Submesoscale Dynamics of the South China Sea (aka Taiwan13)- Revelle Leg 3 18-27 May 2013

Craig M. Lee[1], Anthony Kirincich[2], Kipp Shearman[3], Emily Shroyer[3], Wayne Slade[4], Louis St. Laurent[2], Luc Rainville[1], Ke-Hsien Fu[5], Emmanuel Boss[6] and Burt Jones[7]

[1]Applied Physics Laboratory, University of Washington, [2]Woods Hole Oceanographic Institution, [3]Oregon State University, [4]Sequoia Scientific, [5]National Sun Yat-Sen University, [6]University of Maine, [7]KAUST

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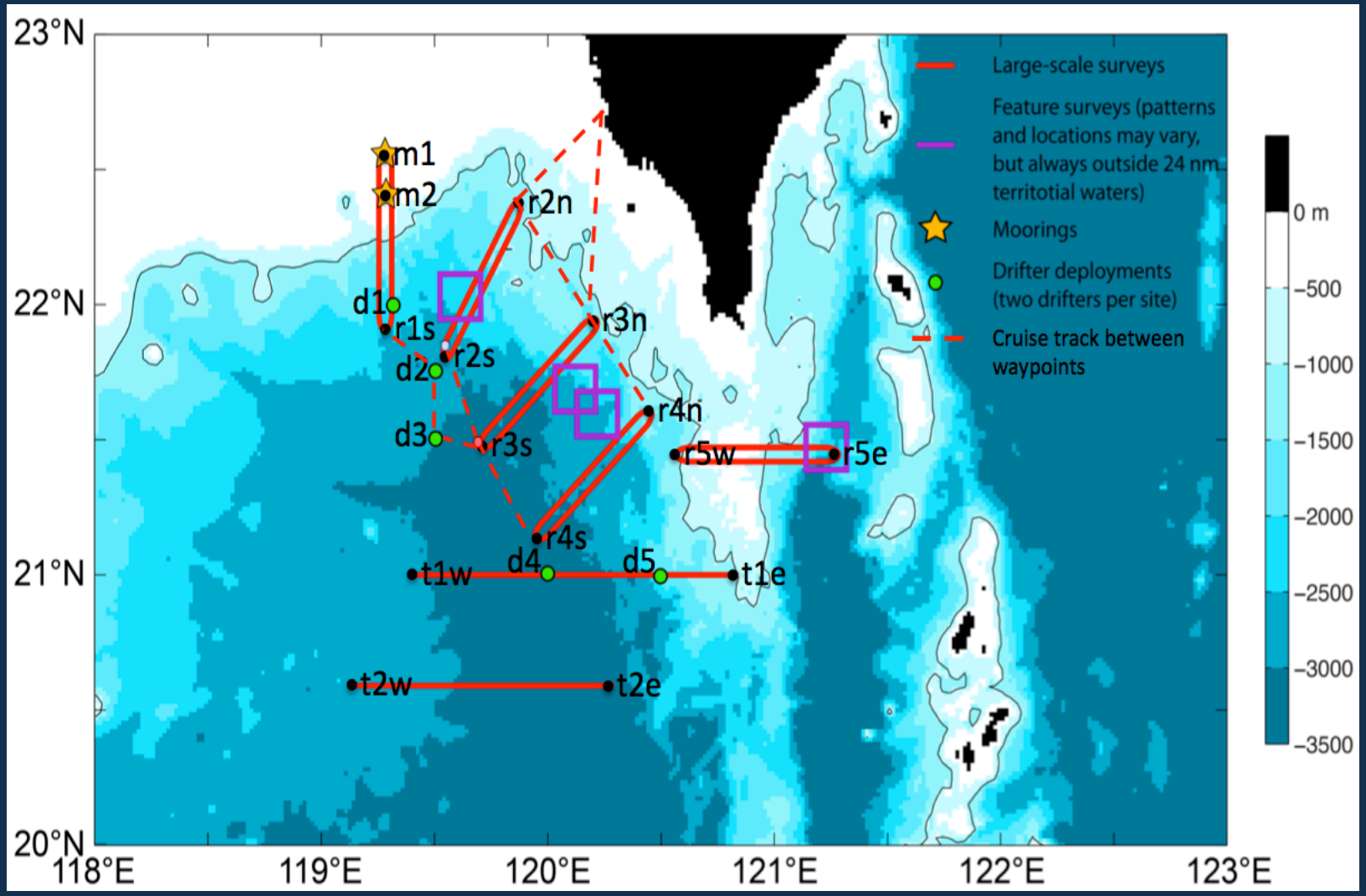
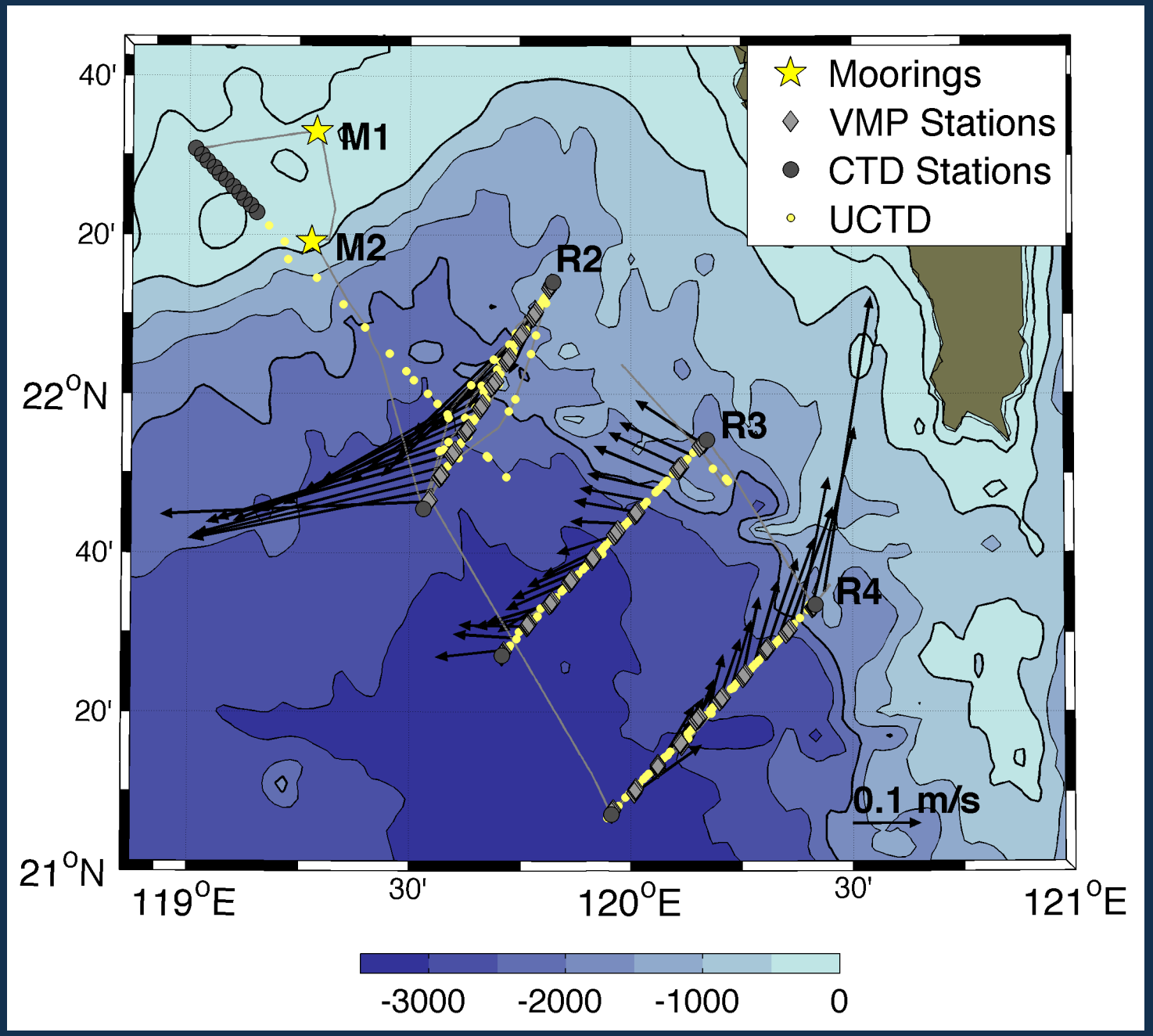
Objectives

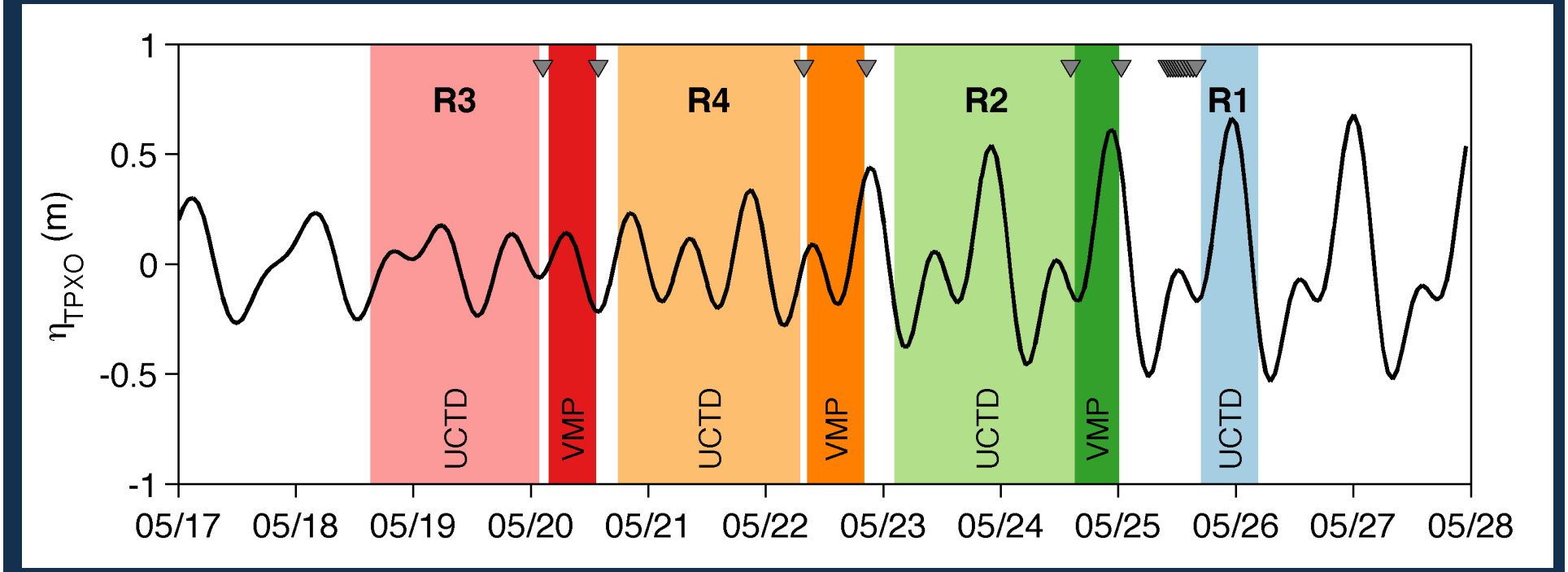
Pilot effort for future investigations of submesoscale dynamics and their role in the energy cascade in the Kuroshio-influenced northeastern South China Sea.

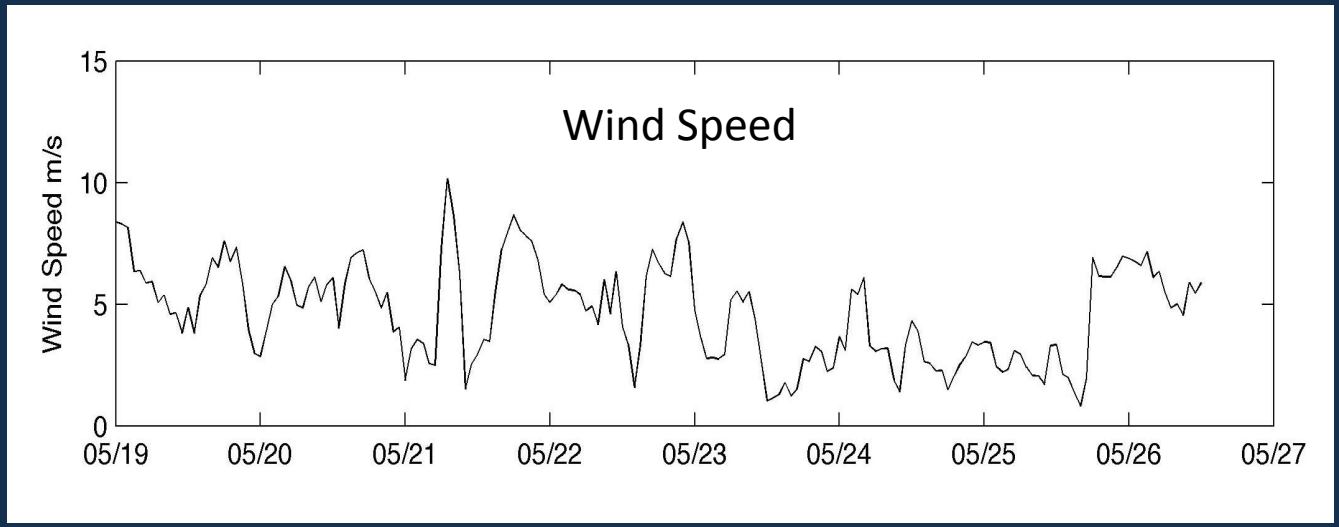
- Characterize the dominant spatial and temporal scales and how they vary as a function of bathymetry and distance from Luzon Strait (Kuroshio influence).
- Identify areas of elevated mesoscale and submeoscale variability to inform upcoming experiments.
- Characterize the internal tide and develop approaches for internal wave and submesoscale variability.

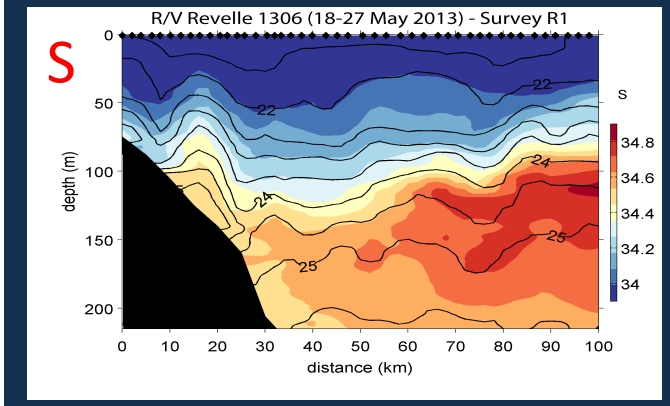
Sampling Plan

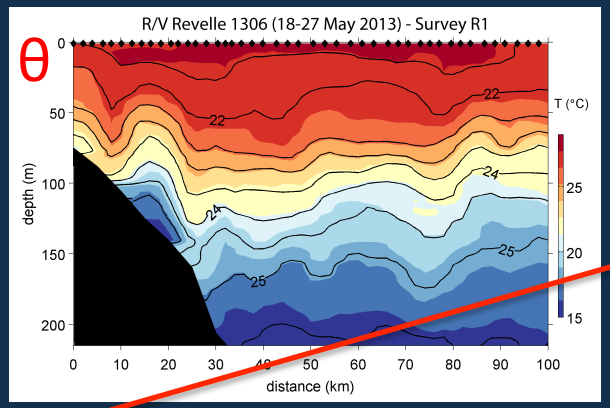


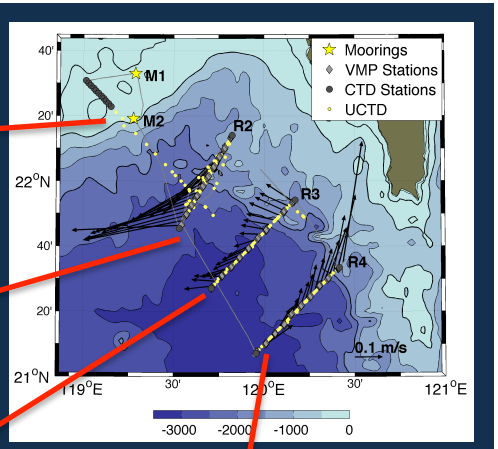

Moorings
VMP Stations
CTD Stations
UCTD
M1
M2
R2
R3
R4
0.1 m/s
40'
20'
22°N
40'
20'
21°N
119°E
30'
120°E
30'
121°E
-3000
-2000
-1000
0

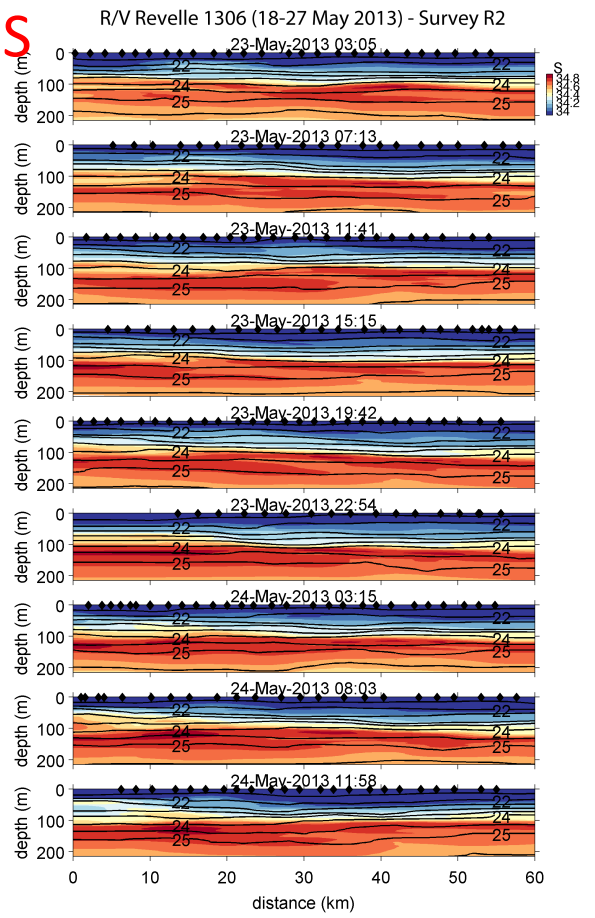

R3
R4
R2
R1
UCTD
VMP
UCTD
VMP
UCTD
VMP
UCTD
η_{TPXO} (m)
1
0.5
0
-0.5
-1
05/17
05/18
05/19
05/20
05/21
05/22
05/23
05/24
05/25
05/26
05/27
05/28

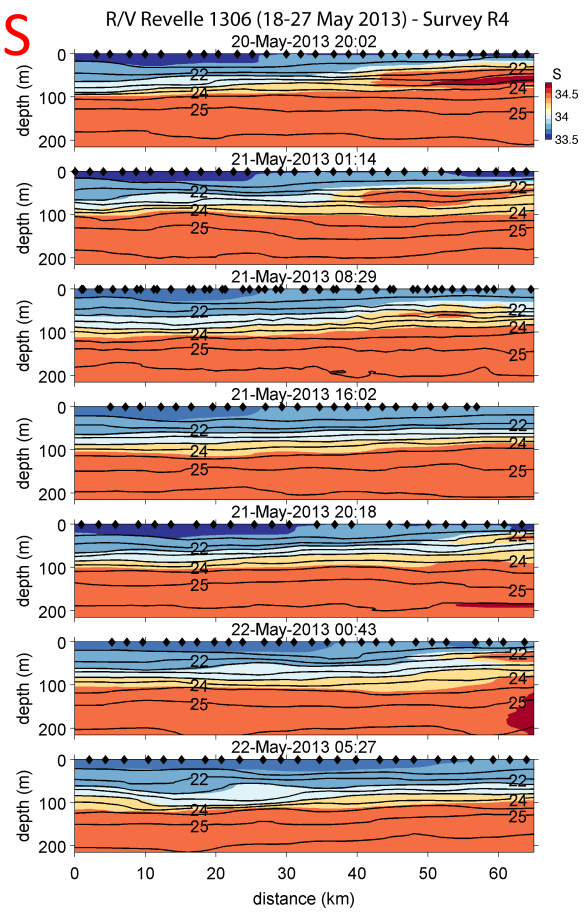

Wind Speed
Wind Speed m/s
15
10
5
0
05/19
05/20
05/21
05/22
05/23
05/24
05/25
05/26
05/27

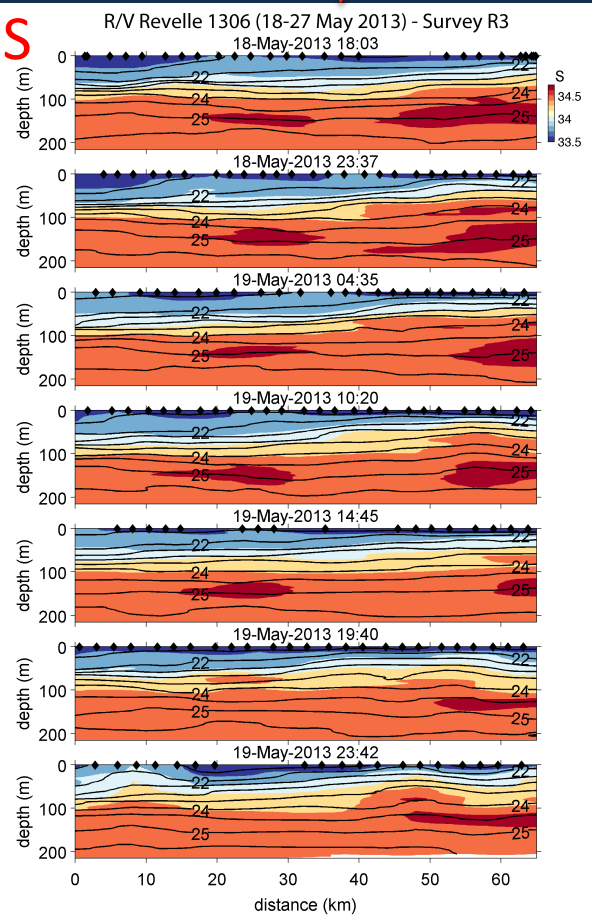

R/V Revelle 1306 (18-27 May 2013) - Survey R1
S
depth (m)
distance (km)
S


R/V Revelle 1306 (18-27 May 2013) - Survey R1
θ
depth (m)
distance (km)
T (°C)

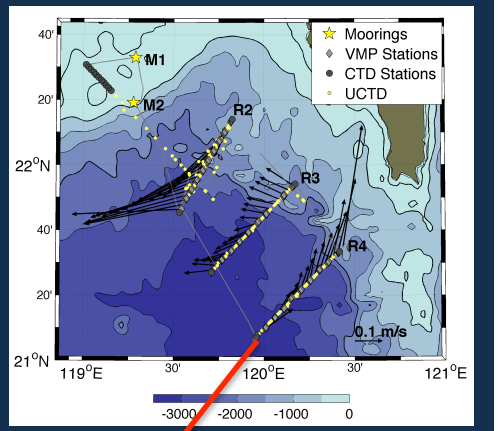

Moorings
VMP Stations
CTD Stations
UCTD
M1
M2
R2
R3
R4
0.1 m/s

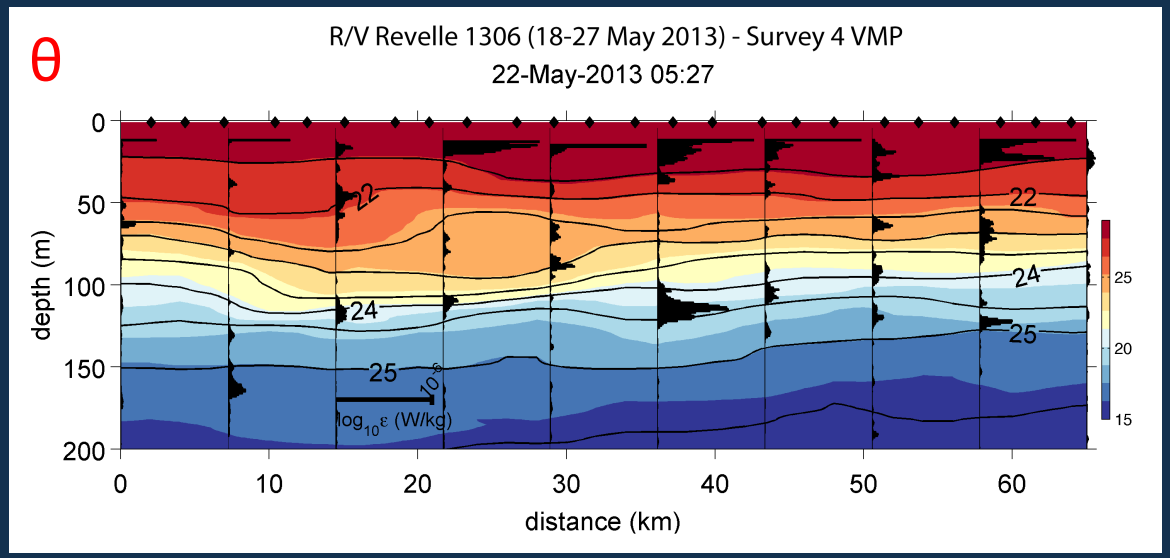

R/V Revelle 1306 (18-27 May 2013) - Survey R2
S
23-May-2013 03:05
23-May-2013 07:13
23-May-2013 11:41
23-May-2013 15:15
23-May-2013 19:42
23-May-2013 22:54
24-May-2013 03:15
24-May-2013 08:03
24-May-2013 11:58
depth (m)
distance (km)

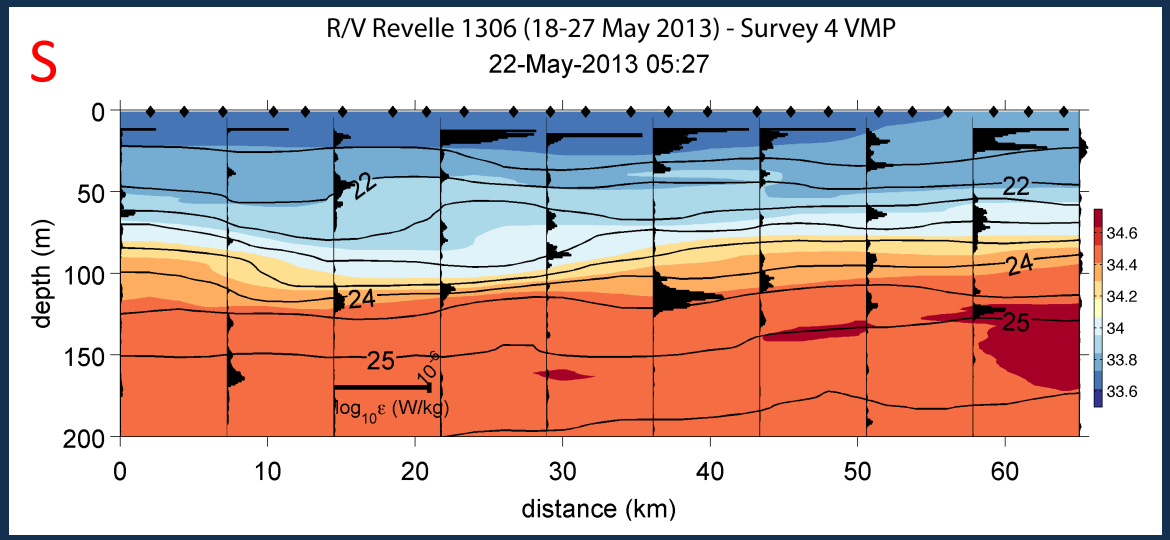

R/V Revelle 1306 (18-27 May 2013) - Survey R4
S
20-May-2013 20:02
21-May-2013 01:14
21-May-2013 08:29
21-May-2013 16:02
21-May-2013 20:18
22-May-2013 00:43
22-May-2013 05:27
depth (m)
distance (km)

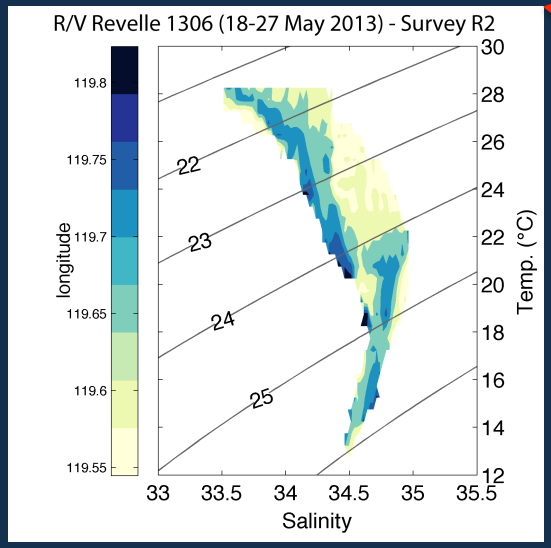

R/V Revelle 1306 (18-27 May 2013) - Survey R3
S
18-May-2013 18:03
18-May-2013 23:37
19-May-2013 04:35
19-May-2013 10:20
19-May-2013 14:45
19-May-2013 19:40
19-May-2013 23:42
depth (m)
distance (km)

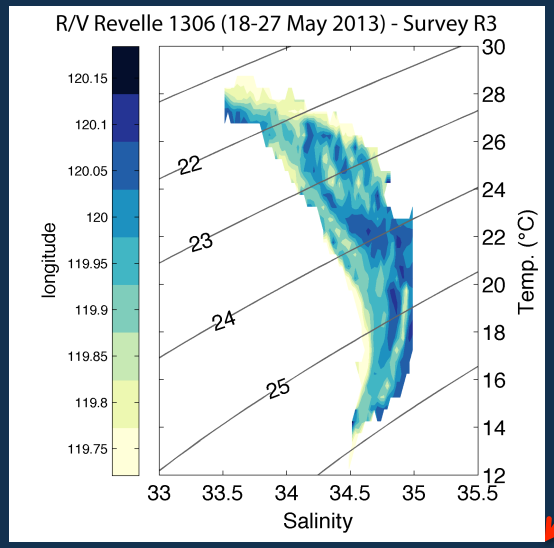
VMP Section Along R4

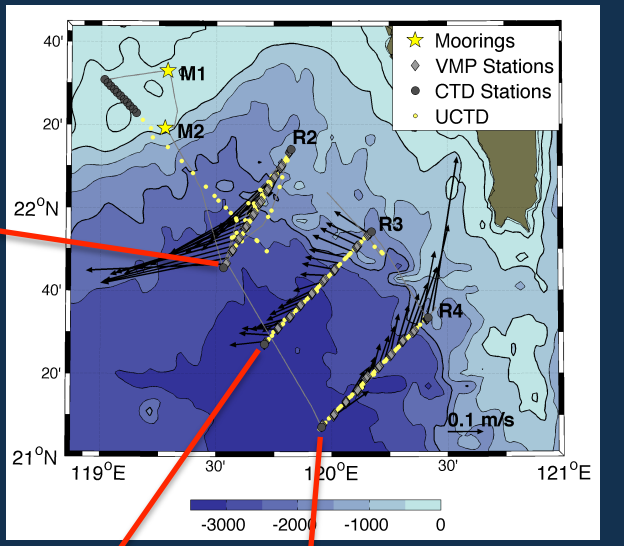


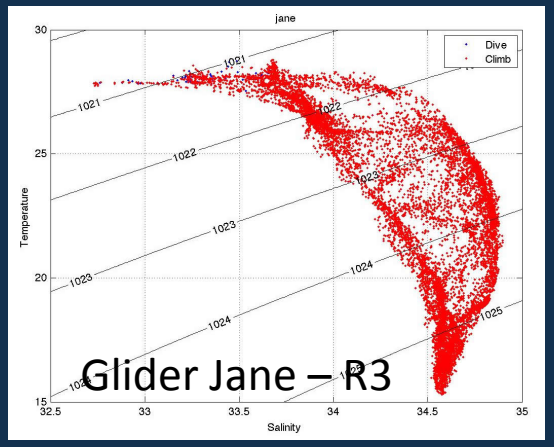


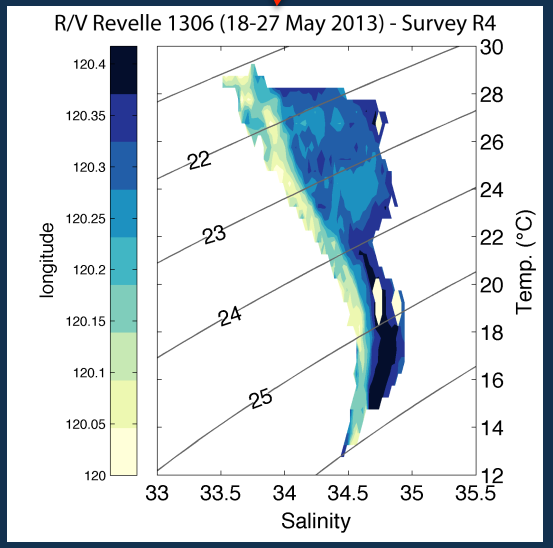


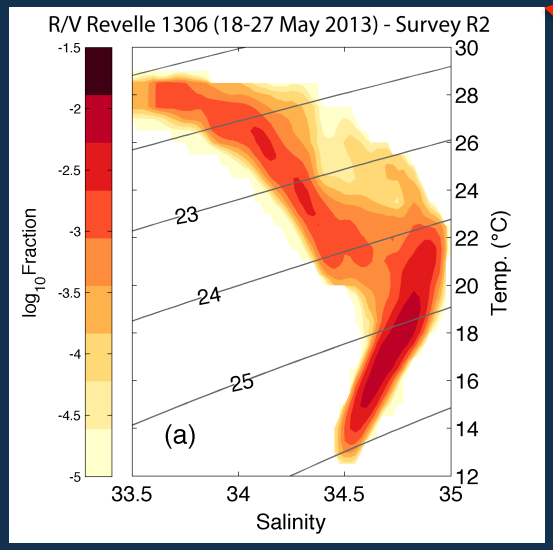

R/V Revelle 1306 (18-27 May 2013) - Survey R2
longitude
Salinity
Temp. (°C)

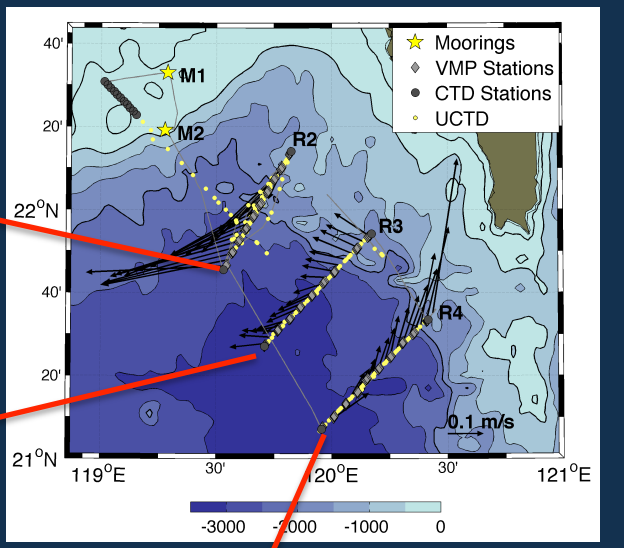

R/V Revelle 1306 (18-27 May 2013) - Survey R3
longitude
Salinity
Temp. (°C)

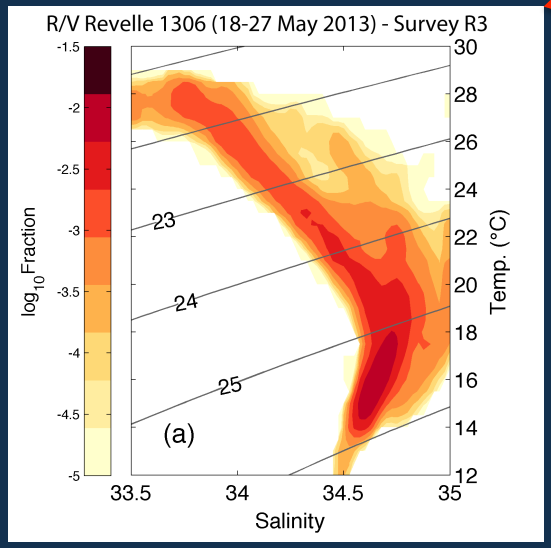

Moorings
VMP Stations
CTD Stations
UCTD
M1
M2
R2
R3
R4
0.1 m/s
22°N
21°N
119°E
120°E
121°E

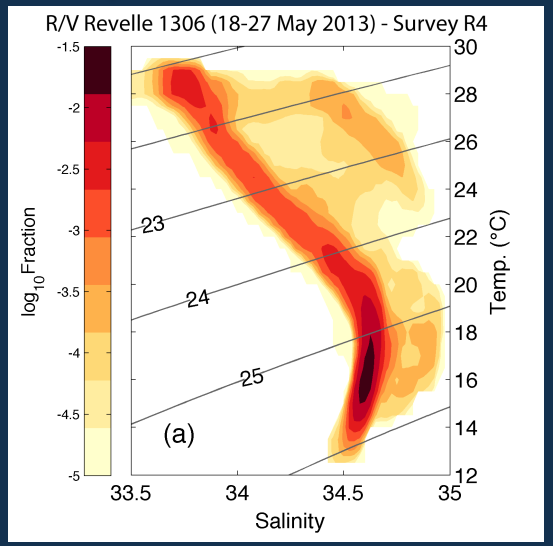

jane
Dive
Climb
Temperature
Salinity
Glider Jane – R3


R/V Revelle 1306 (18-27 May 2013) - Survey R4
longitude
Salinity
Temp. (°C)


R/V Revelle 1306 (18-27 May 2013) - Survey R2
log10 Fraction
Temp. (°C)
Salinity
(a)
23
24
25


Moorings
VMP Stations
CTD Stations
UCTD
M1
M2
R2
R3
R4
0.1 m/s
22°N
21°N
119°E
120°E
121°E


R/V Revelle 1306 (18-27 May 2013) - Survey R3
log10 Fraction
Temp. (°C)
Salinity
(a)
23
24
25


R/V Revelle 1306 (18-27 May 2013) - Survey R4
log10 Fraction
Temp. (°C)
Salinity
(a)
23
24
25

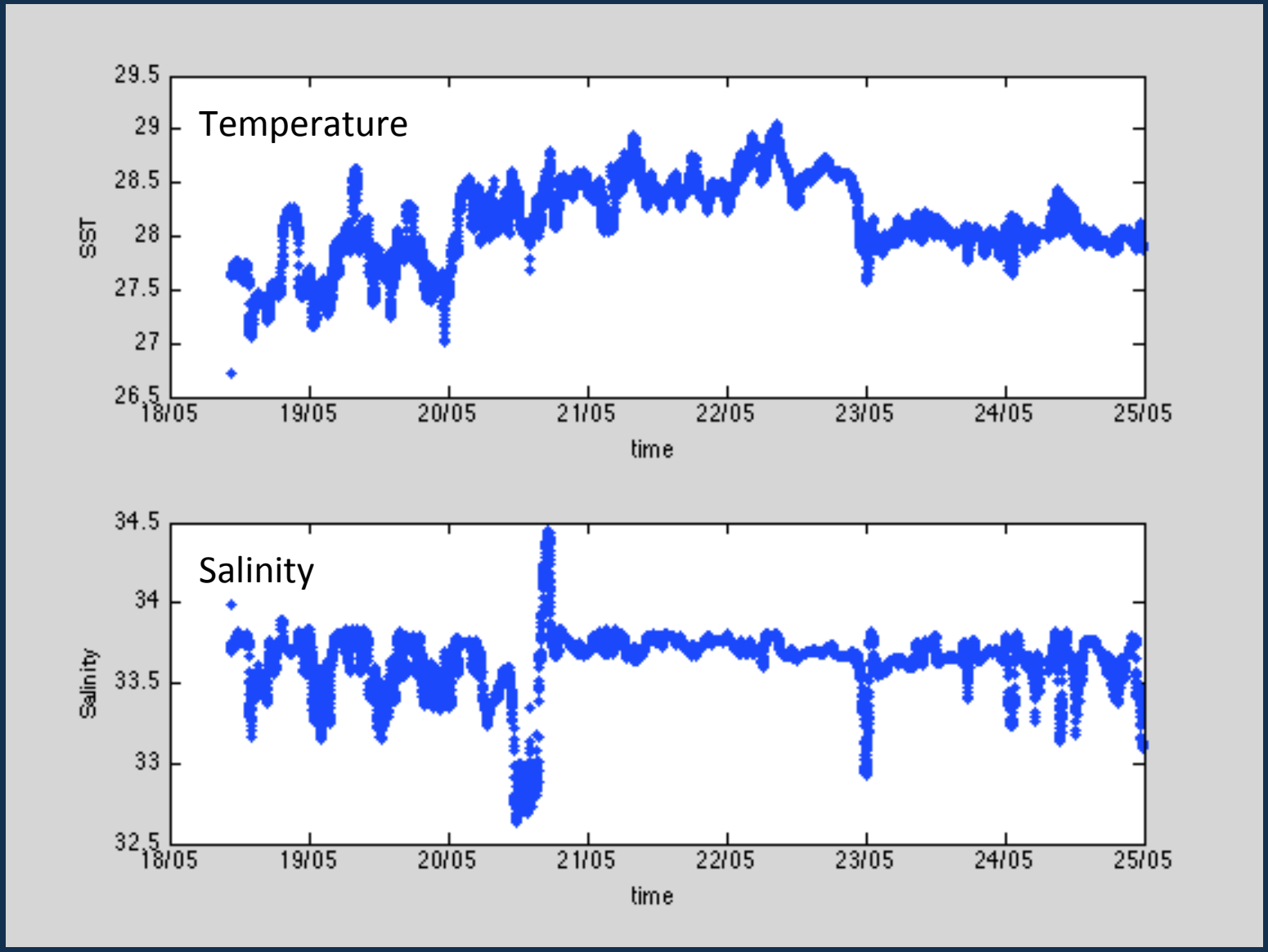
Preliminary analysis of inline optical data during leg 3 – May 2013

- Data from in-line system: TSG + GPS + AC-S (hyperspectral spectophotometer measuring absorption and attenuation).
- Method of measurements and processing as in Slade et al., 2010, JTECH.
- Bio-optical variables available:
  Chlorophyll (via the red absorption peak).
  Particulate organic carbon (via attenuation at 660nm).
  Size parameter (from spectral particulate attenuation).

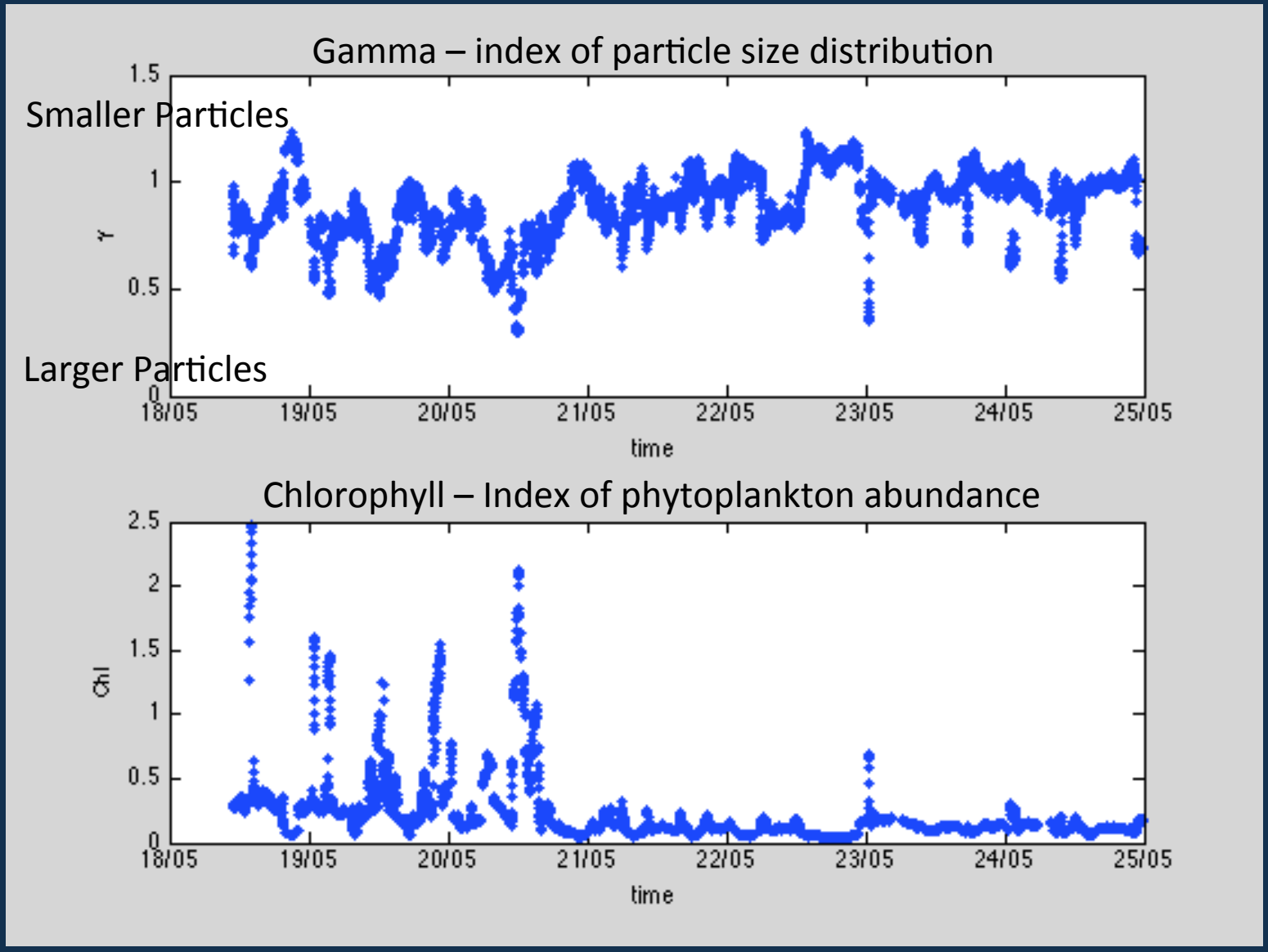
Approach

- Optical, biological, and chemical variables provide sensitive tracers of water masses.
- Because optical variables are often related to biological properties, they integrate the environmental processes contributing to their presence.
- Optical variables easily resolve processes at physically relevant temporal and spatial scales

Time series - hydrographic properties:



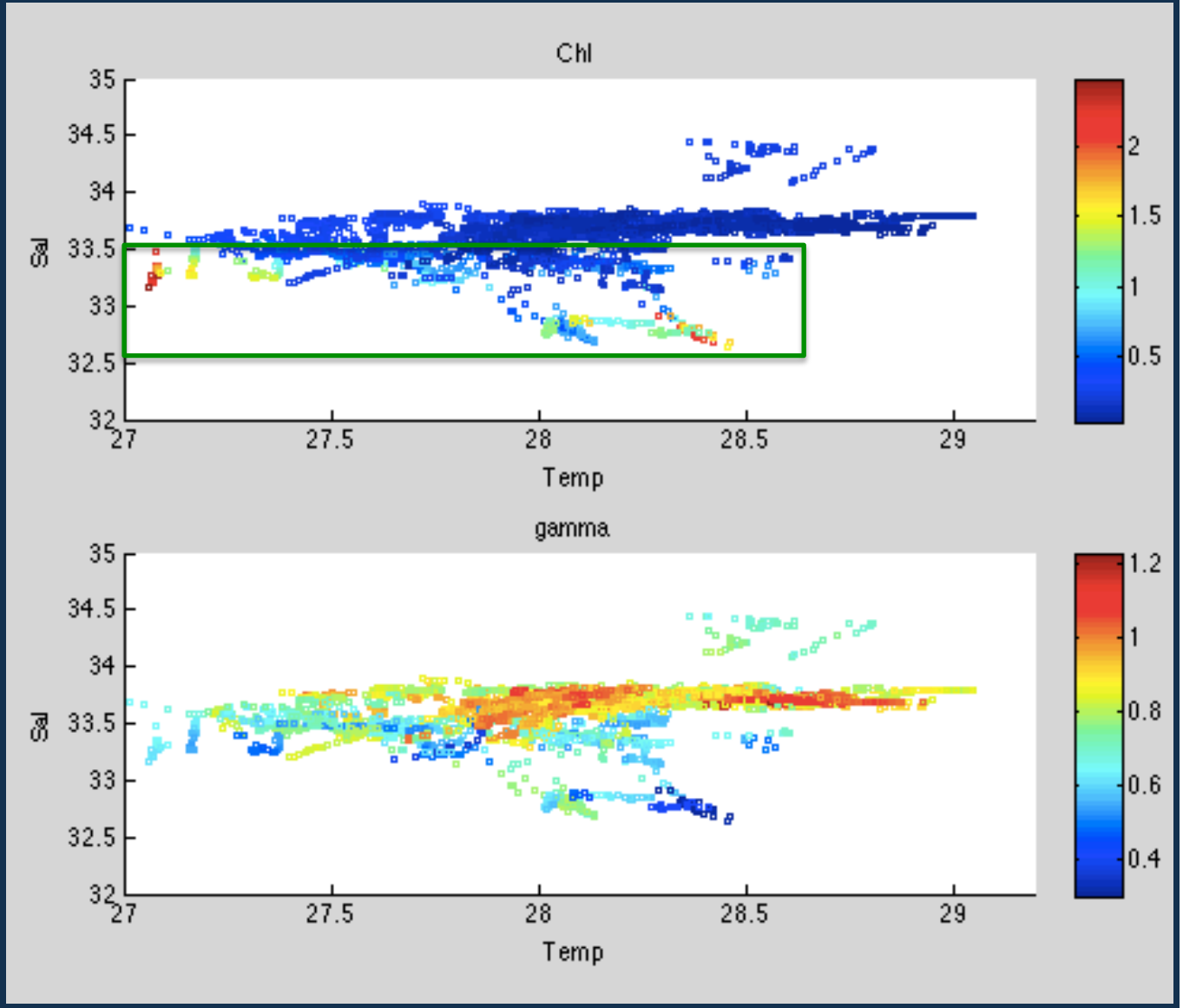
Time series - bio-optical properties:

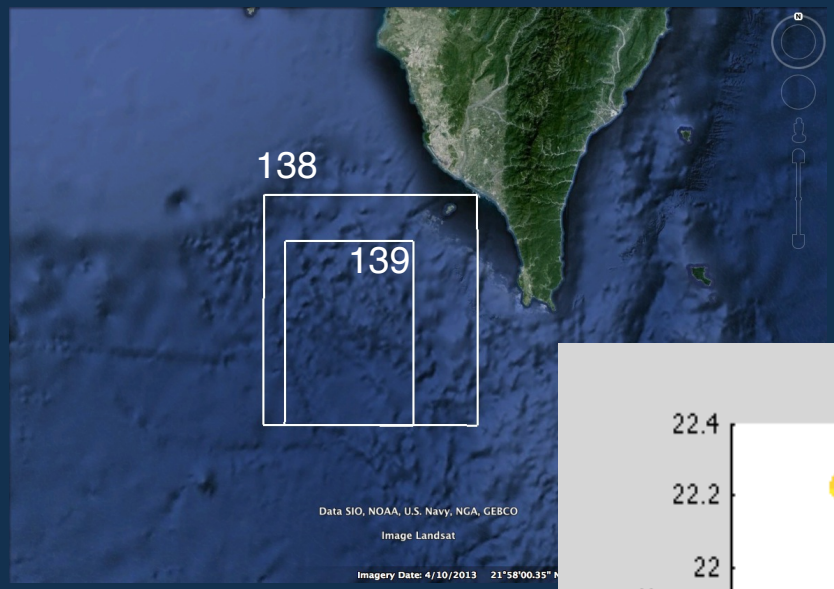


Preliminary conclusions:

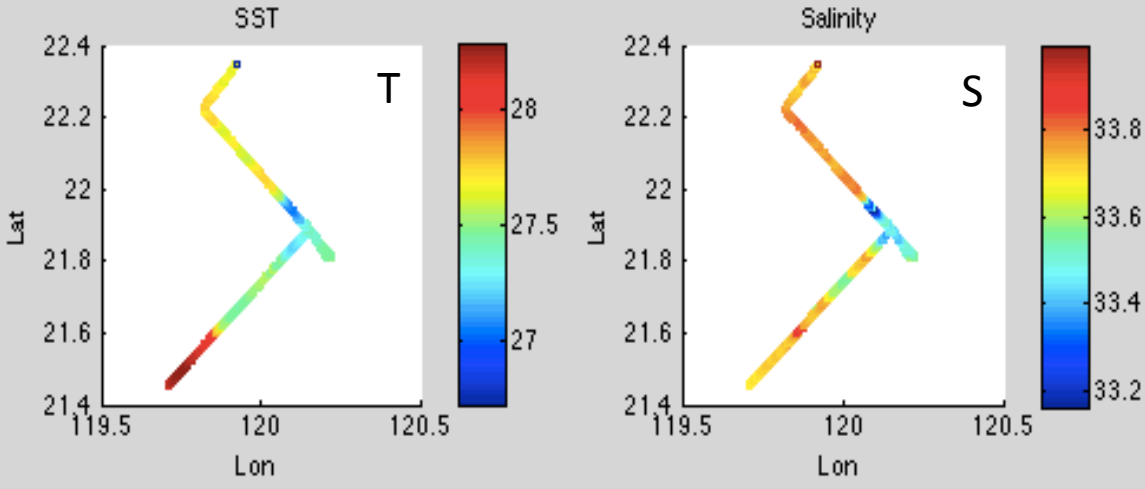
Low salinity is associated with high Chlorophyll

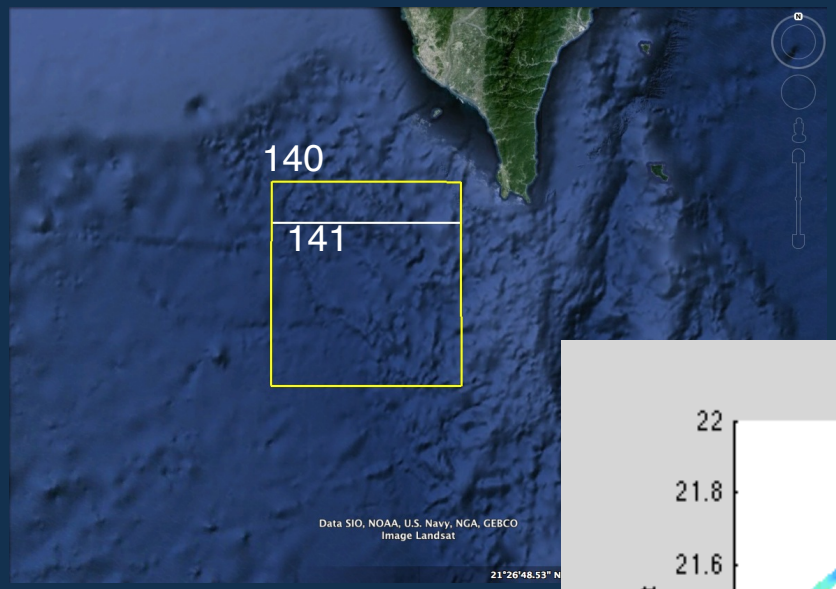
Small size (high g) co-vary with low Chl (but size has more variability.





Day 138 – May 18, 2013





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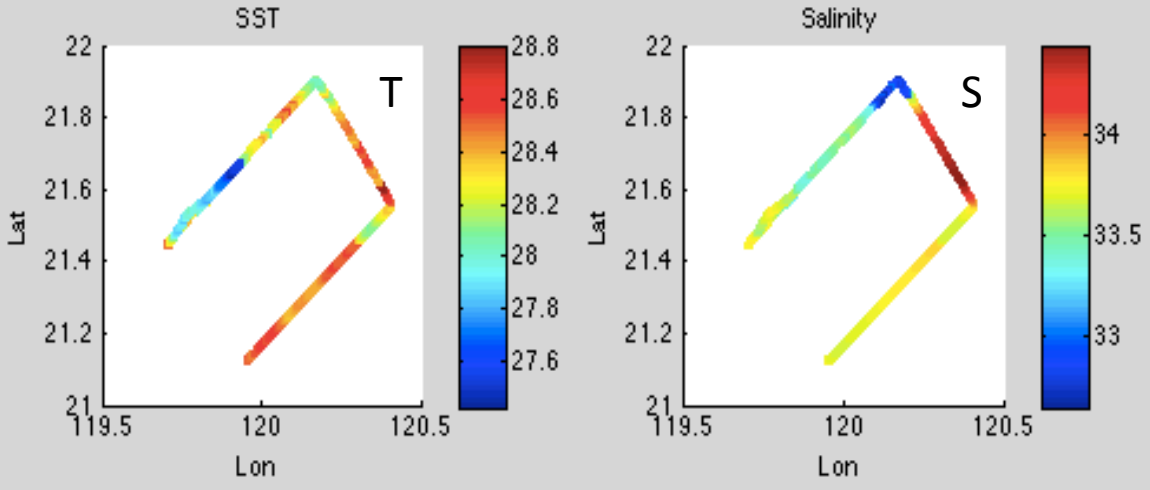

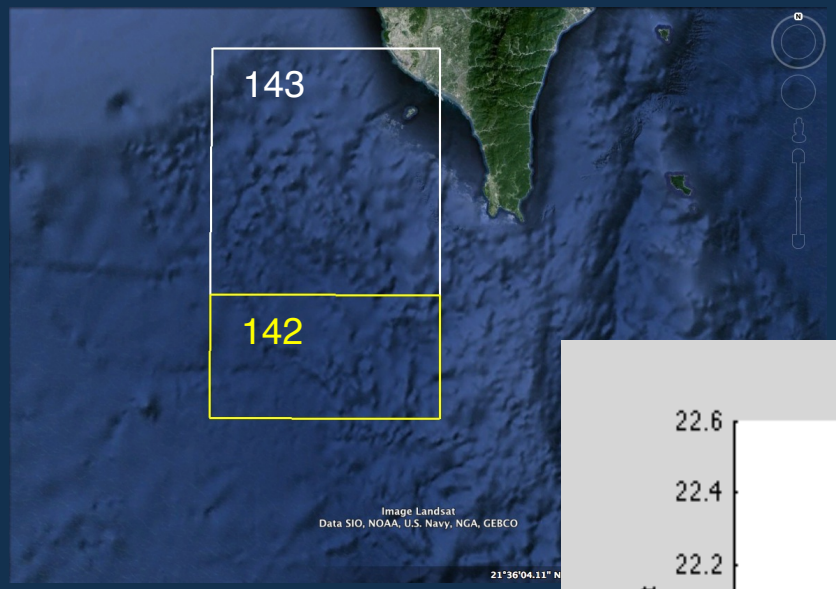

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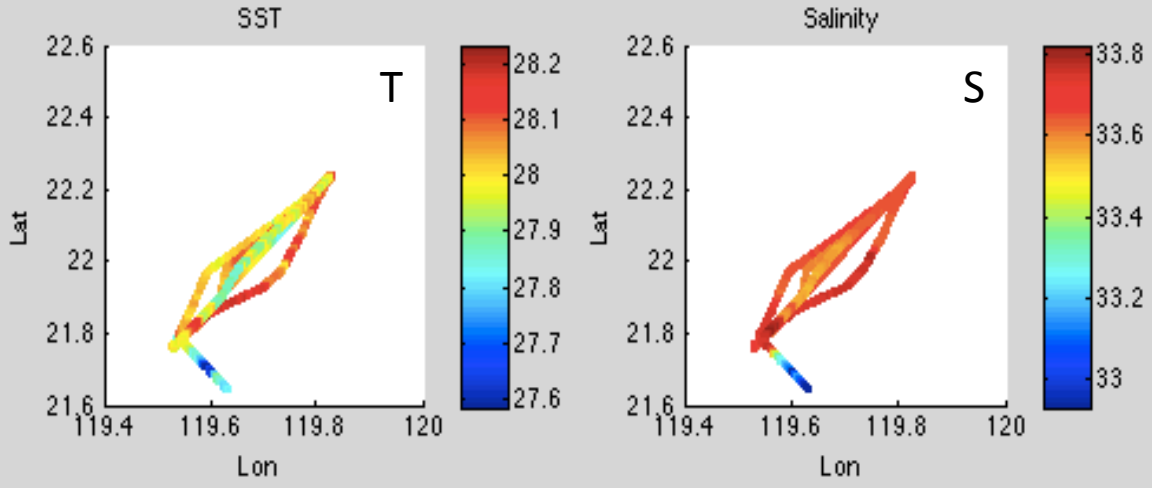

Summary

- The optical variables of chlorophyll concentration and γ (particle size distribution) do correlate with water mass variability (T/S)
- During the cruise
  - Primary change was a temporal shift after the first 3 days
  - There was spatial structure (lower salinity water to the east), but not clearly defined features
- Use of vertical measurements (tow vehicles and gliders) equipped with optical sensors should provide better definition of the submesoscale features.