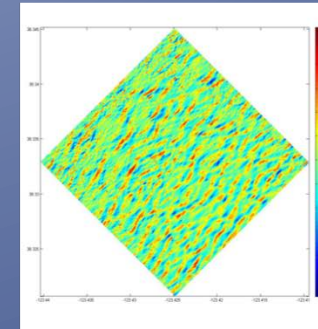
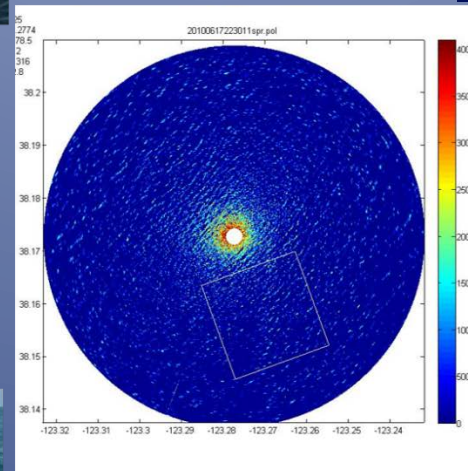
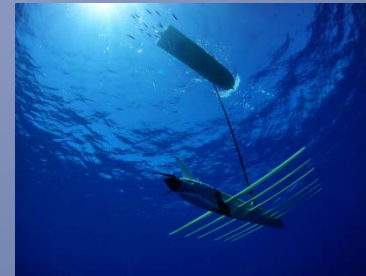




Emerging Technologies for Ocean Sampling

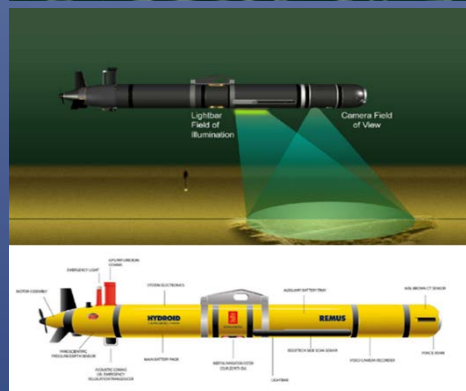
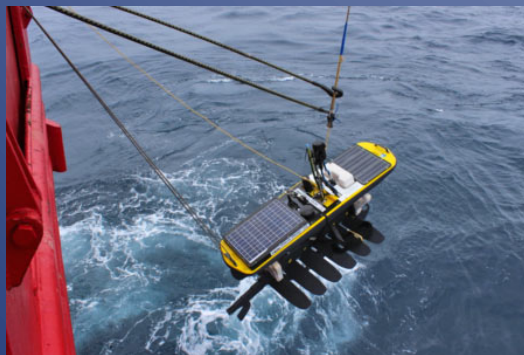
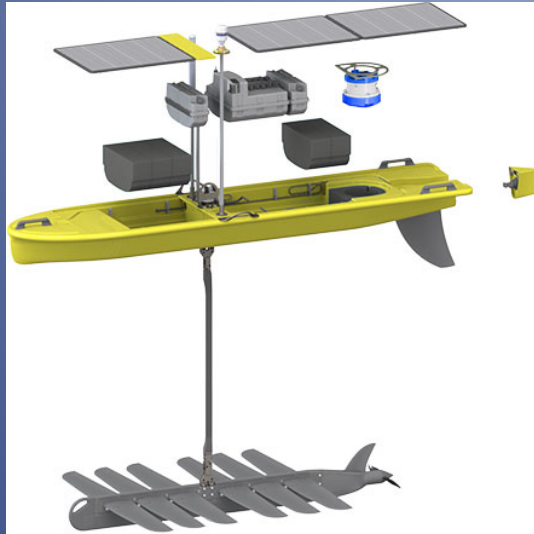


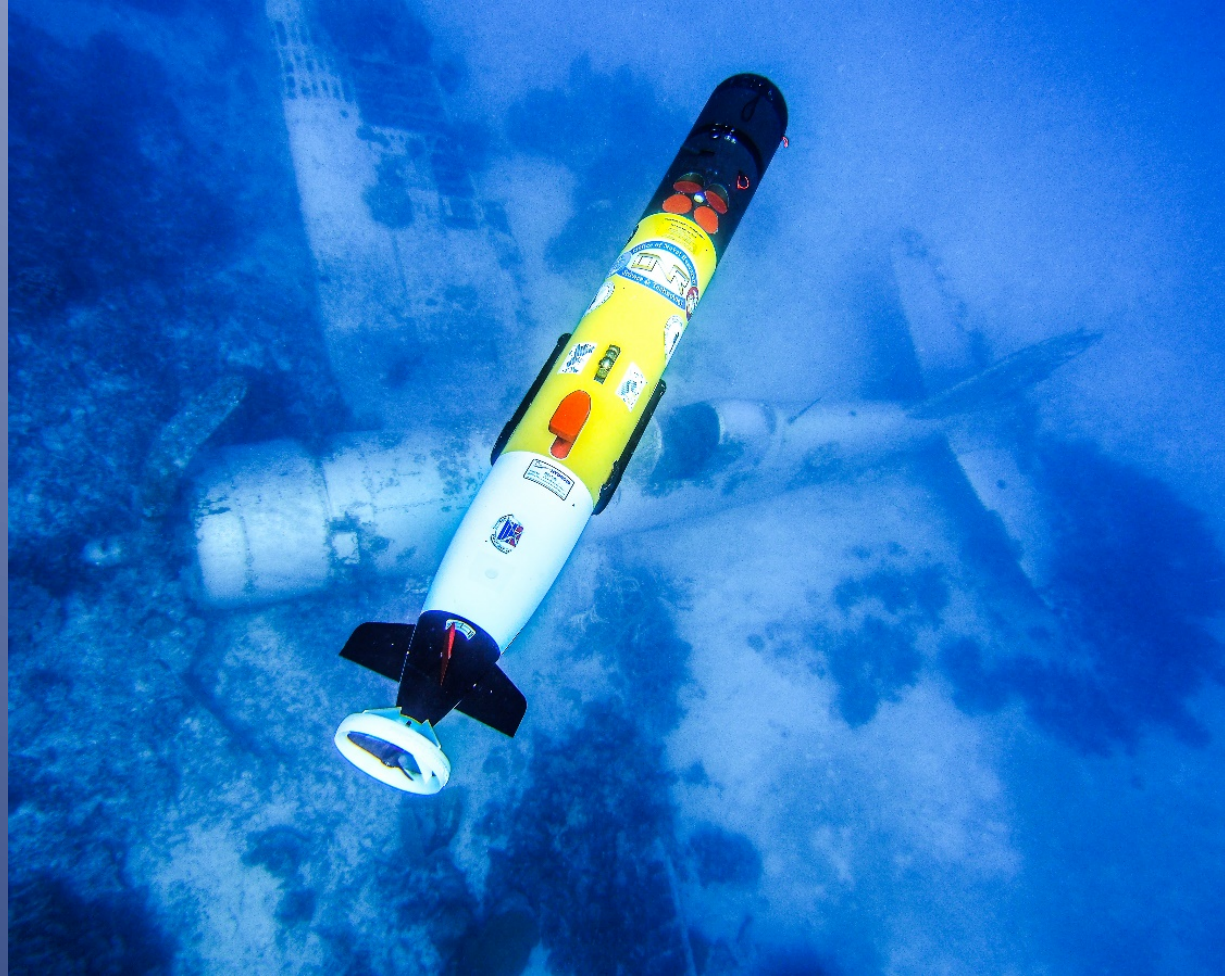
Peter Rogowski, Eric Terrill
Scripps Institution of Oceanography – UCSD

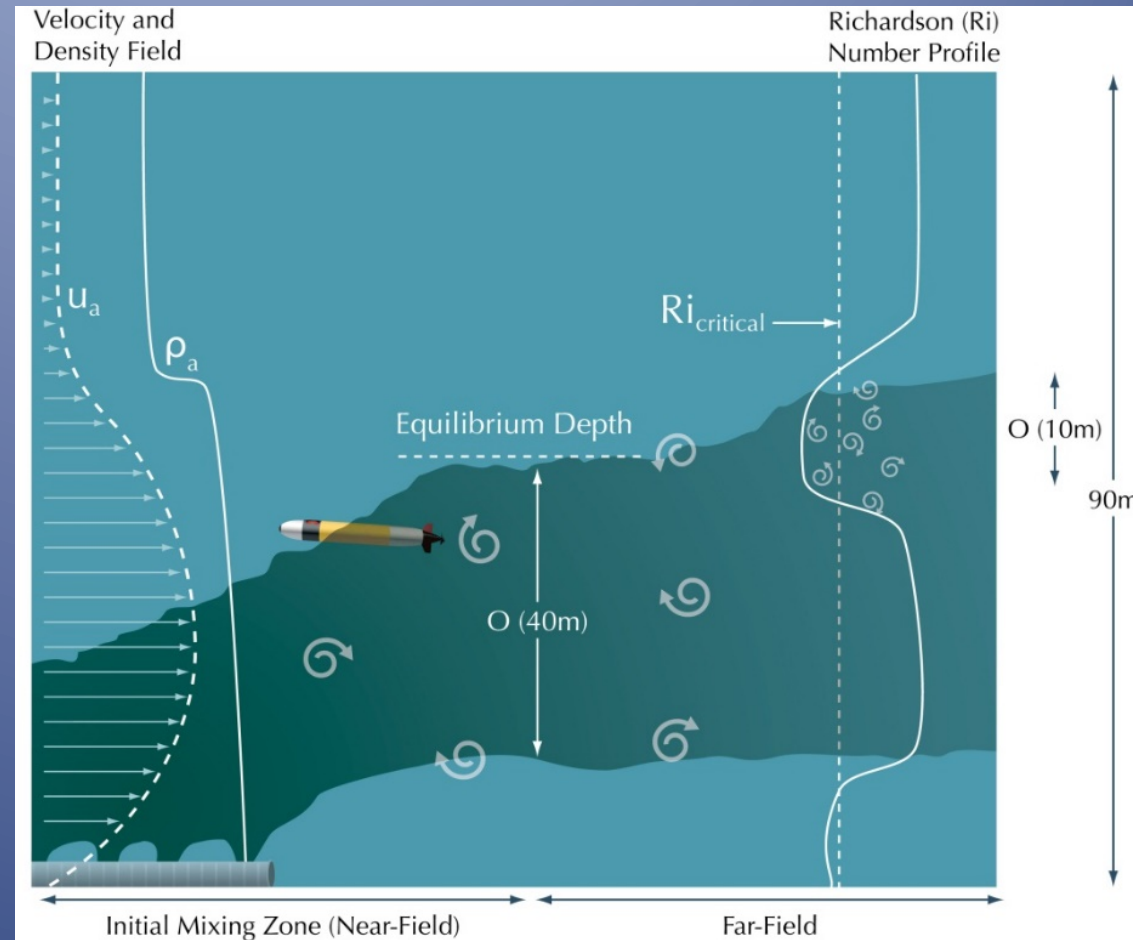


Autonomous Applications

- Leverage highly maneuverable and sensor rich unmanned vehicles for process studies and hypothesis testing
 - Unmanned Underwater Vehicles (eg. REMUS 100, 600)
 - Unmanned Aerial Systems (multirotors, both tethered and free-flying)
- Examples: air-sea interaction, optics, turbulence, other



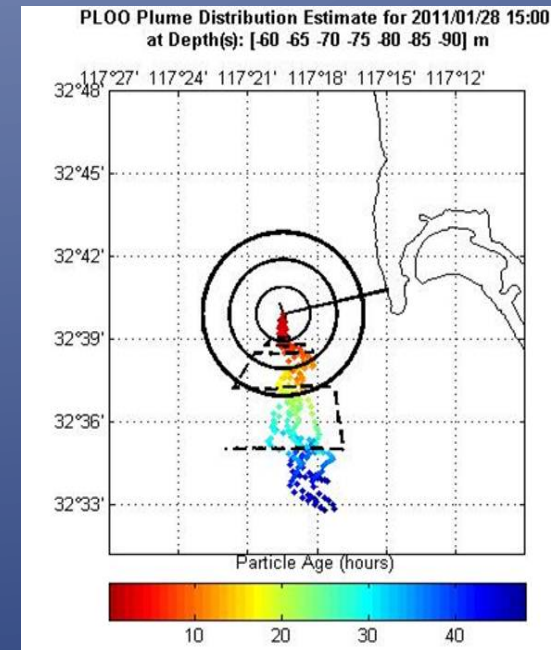
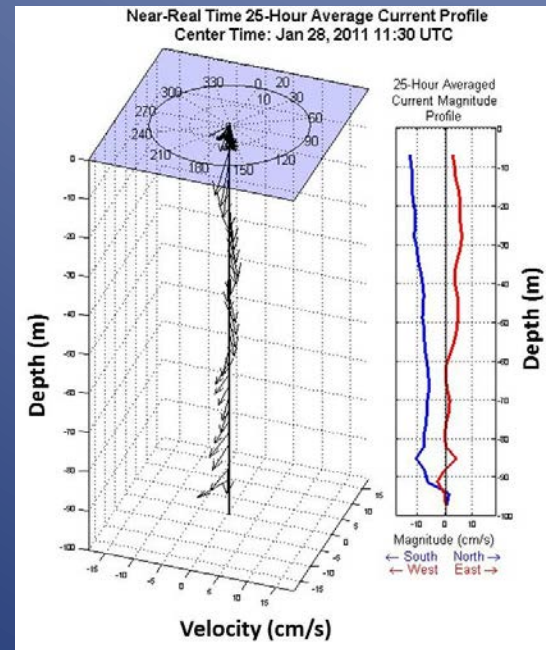
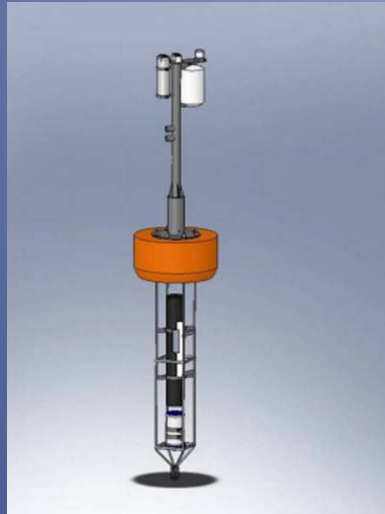






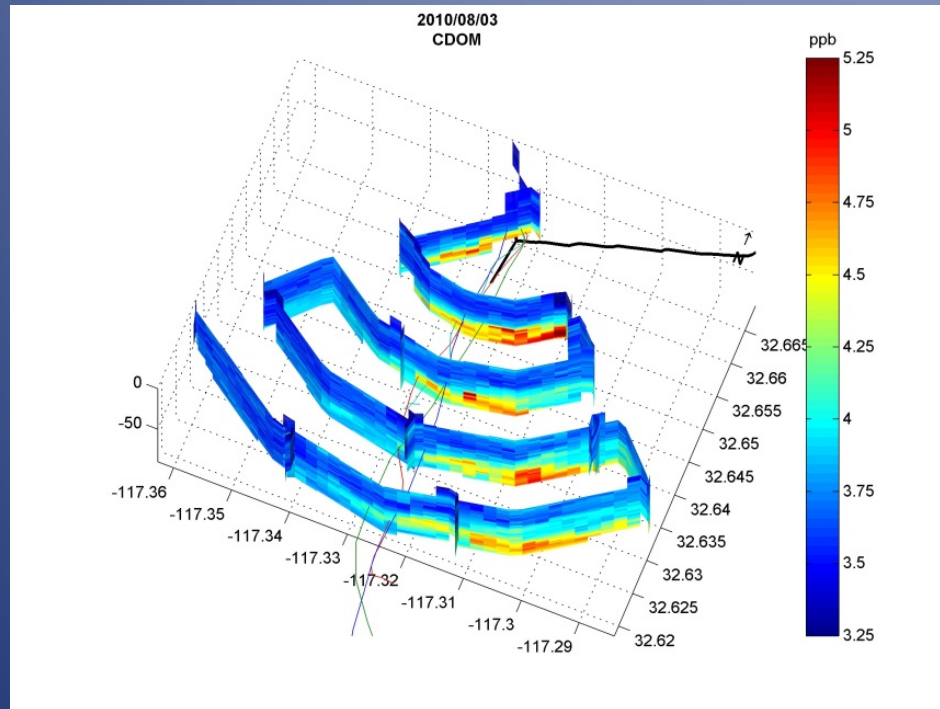
Instrumentation:

- ADCP (RDI)
- Temperature Chain
(Precision Measurement Engineering)
- Self Contained Temperature & Salinity Sensor (Seabird)
- Data Logger (Scripps)
- Iridium Satellite Telemetry Unit
- GPS Receiver

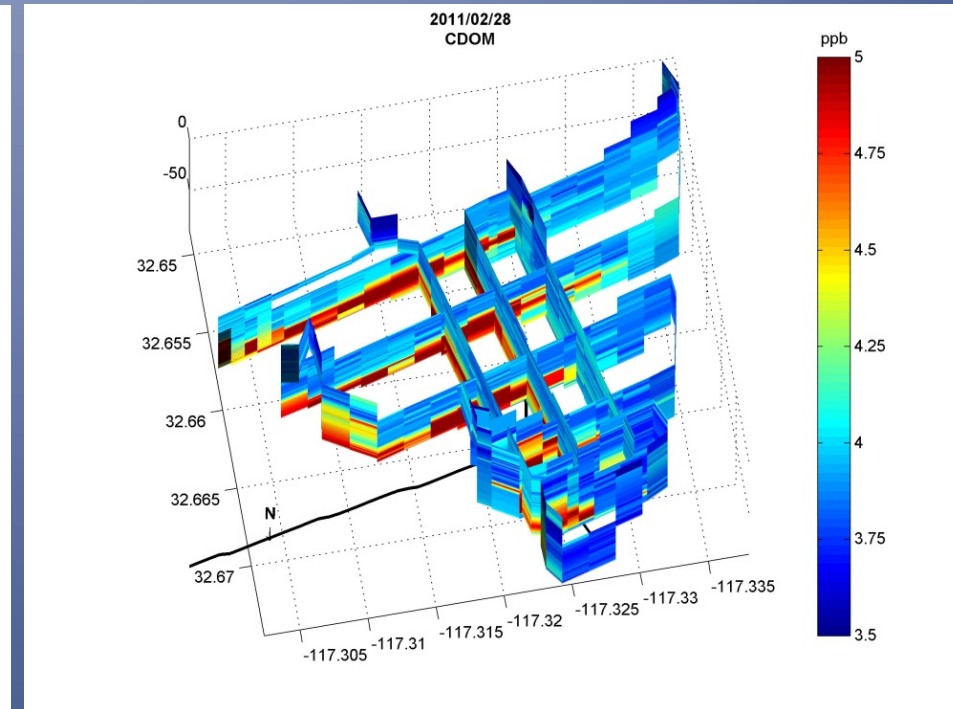




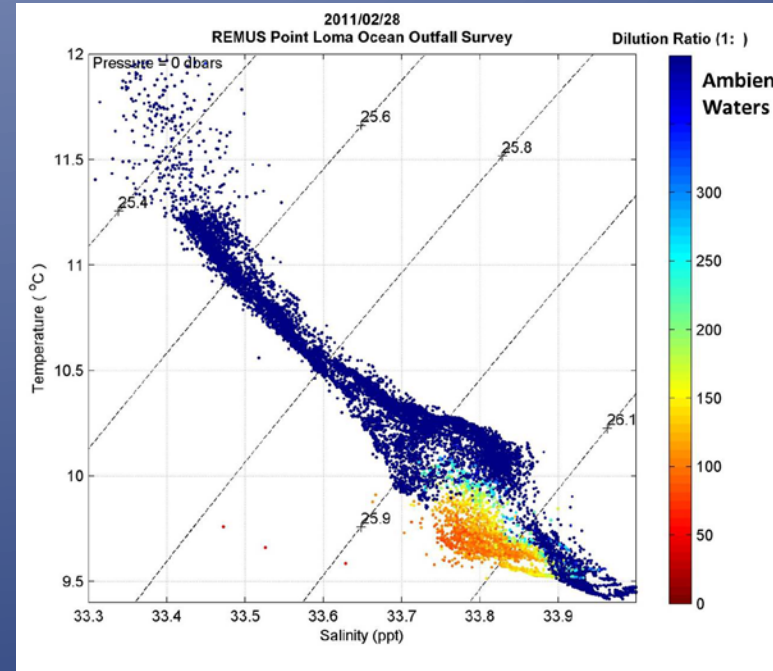
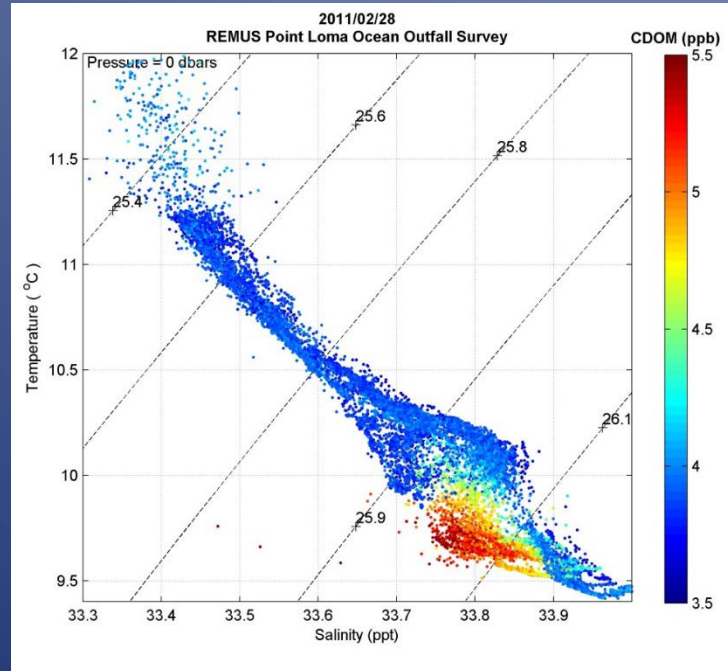
August, 3, 2010

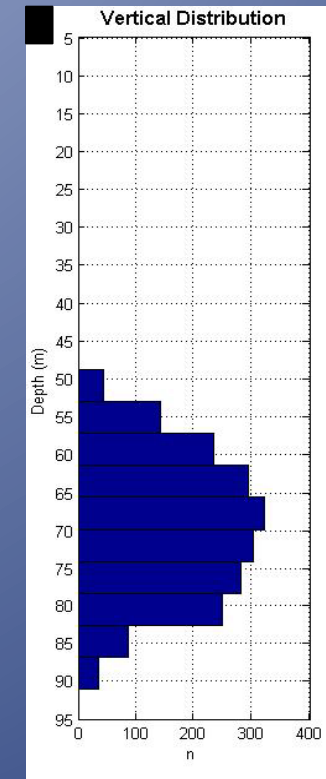
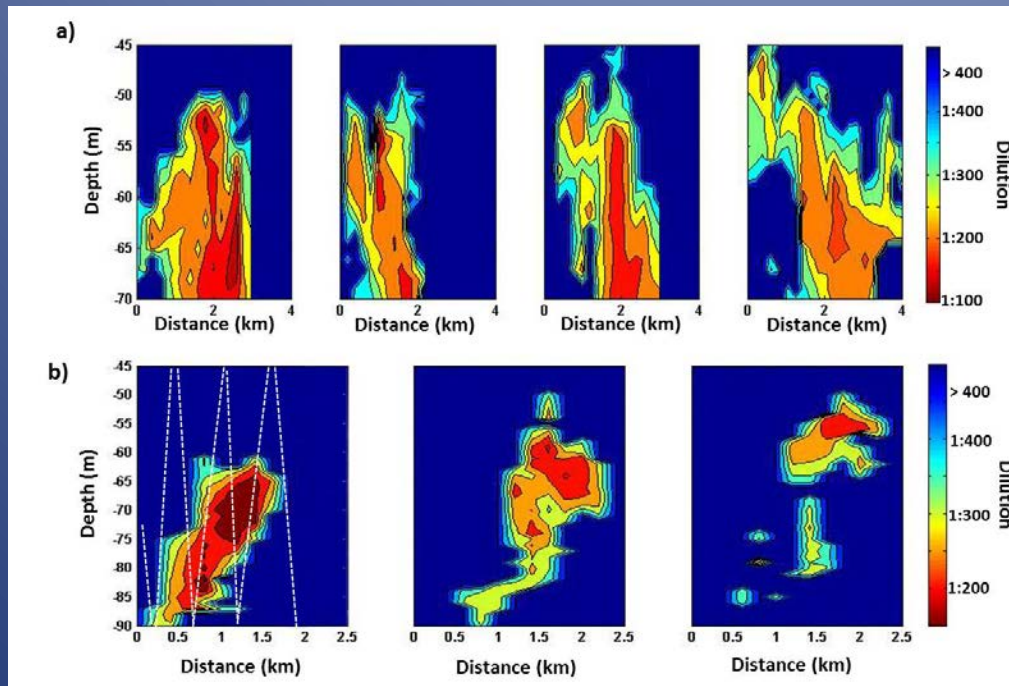
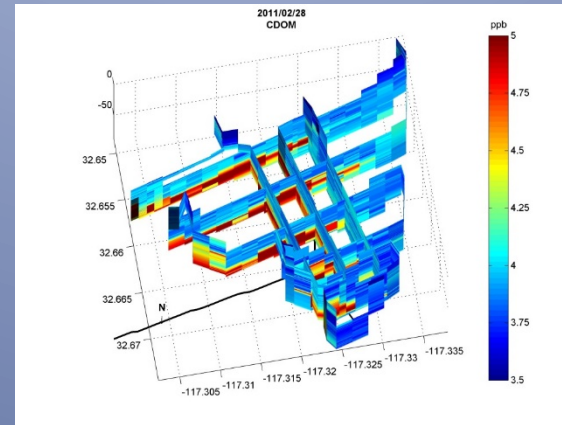
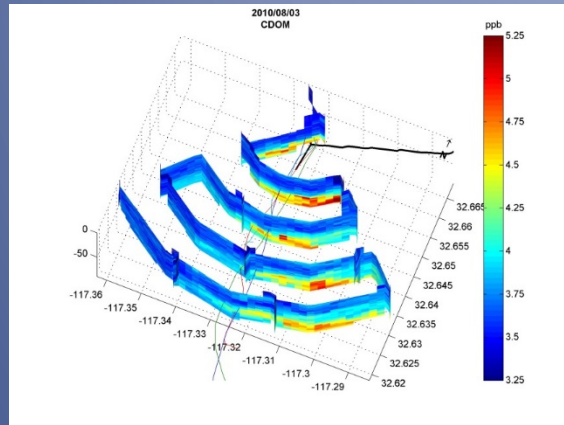


February, 28, 2010



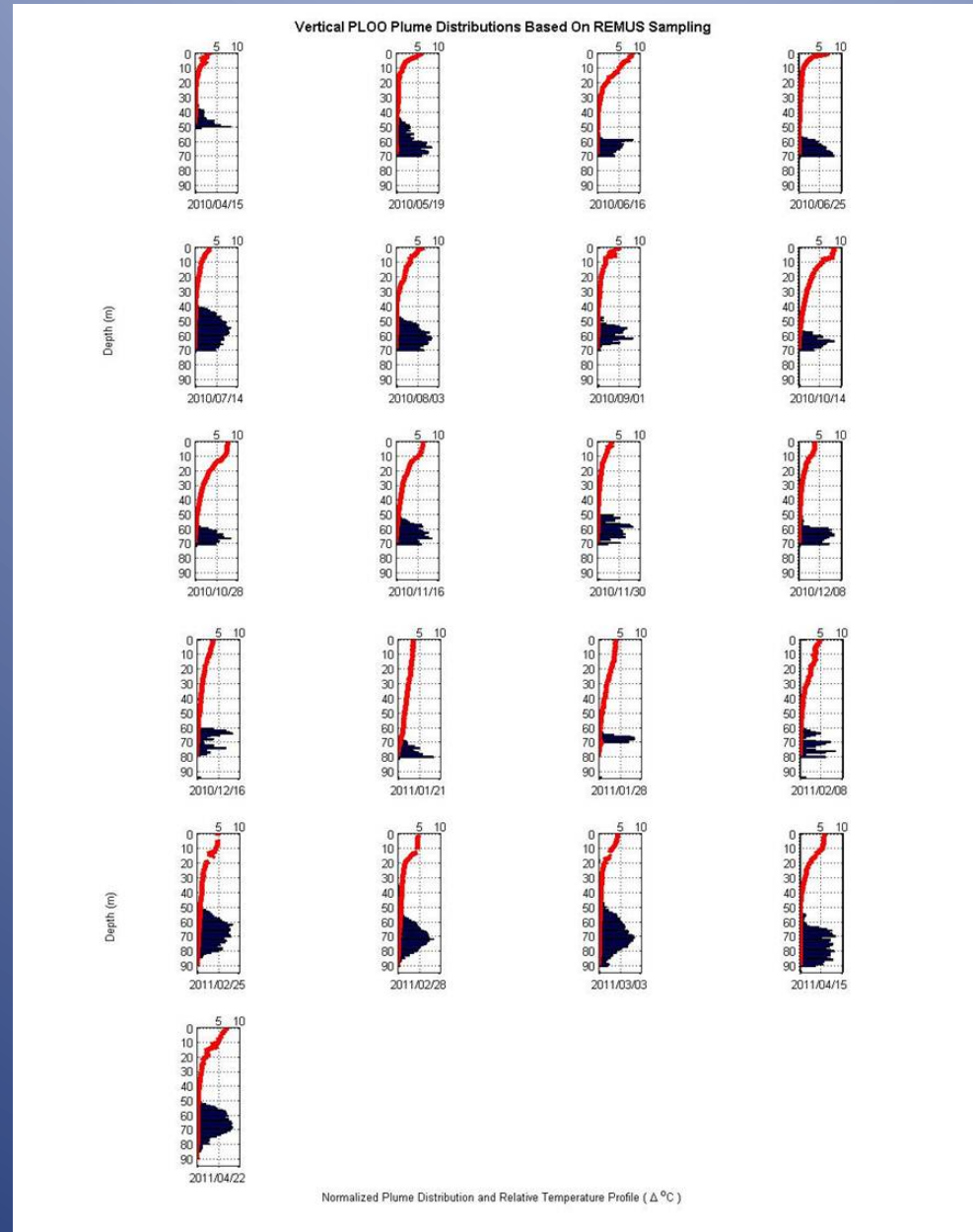
* CDOM is used as a natural tracer





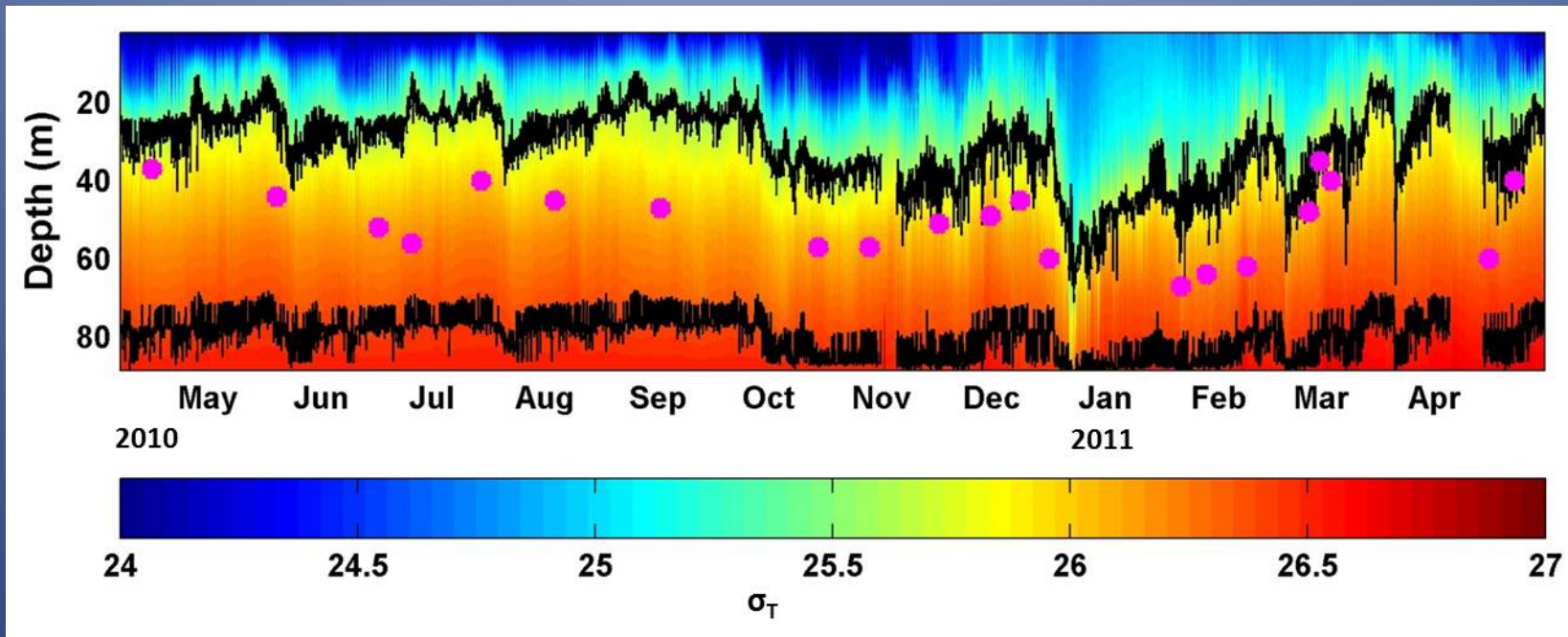
CDOM > 4.1

- Additional plume rise and mixing seen in 2/28/2011 survey was due to internal waves propagating through the study area.





Observed Plume Height vs Modeled Plume Height (NRfield Plume Model)





Final Report

Point Loma Ocean Outfall Plume Behavior Study

Prepared For

City of San Diego Public Utilities Department

NOAA Award No. NA08NOS4730441
(UCSD Contract H094679)

Prepared By

Scripps Institution of Oceanography
University of California, San Diego
9500 Gilman Drive
La Jolla, CA 92093-0213

Principal Contact Peter Rogowski, Postdoctoral Researcher
Principal Investigators P. Edward Parnell, Associate Researcher
 Paul Dayton, Professor
 Eric Terrill, CORDC Director

September 14, 2012

Recommendations:

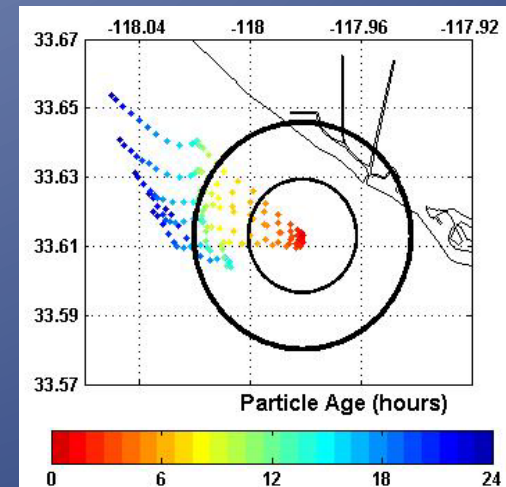
- **Dedicated mooring near outfall for monitoring of stratification and subsurface currents of receiving waters.**
- **Optimize sampling locations for quarterly water quality sampling based on subsurface current data.**
- **Routine (i.e. monthly) AUV sampling of effluent plume to measure plume location and dilution.**

OCSD Diversion Summary (September 2012)





9/28/2012 (5 – 10 m)



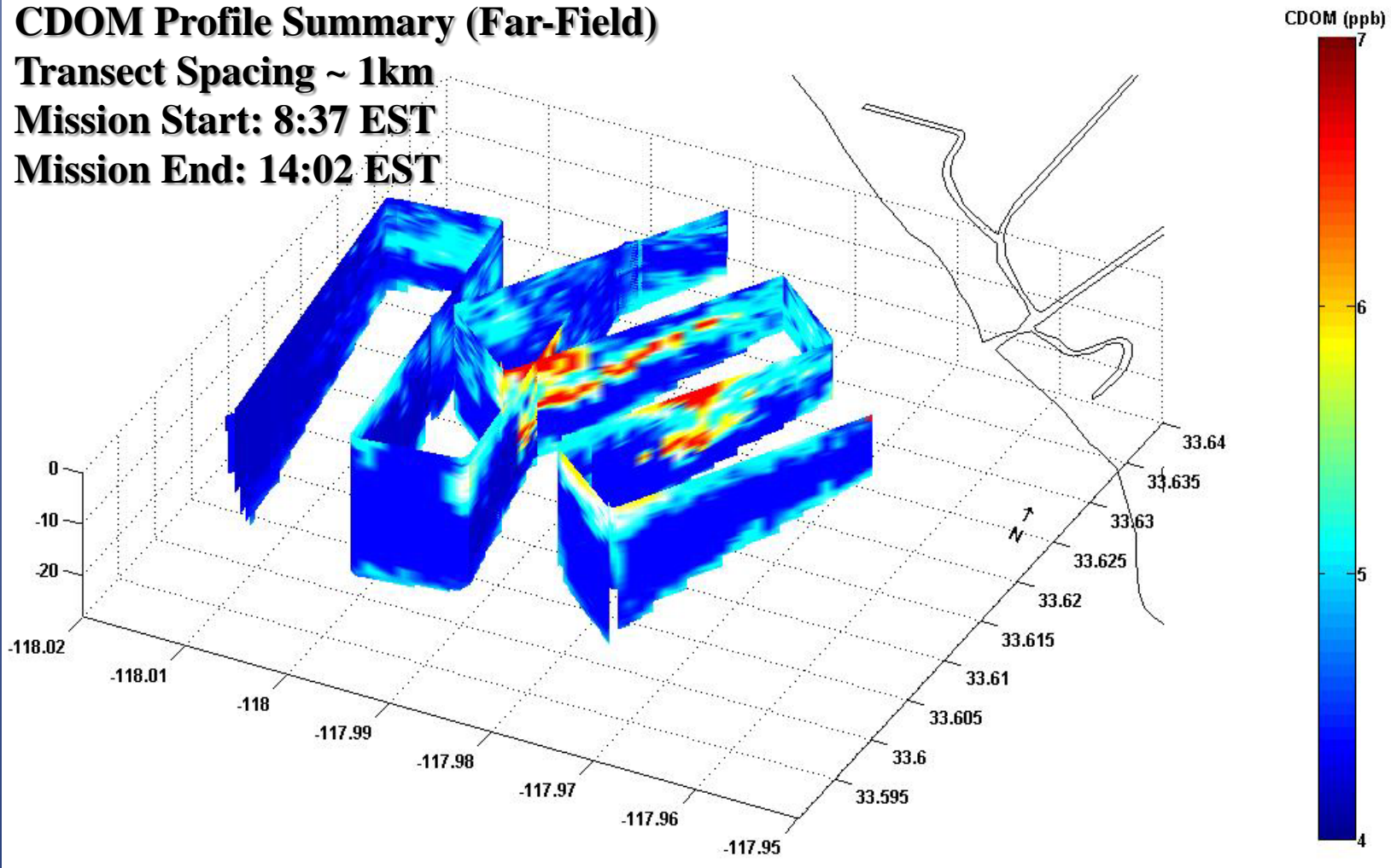


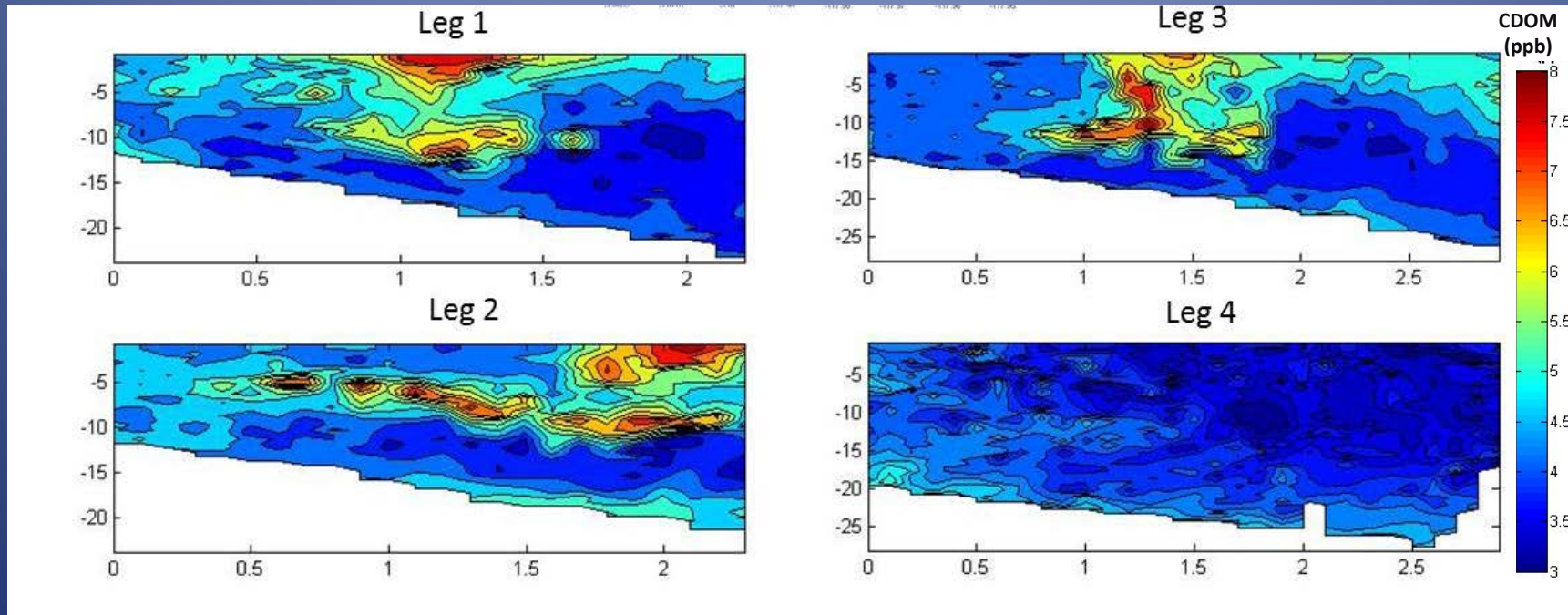
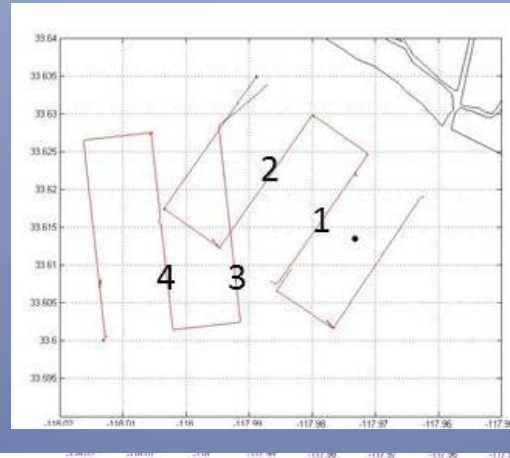
CDOM Profile Summary (Far-Field)

Transect Spacing ~ 1km

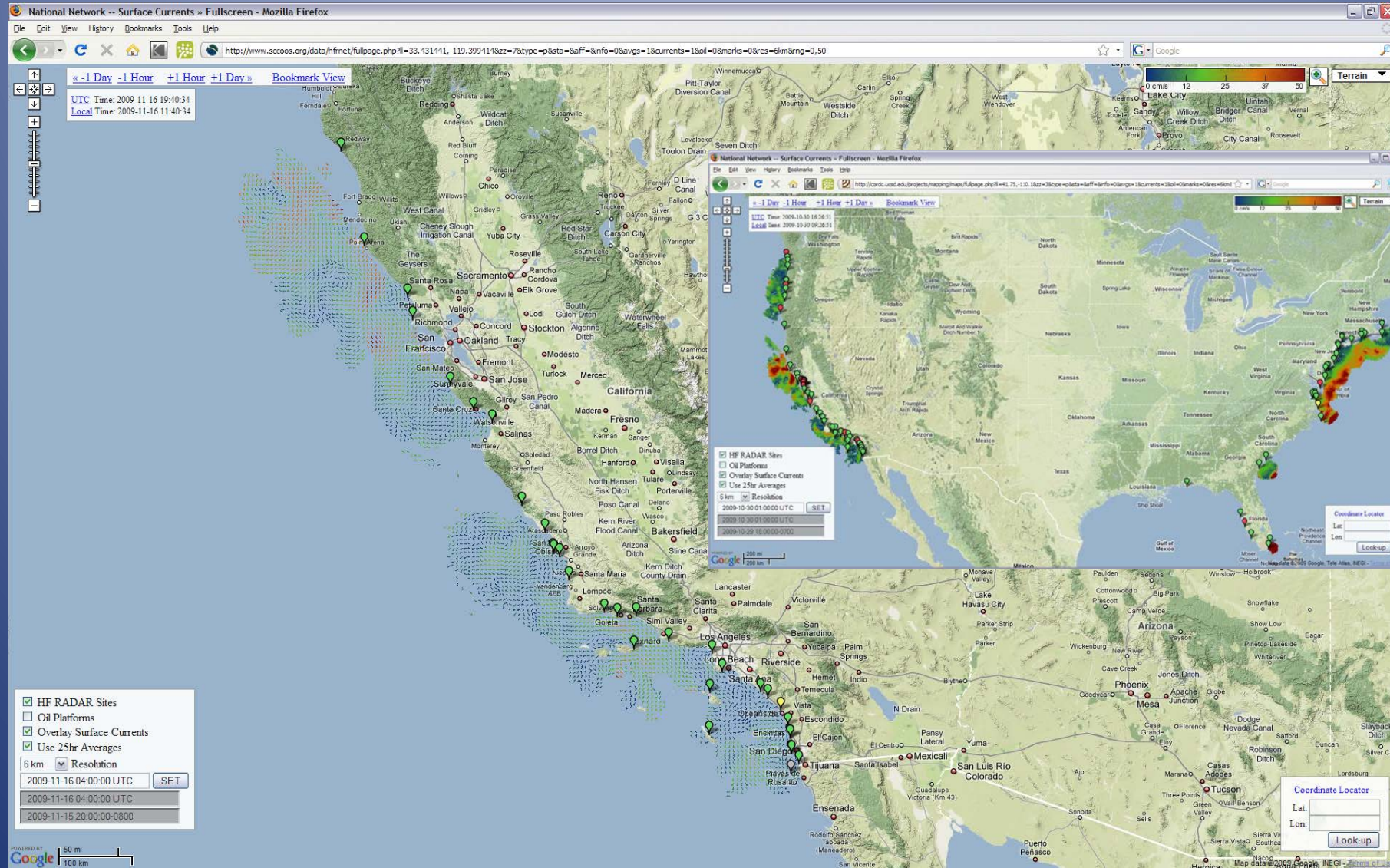
Mission Start: 8:37 EST

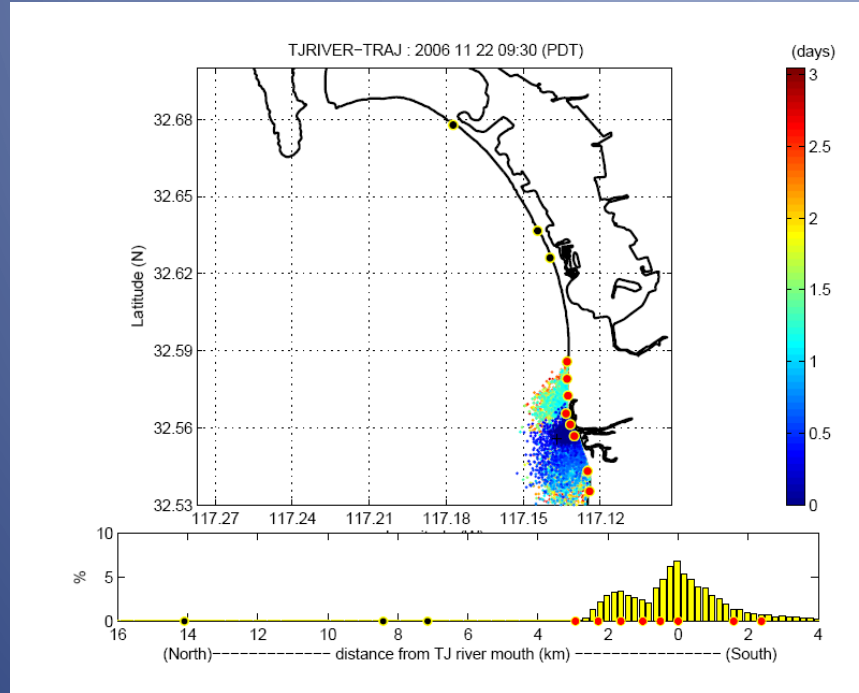
Mission End: 14:02 EST





Surface Current Mapping through HF Radar





Stormwater Plume Tracking

UTC Time: 2010-04-28 21:19:39
Local Time: 2010-04-28 14:19:39

Tijuana River Flow Rate

| Latest Observations | 24hr Maximum | 24hr Minimum |
|-------------------------|-------------------------|-------------------------|
| 28.99 MGD | 41.31 MGD | 28.99 MGD |
| 1.27 cm/s | 1.81 cm/s | 1.27 cm/s |
| 2010-04-28 13:15:00 UTC | 2010-04-27 20:15:00 UTC | 2010-04-27 15:30:00 UTC |

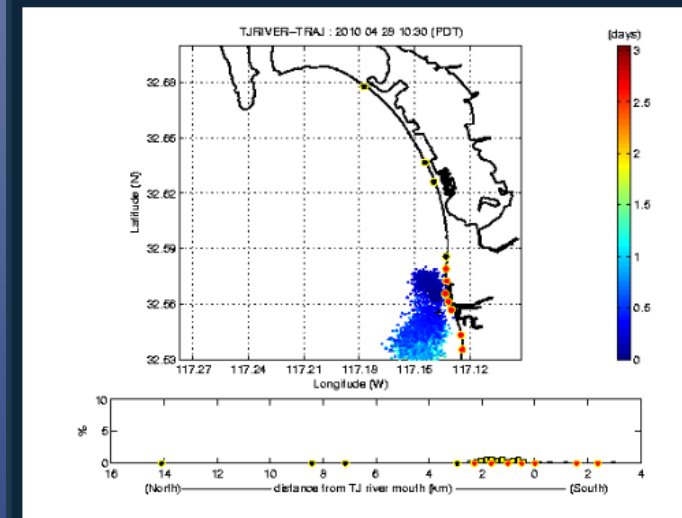
MGD = Millions of gallons per day. cm/s = Cubic meters per second.
Values in red indicate the data is greater than 24 hours old. Otherwise values are displayed in black.

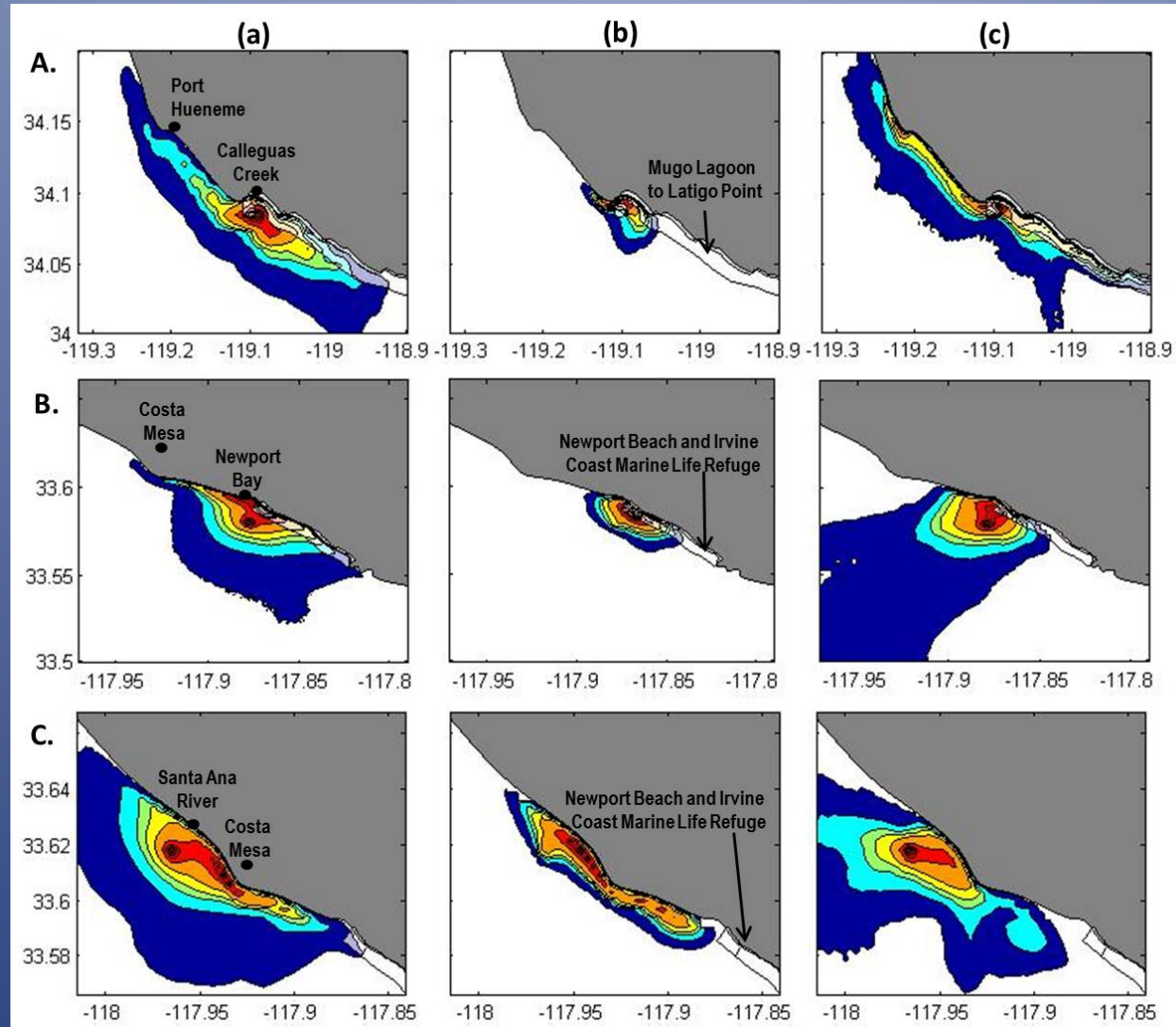
Tijuana River Plume Tracking

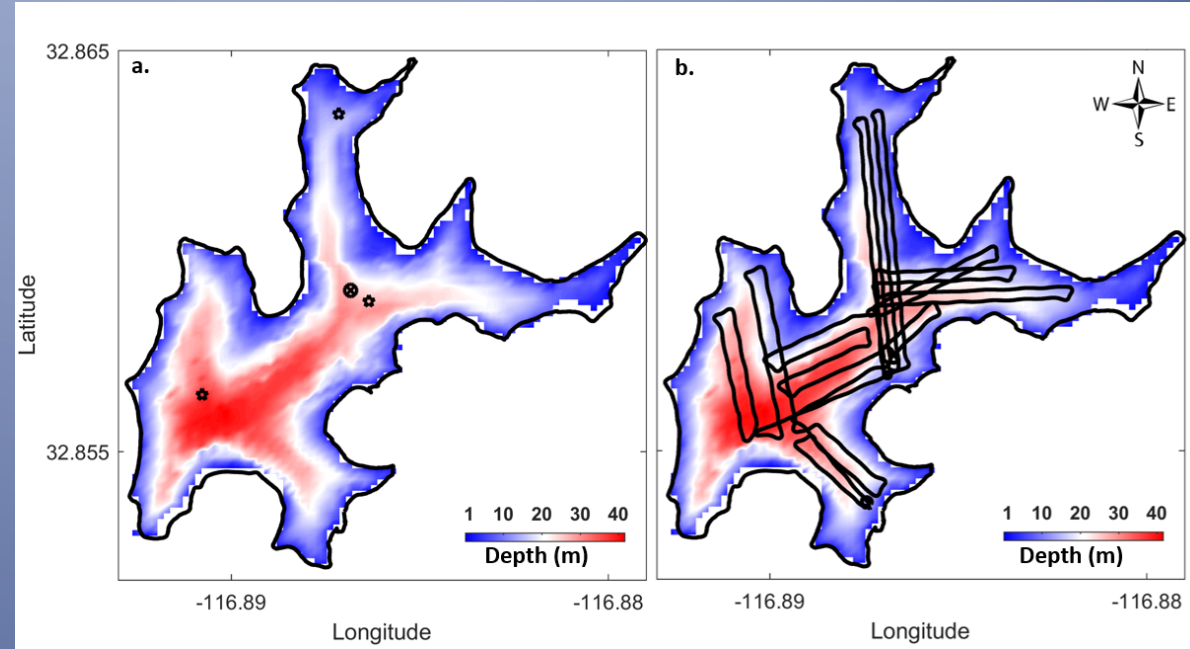
Start Animation

| | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|
| -119 | -118 | -117 | -116 | -115 | -114 | -113 | -112 | -111 | -110 | -109 | -108 |
| -107 | -106 | -105 | -104 | -103 | -102 | -101 | -100 | -99 | -98 | -97 | -96 |
| -95 | -94 | -93 | -92 | -91 | -90 | -89 | -88 | -87 | -86 | -85 | -84 |
| -83 | -82 | -81 | -80 | -79 | -78 | -77 | -76 | -75 | -74 | -73 | -72 |
| -71 | -70 | -69 | -68 | -67 | -66 | -65 | -64 | -63 | -62 | -61 | -60 |
| -59 | -58 | -57 | -56 | -55 | -54 | -53 | -52 | -51 | -50 | -49 | -48 |
| -47 | -46 | -45 | -44 | -43 | -42 | -41 | -40 | -39 | -38 | -37 | -36 |
| -35 | -34 | -33 | -32 | -31 | -30 | -29 | -28 | -27 | -26 | -25 | -24 |
| -23 | -22 | -21 | -20 | -19 | -18 | -17 | -16 | -15 | -14 | -13 | -12 |
| -11 | -10 | -9 | -8 | -7 | -6 | -5 | -4 | -3 | -2 | -1 | NOW |

An animated gif has been created as an alternative to this animation sequence.

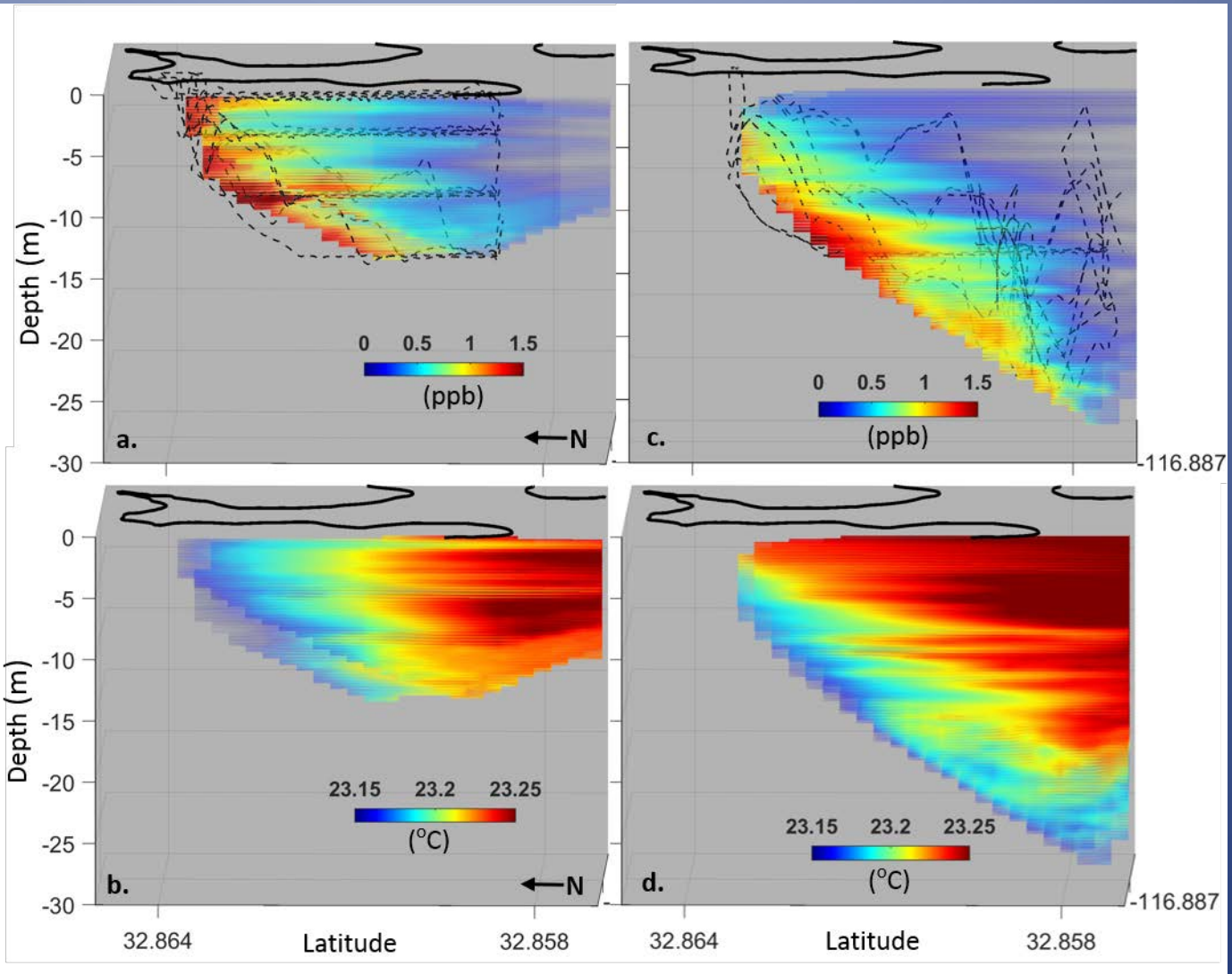








Rhodamine



Temperature



Coastal Observing R&D Center
Scripps Institution of Oceanography

