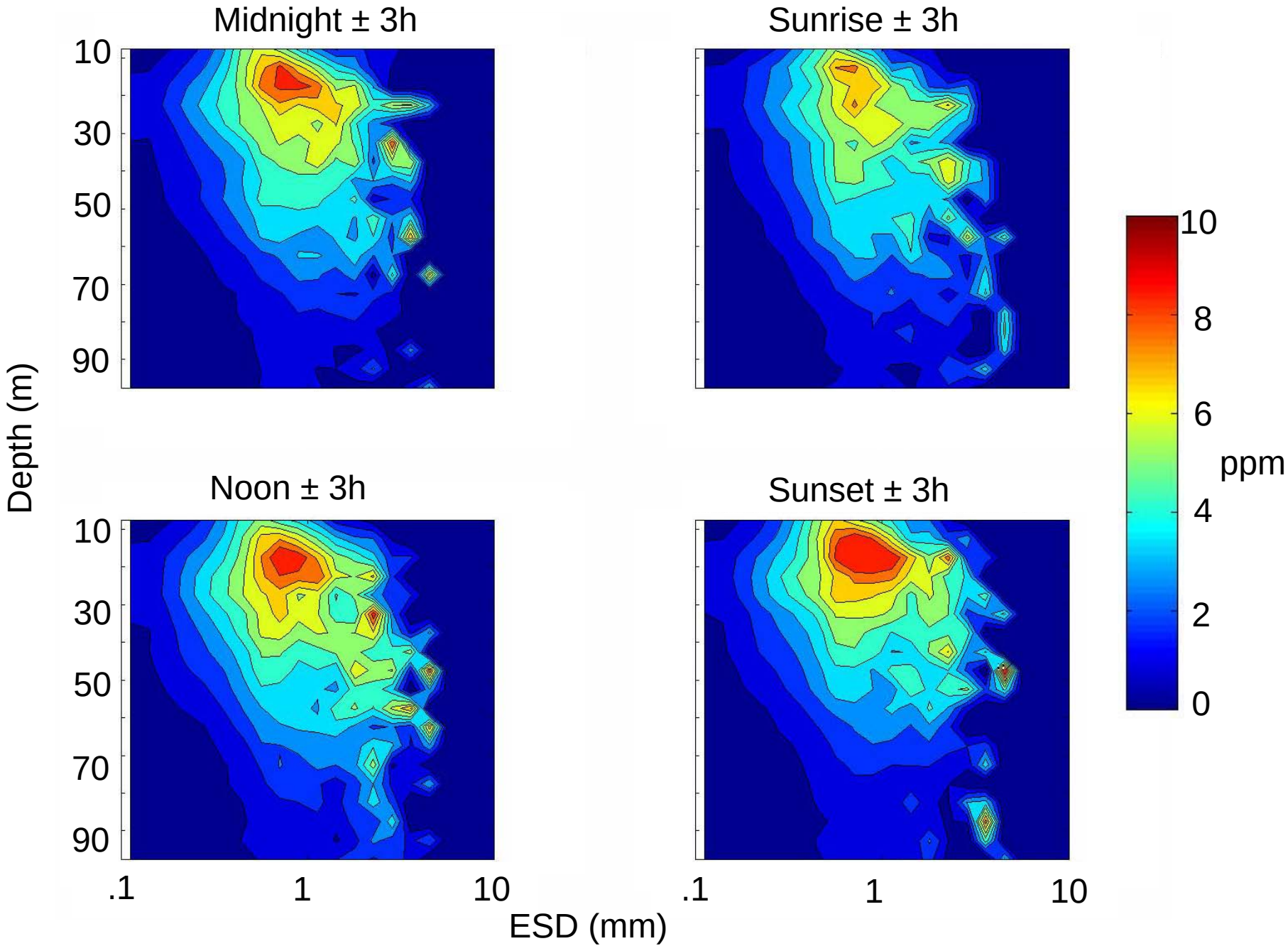
Particle Concentration (# m^{-3})



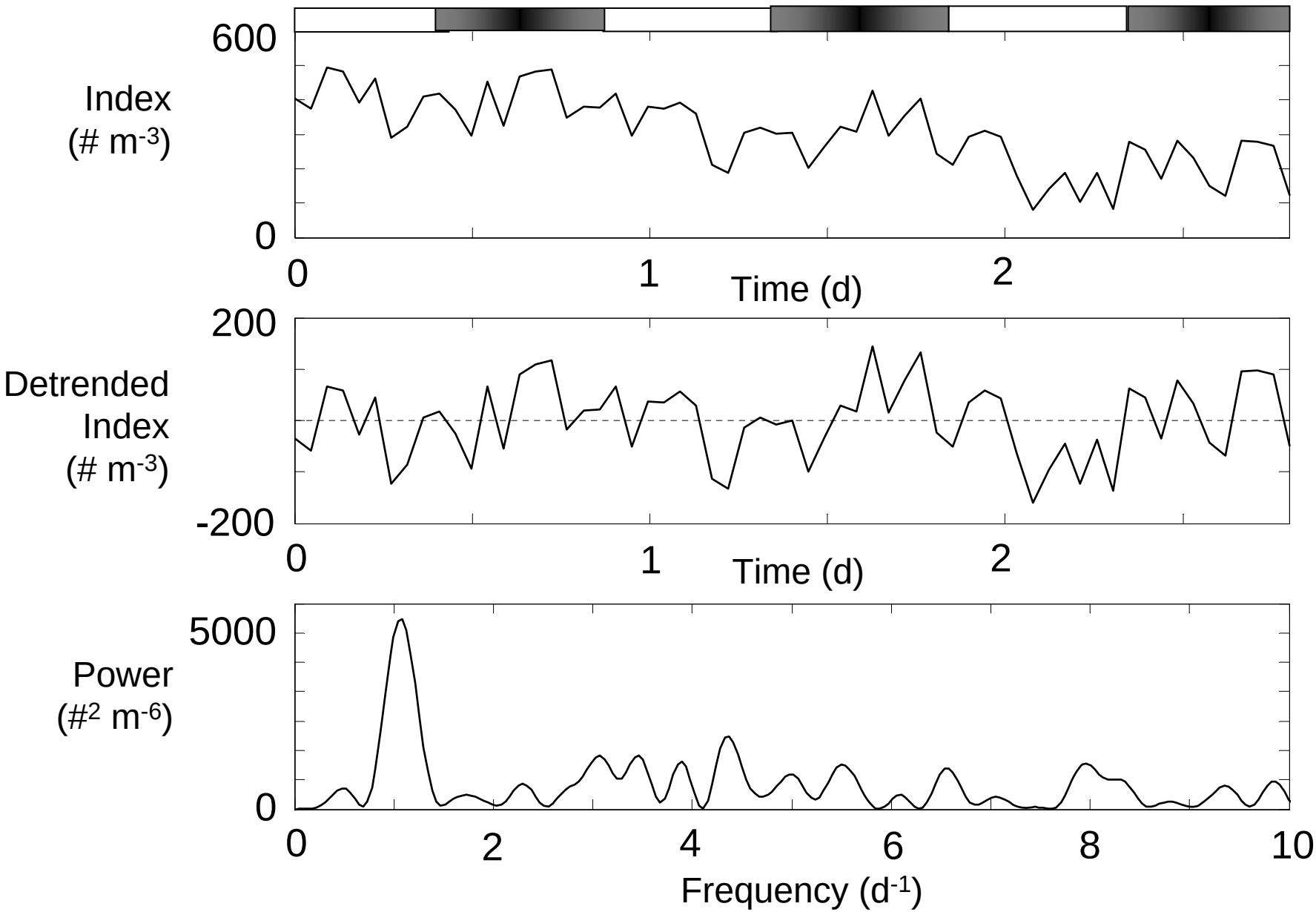
Particle Concentration (ppm)

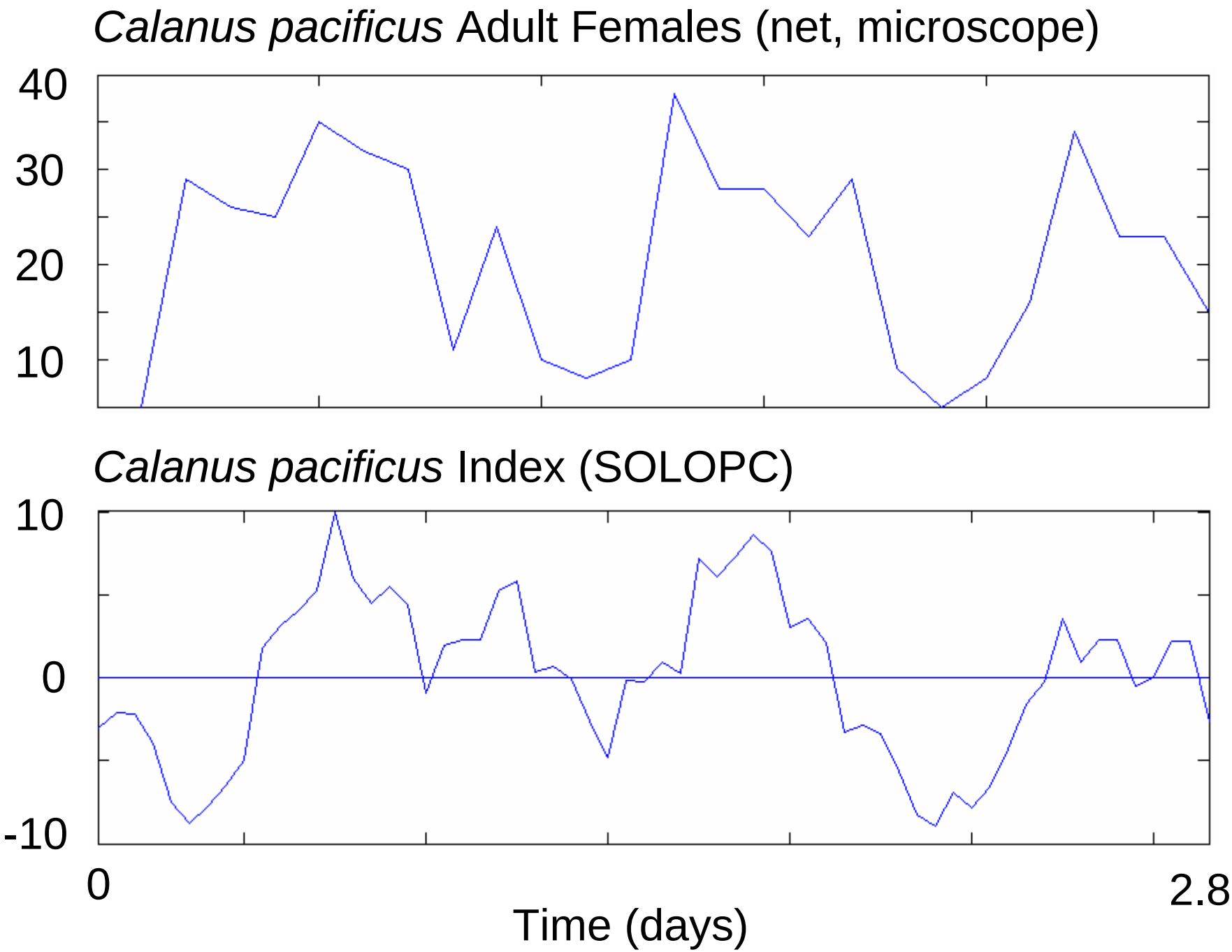


Normalized Volume Spectra

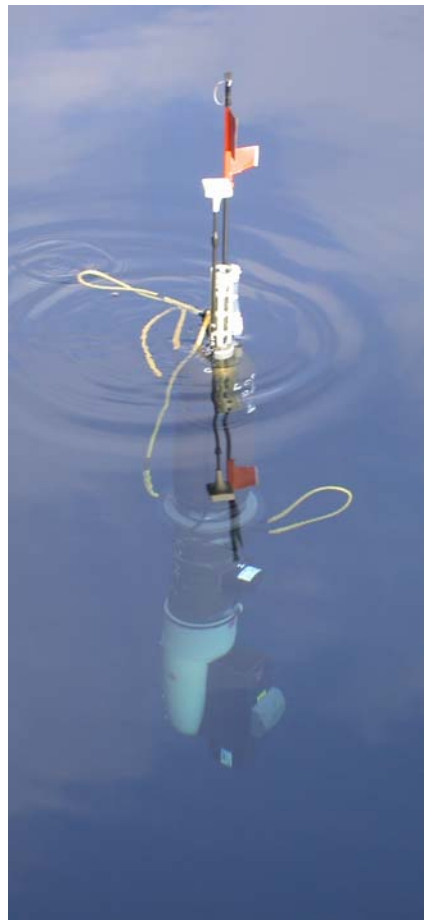


Index of *Calanus pacificus* Abundance

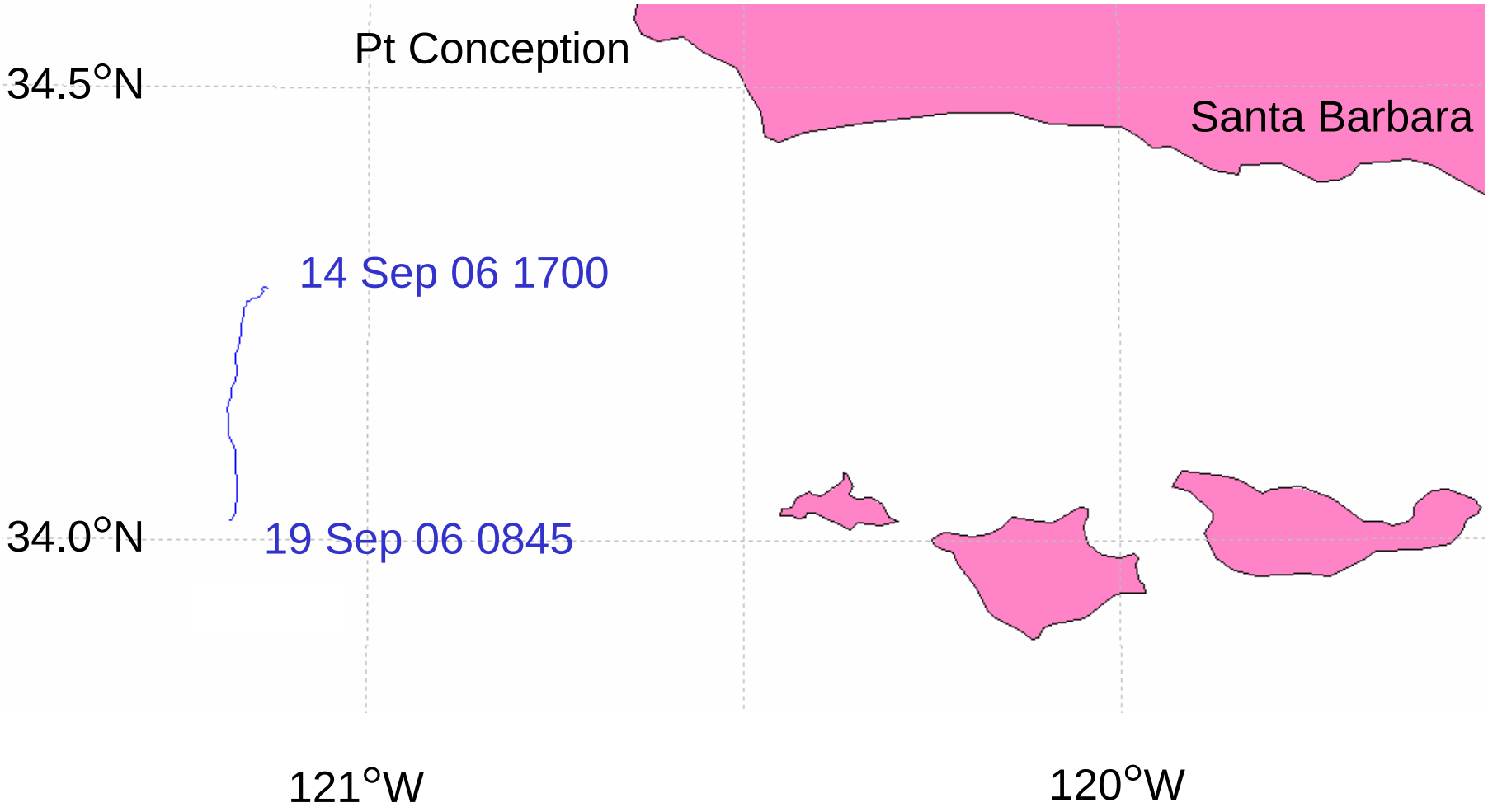



Calanus pacificus Adult Females (net, microscope)
40
30
20
10
Calanus pacificus Index (SOLOPC)
10
0
-10
0
2.8
Time (days)

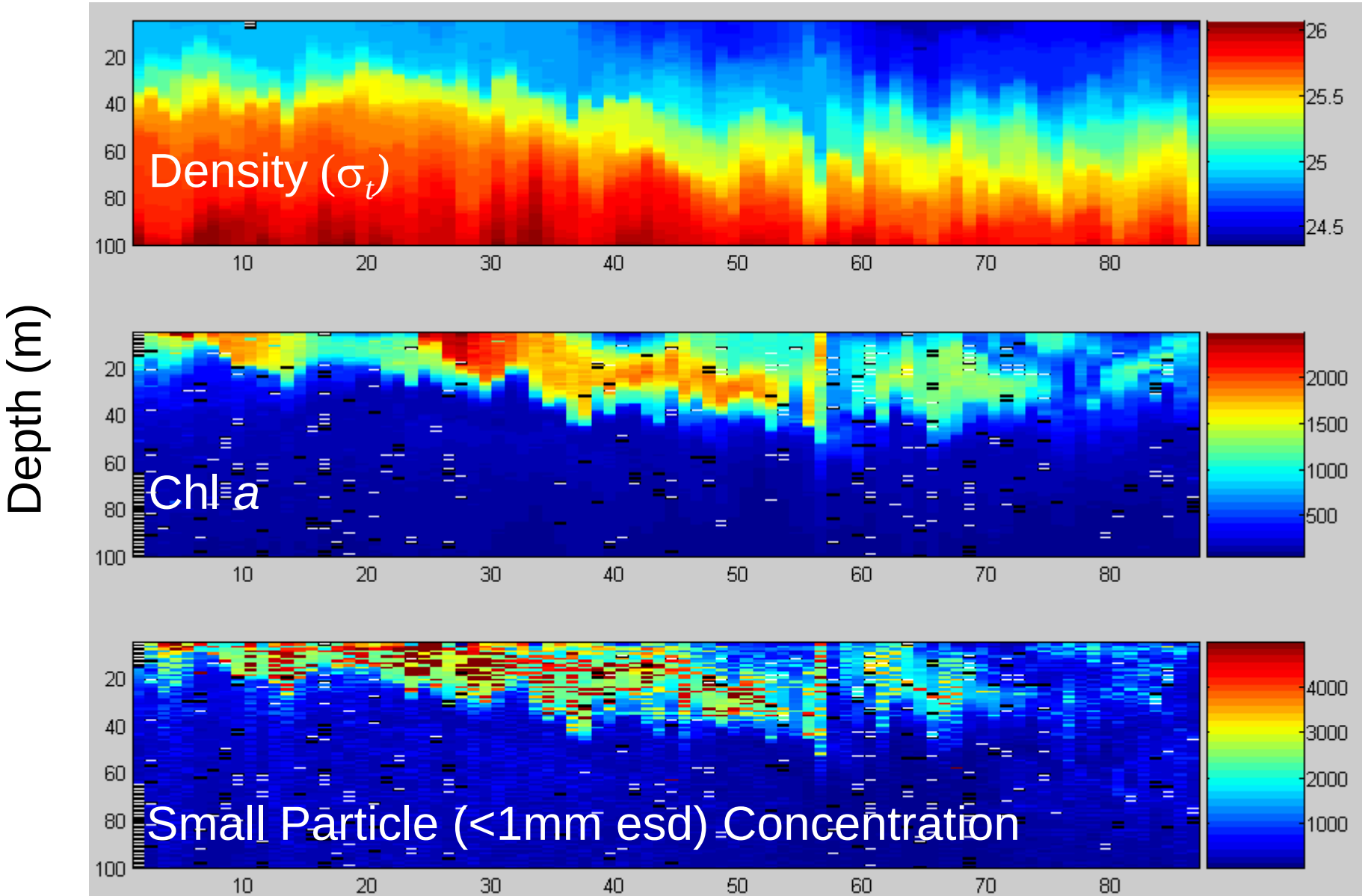
2006 SOLOPC



2006 SOLOPC


Pt Conception
34.5°N
Santa Barbara
14 Sep 06 1700
34.0°N
19 Sep 06 0845
121°W
120°W

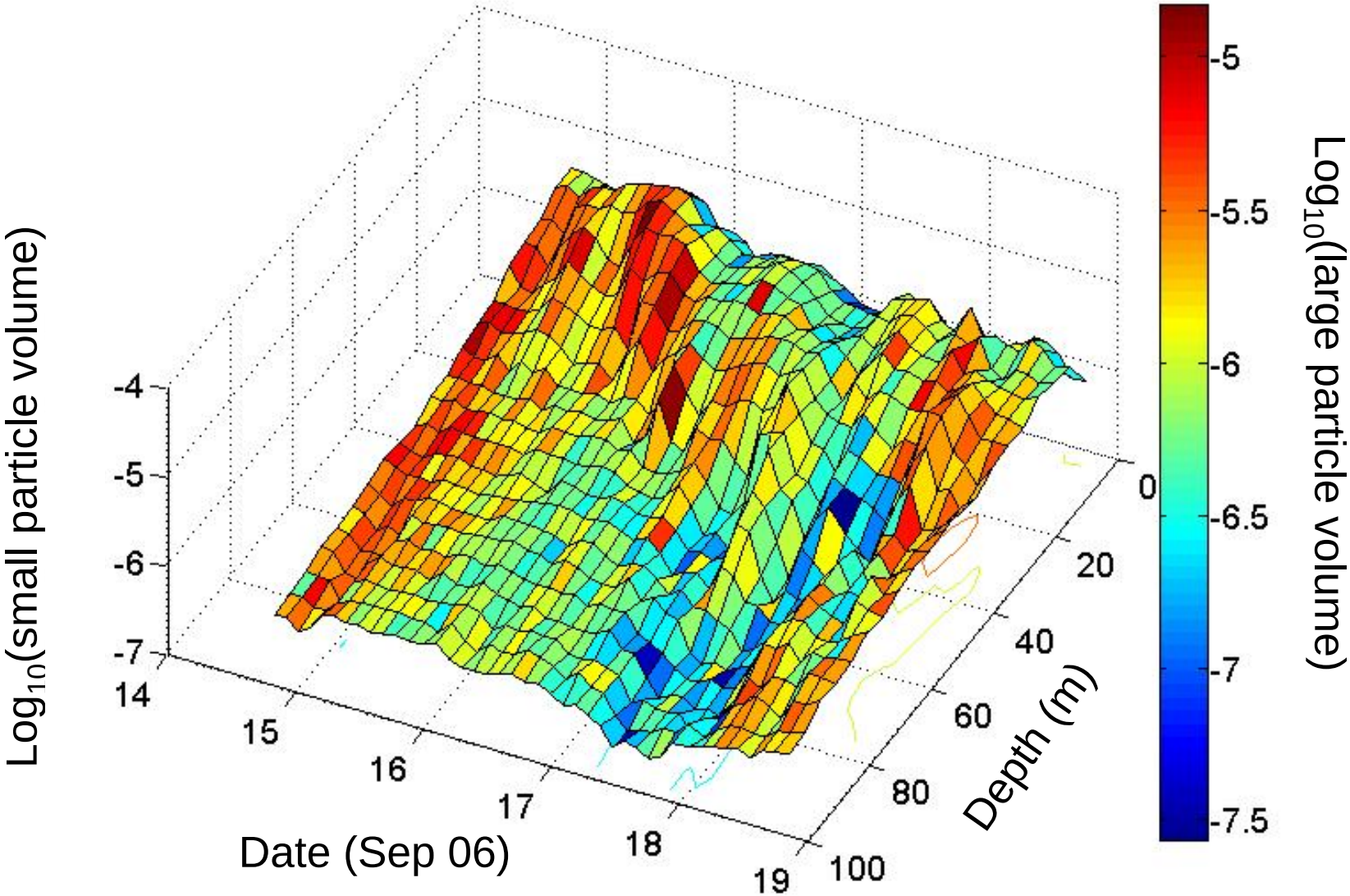
2006 SOLOPC

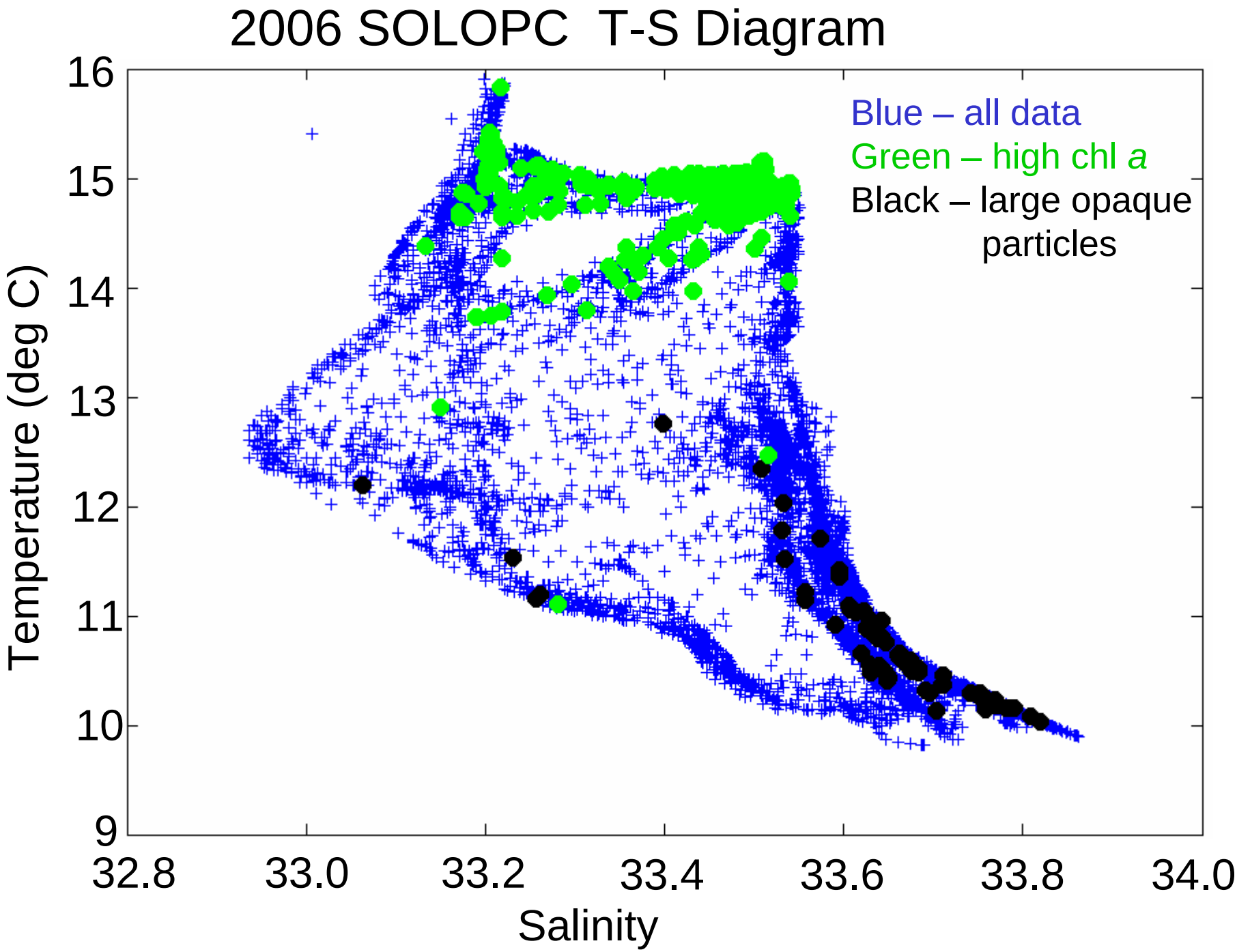


14 Sep 06 1700

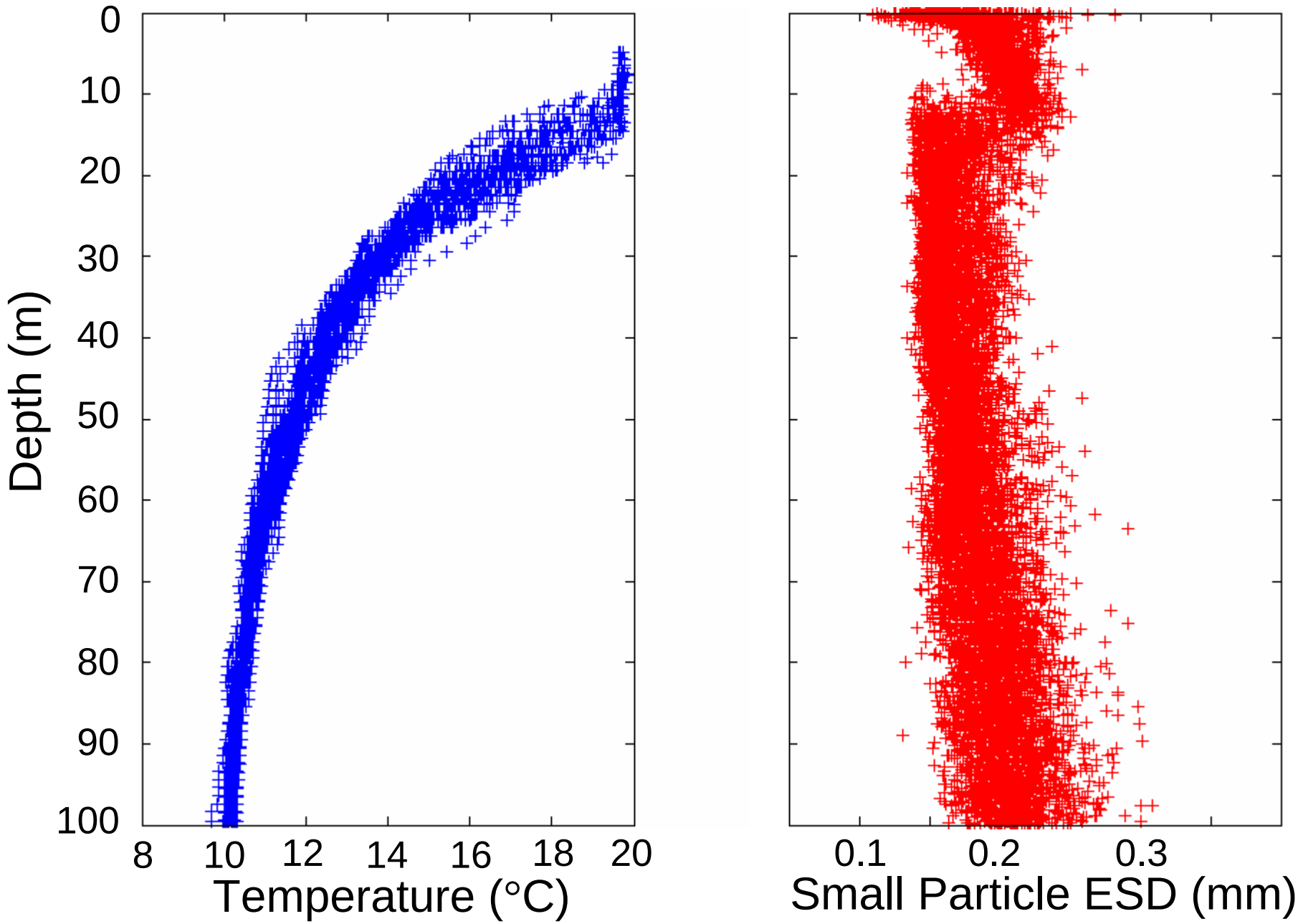
19 Sep 06 0845

2006 SOLOPC

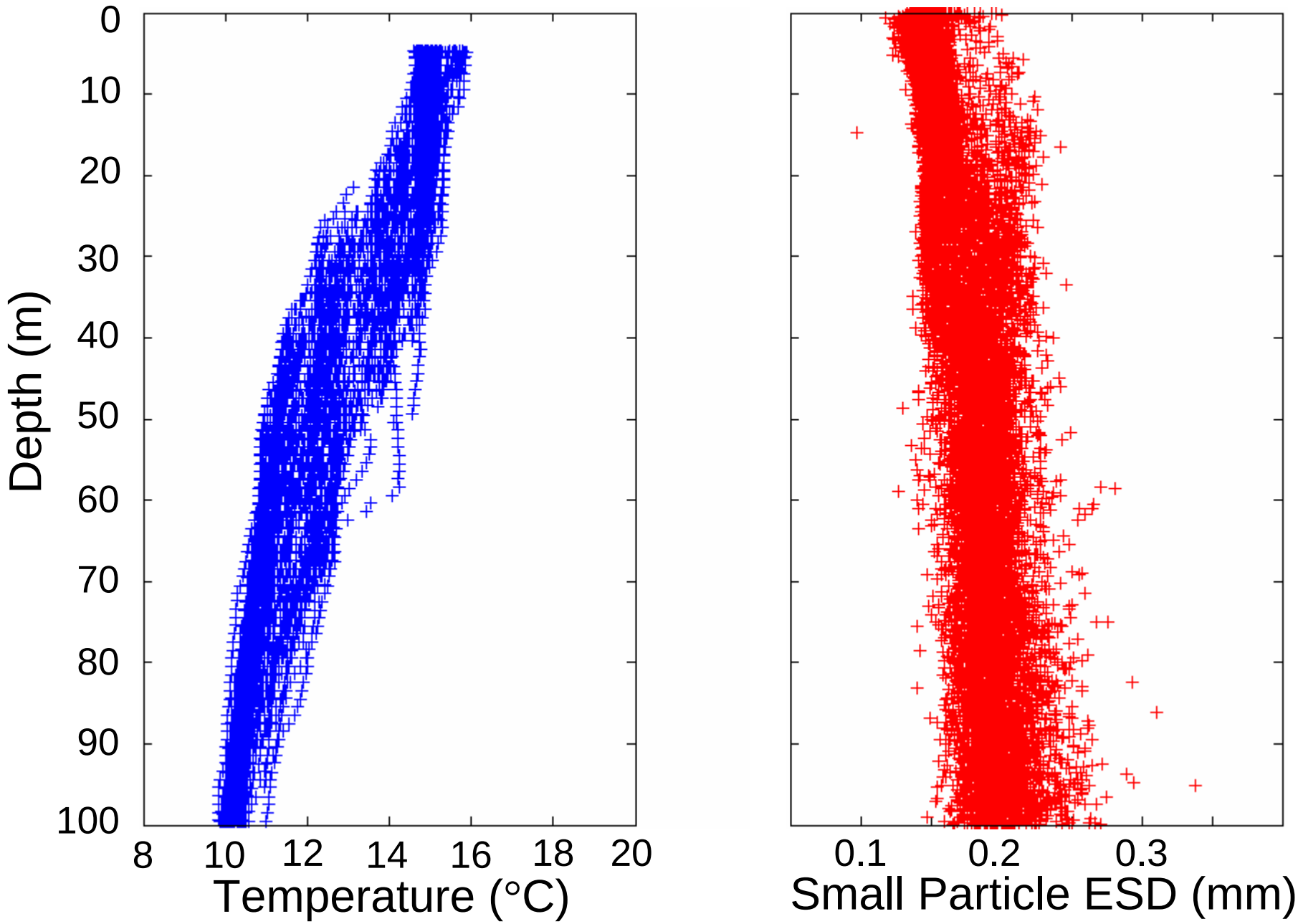

Log10(small particle volume)
-4
-5
-6
-7
14
15
16
17
18
19
Date (Sep 06)
0
20
40
60
80
100
Depth (m)
-5
-5.5
-6
-6.5
-7
-7.5
Log10(large particle volume)

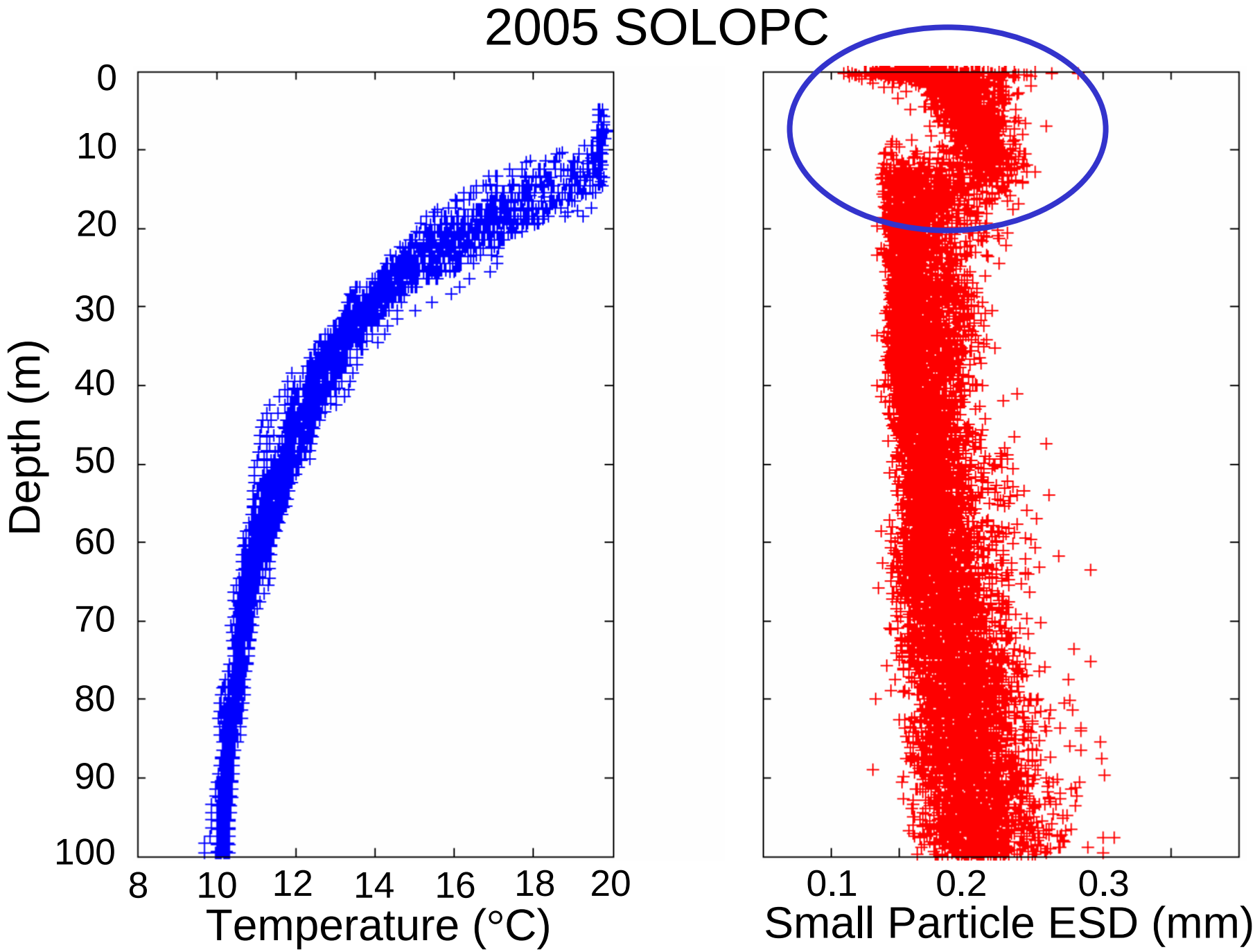

2006 SOLOPC T-S Diagram
Blue – all data
Green – high chl *a*
Black – large opaque particles
Temperature (deg C)
Salinity
16
15
14
13
12
11
10
9
32.8
33.0
33.2
33.4
33.6
33.8
34.0

2005 SOLOPC


Depth (m)
0
10
20
30
40
50
60
70
80
90
100
8
10
12
14
16
18
20
Temperature (°C)
0.1
0.2
0.3
Small Particle ESD (mm)

2006 SOLOPC


Depth (m)
0
10
20
30
40
50
60
70
80
90
100
8
10
12
14
16
18
20
Temperature (°C)
0.1
0.2
0.3
Small Particle ESD (mm)


2005 SOLOPC
Depth (m)
0
10
20
30
40
50
60
70
80
90
100
8
10
12
14
16
18
20
Temperature (°C)
0.1
0.2
0.3
Small Particle ESD (mm)

Summary of Results

SOLOPC performed well during deployments in 2005 and 2006

2005 diel variation

particles were most abundant (numbers & volume) ~ 15-20 m depth and decreased deeper; increased in size and decreased in transparency with depth; large particles were rare but contributed significant volume

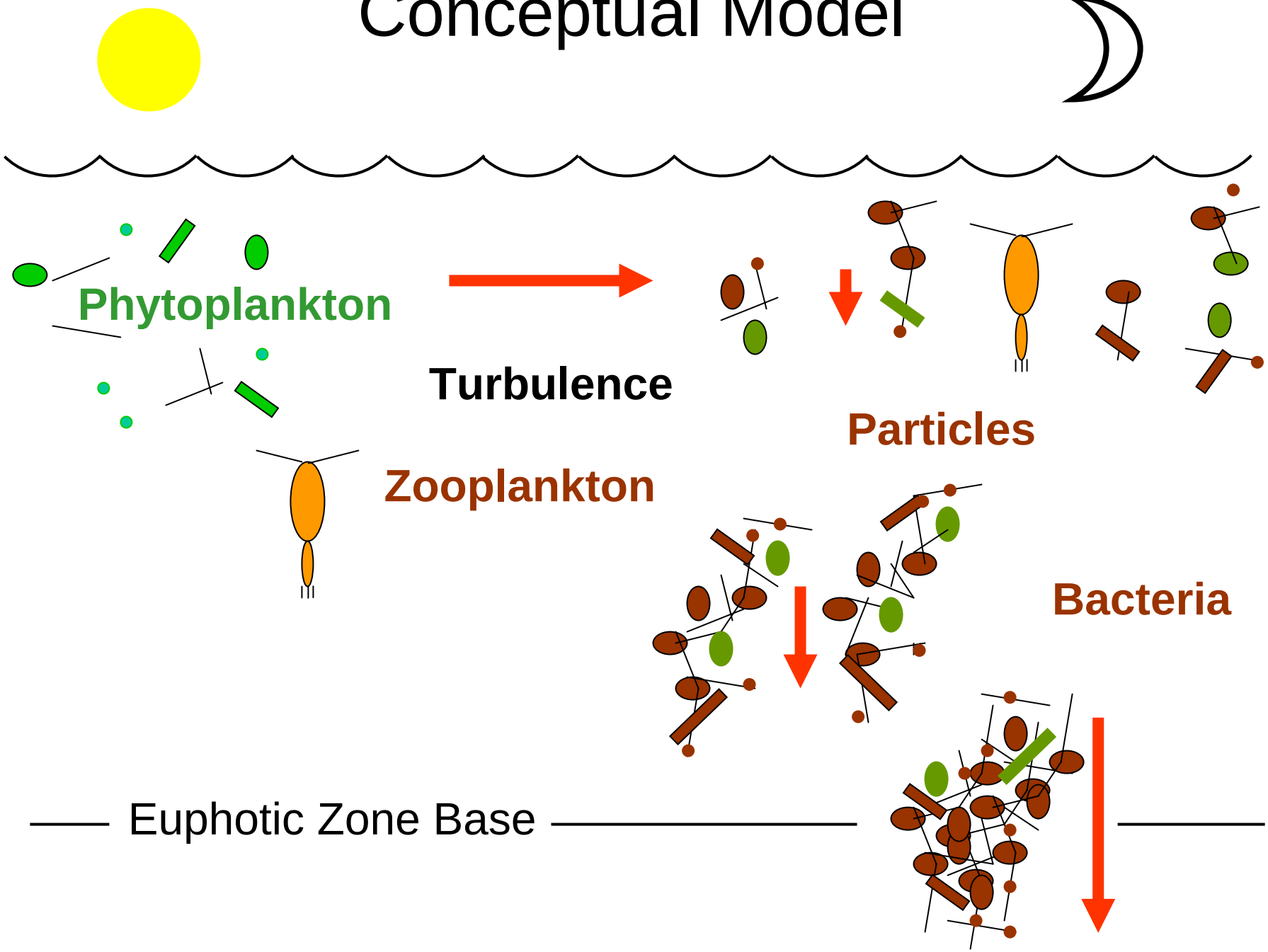
Calanus AF estimates compared favorably with microscopic analysis of net samples

2006 different than 2006 – temporal trend

small particles were most abundant near surface but increased in depth during the 5-d deployment

large, opaque particles were deeper

Conceptual Model



Future

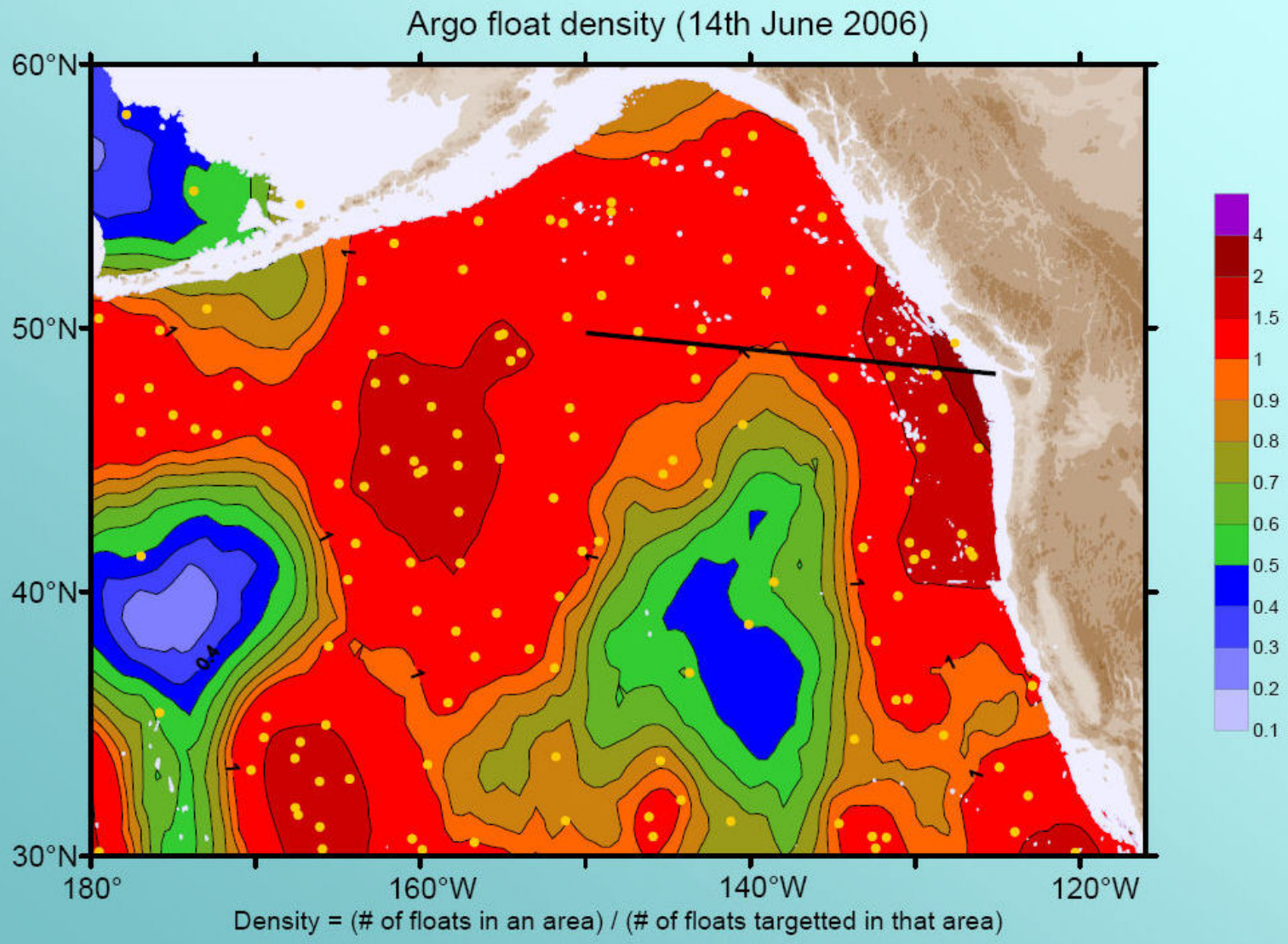
Short deployment and recovery in

- process studies (e.g. on station for hours to days)
- perturbation experiments (e.g. in and out of Fe-enriched patches or mesoscale features)

Long deployments in open ocean to observe seasonal and episodic variation

Modeling particle and plankton dynamics, export flux, and the biological pump

This is a recent picture of local coverage



(http://www.pices.int/publications/presentations/LineP/2_1_FreelandandCummins.pdf)

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