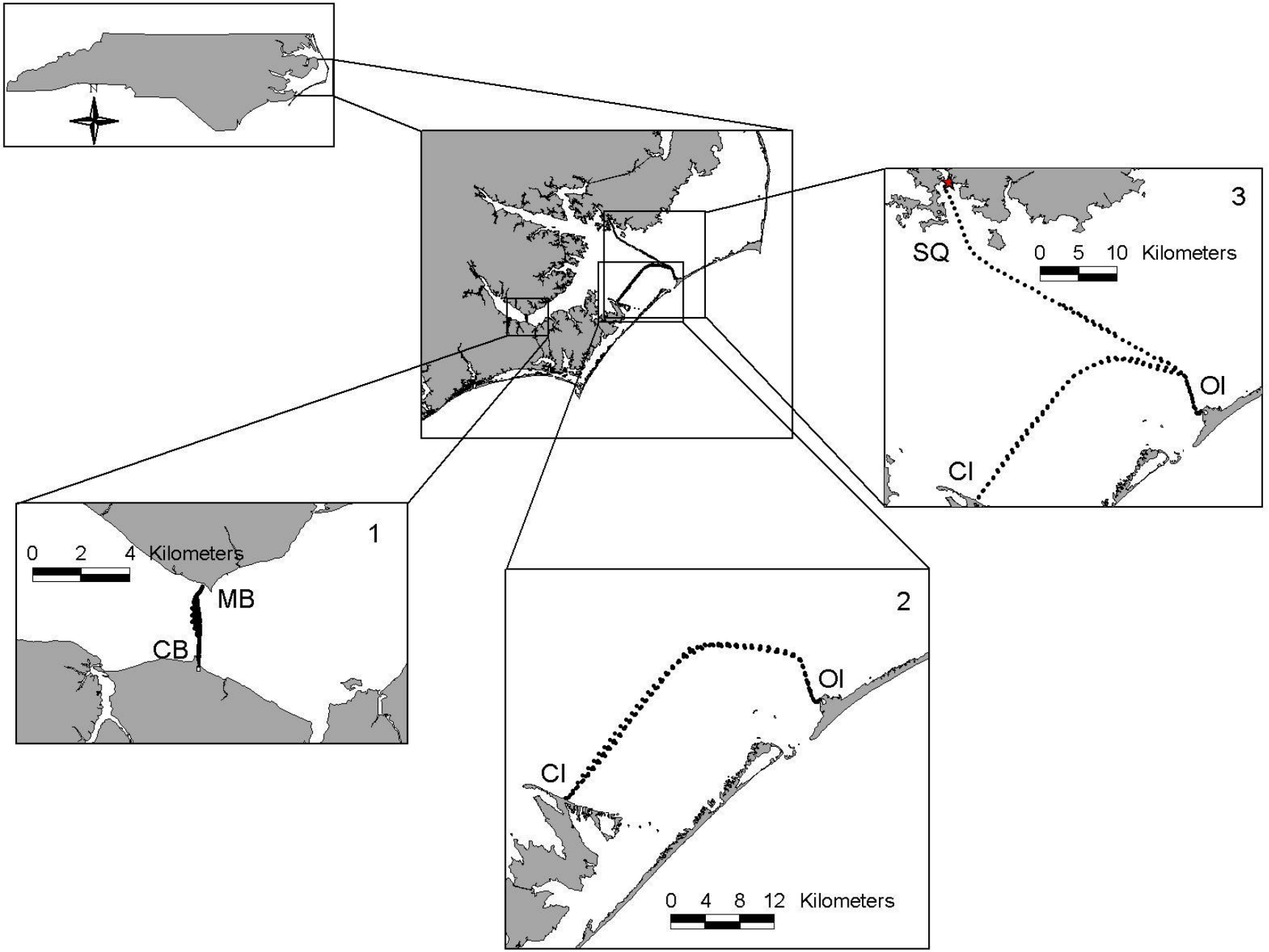
FerryMon

An Estuary Observing System

J.Ramus and H. Paerl

ferrymon.org


FLOYD J LUPTON


N
1
0 2 4 Kilometers
MB
CB
2
OI
CI
0 4 8 12 Kilometers
3
SQ
0 5 10 Kilometers
OI
CI

Ferry Route		1	2	3
Initiated		Nov-00	Feb-01	May-01
Origination		Cherry Branch	Cedar Island	Swan Quarter
Destination		Minnesott Beach	Ocracoke Island	OI/CI
Ferry Name		Floyd Lupton	Carteret	Gov. Hyde
Avg. Speed (knots)		8.0	10.7	10.4
# of crossings/day		40	4	2
# of data points/day		300	200	200-300

Pamlico Sound Stats:

Length = approx. 100-140 km

Width = 35-50 km

Surface Area = 4350 km^2

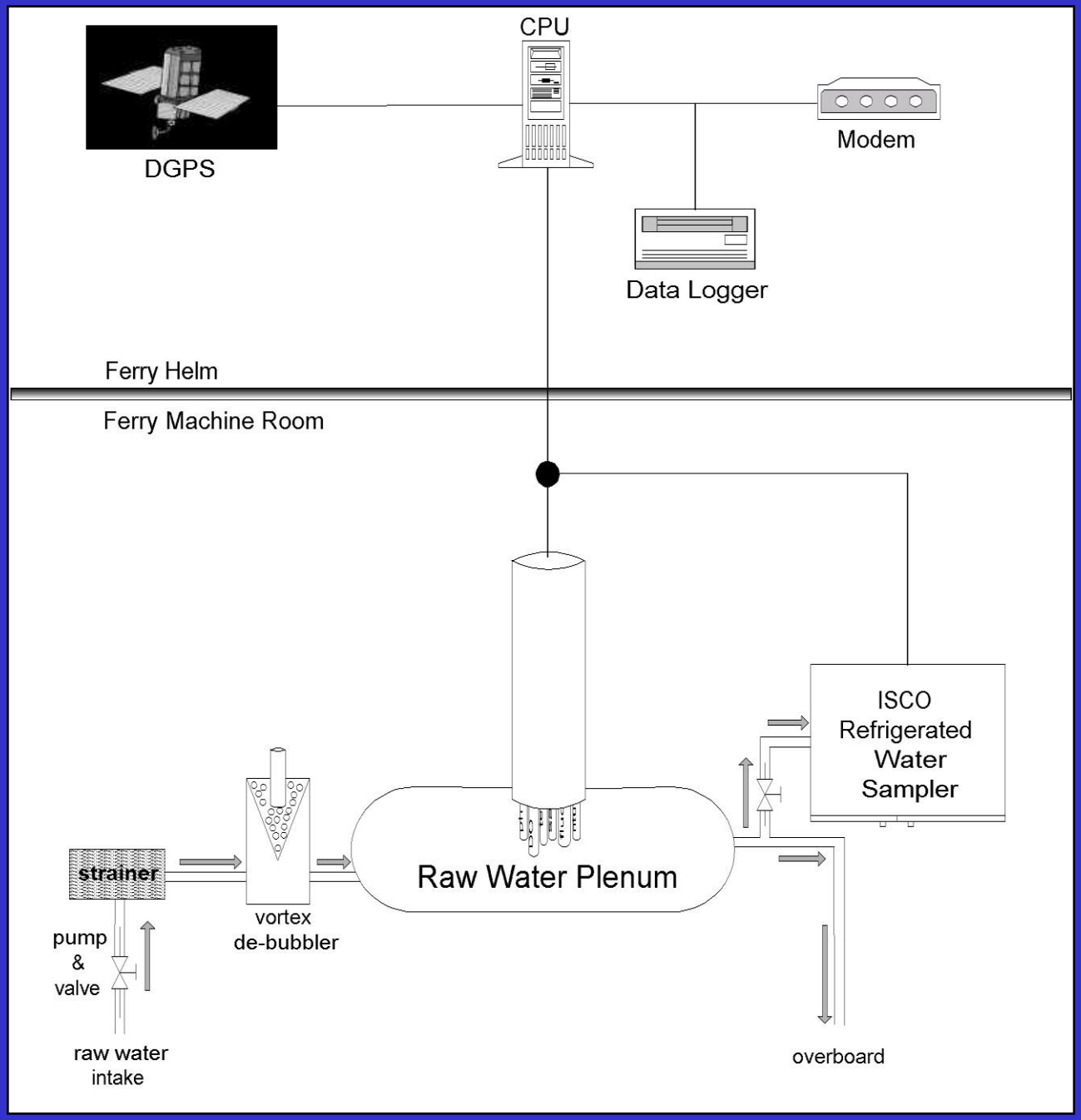
Volume = 26 x 10^9 m^3

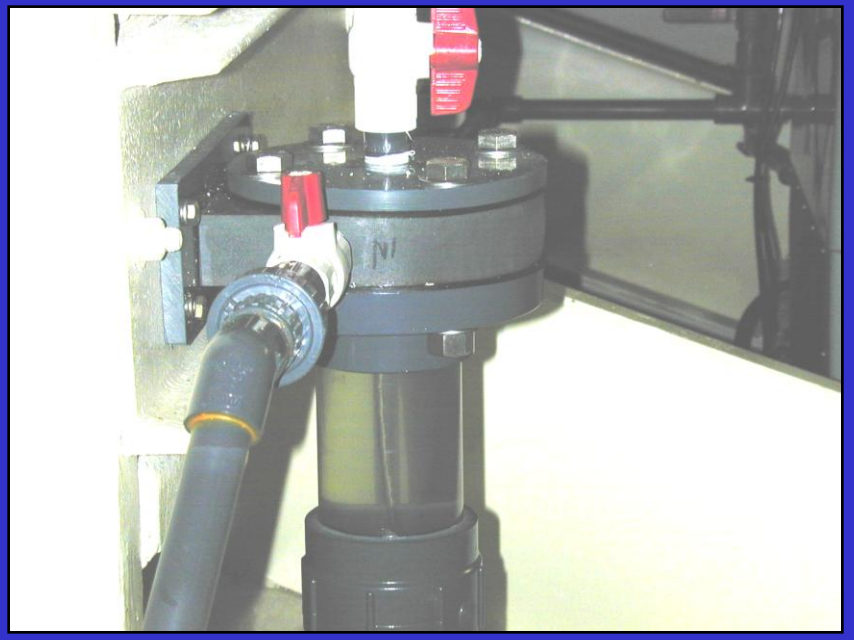
Depth = 0.5-8.0 m,average is 4.5 m

Estuarine Type = slightly stratified to well-mixed largely wind-driven circulation, tidal effects at inlets

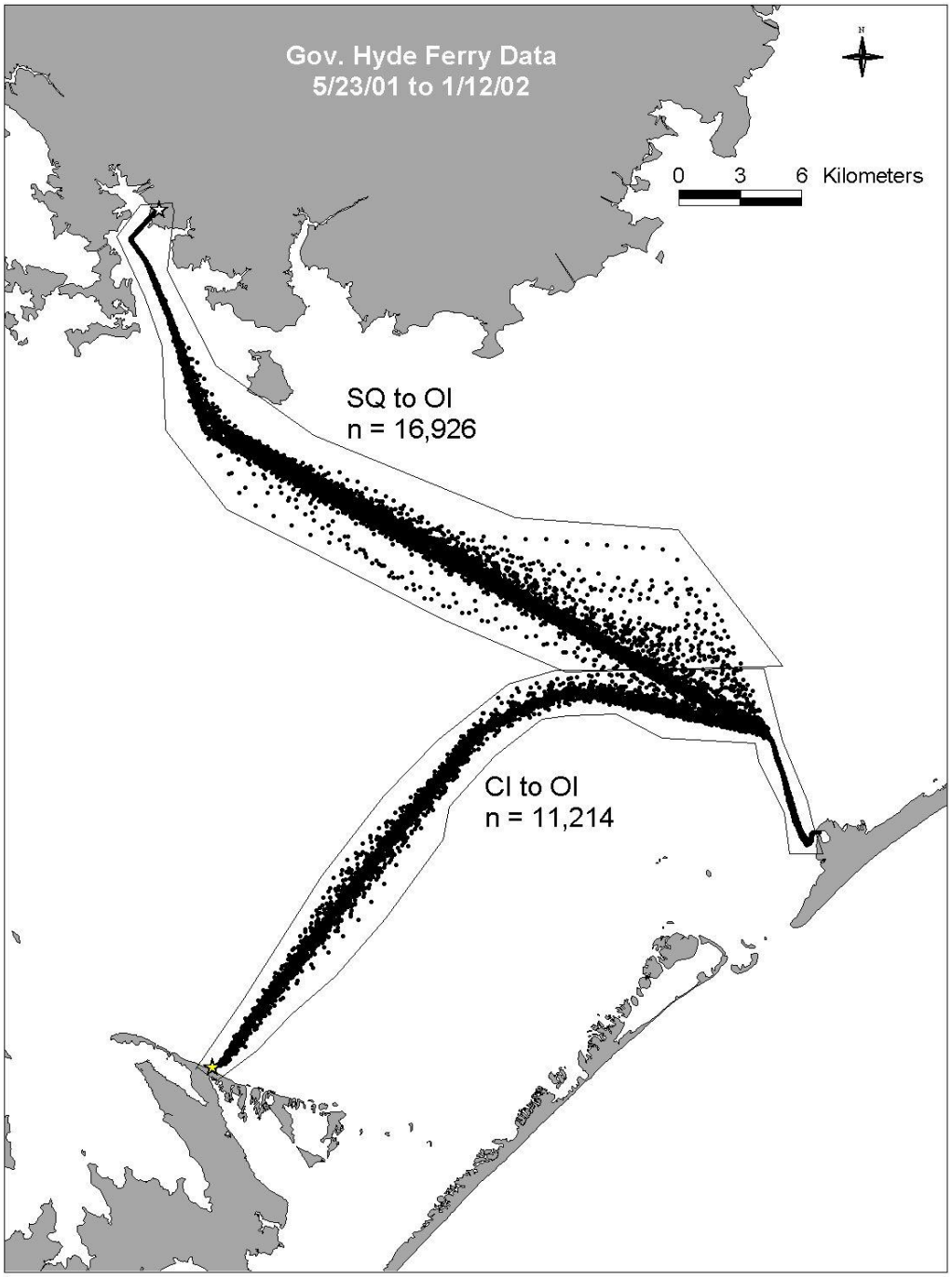
FW Flushing Time = up to 11 months, complex interactions with Albemarle Sound Pamlico River, Neuse River, coastal ocean

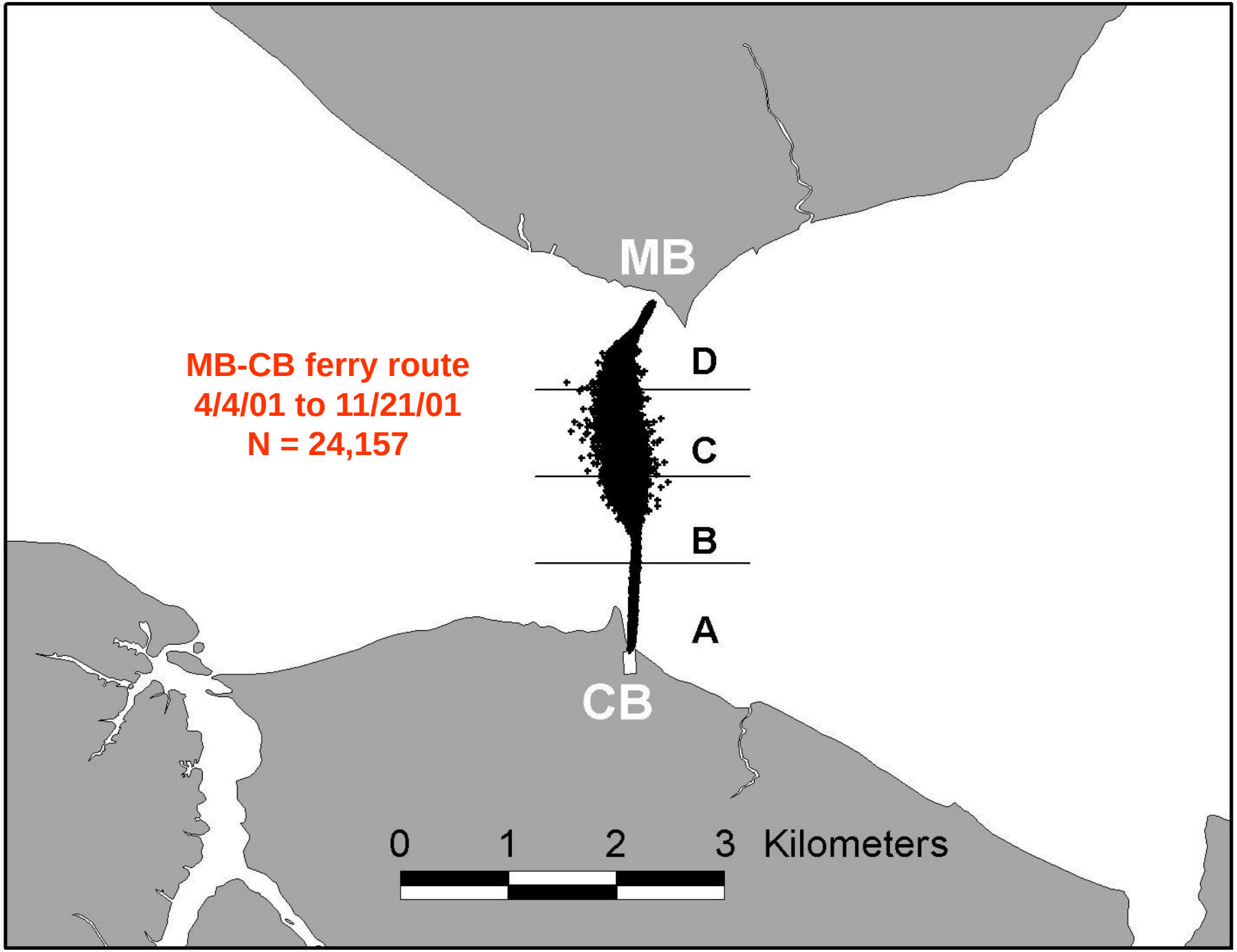
Oceanic Exchange = limited to Oregon, Hatteras, and Ocracoke Inlets

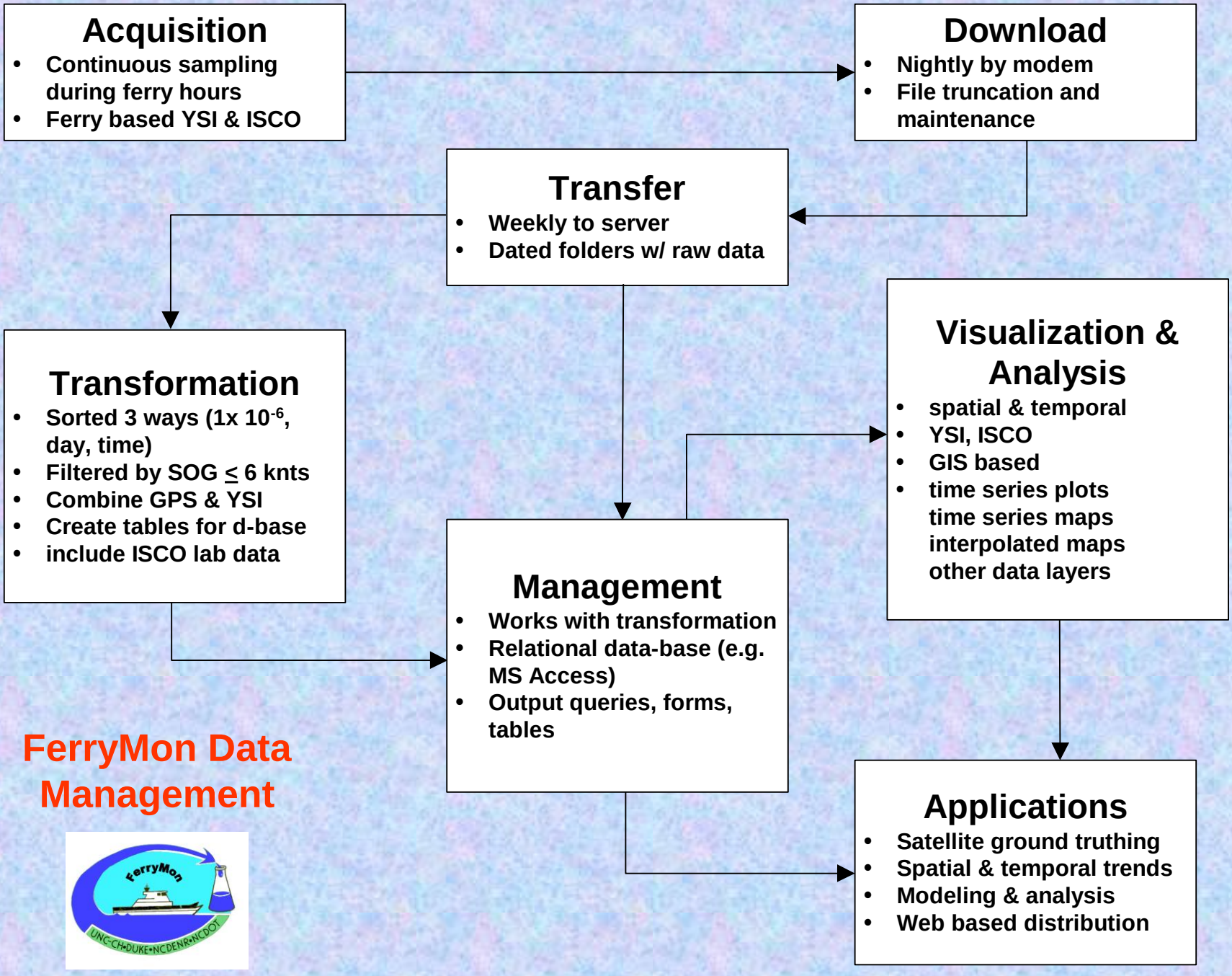

CPU
DGPS
Modem
Data Logger
Ferry Helm
Ferry Machine Room
ISCO
Refrigerated
Water
Sampler
strainer
Raw Water Plenum
vortex
de-bubbler
pump
&
valve
raw water
intake
overboard

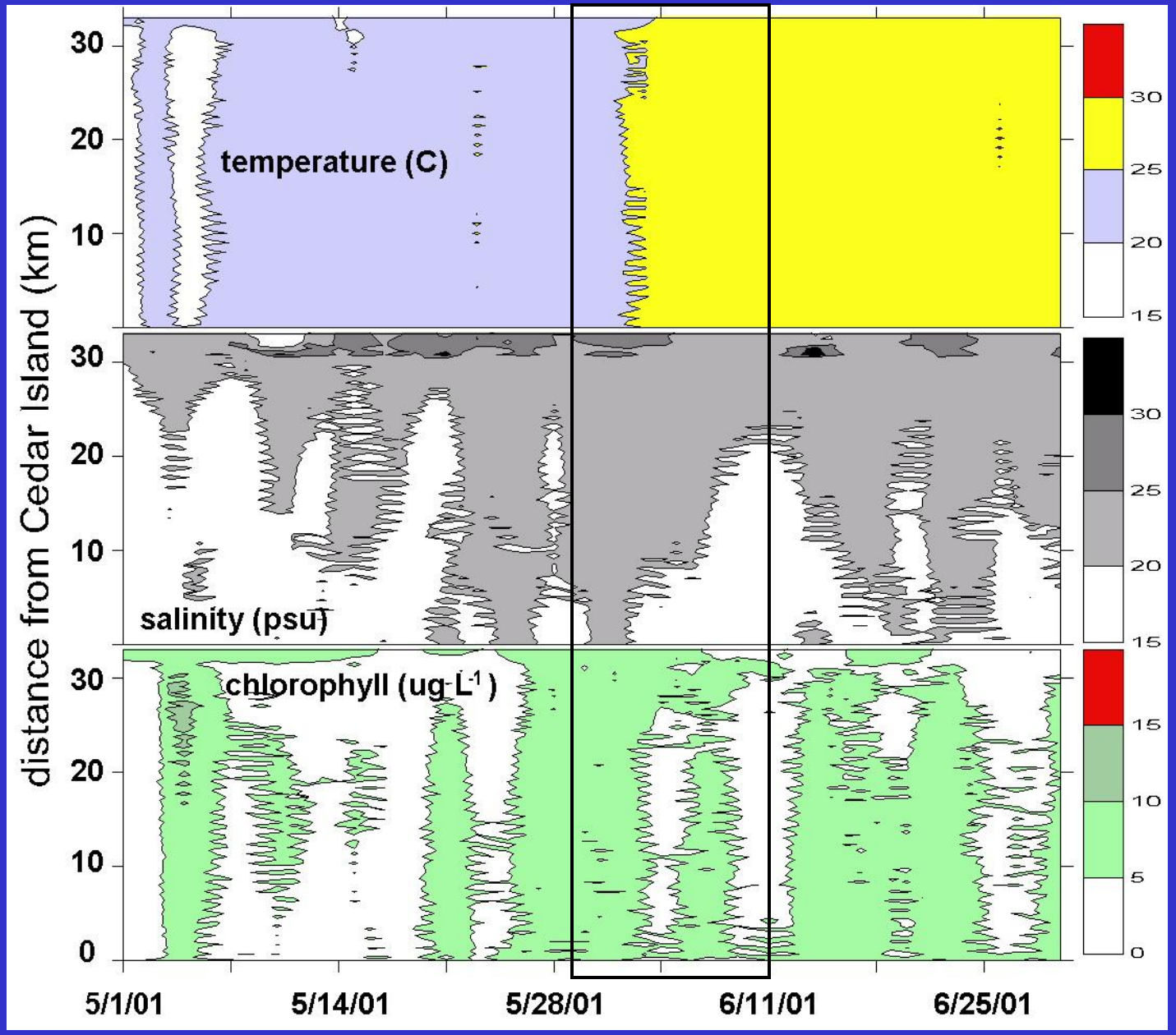


Automated Sampling System


Gov. Hyde Ferry Data
5/23/01 to 1/12/02
N
0 3 6 Kilometers
SQ to OI
n = 16,926
CI to OI
n = 11,214

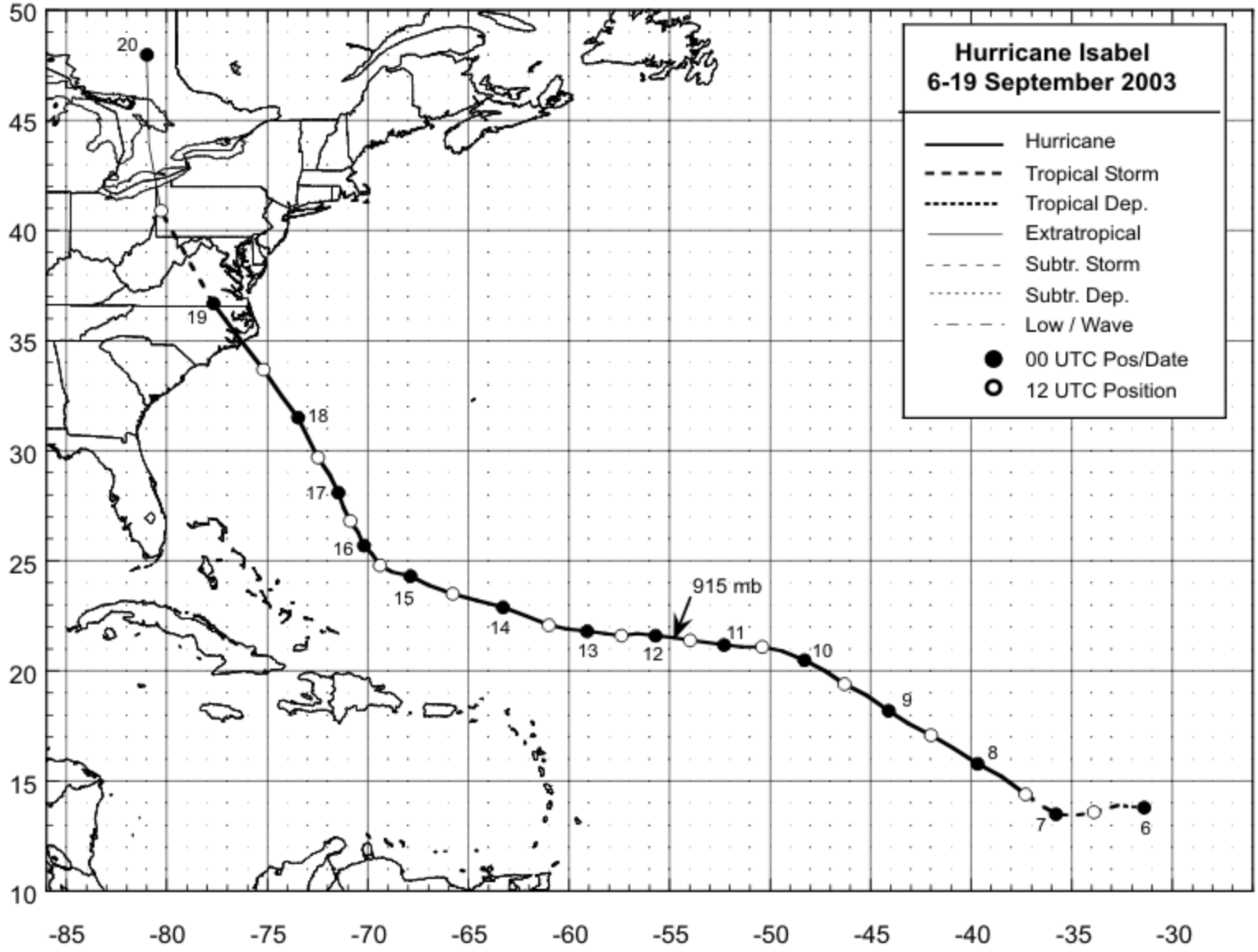

MB-CB ferry route
4/4/01 to 11/21/01
N = 24,157
MB
D
C
B
A
CB
0
1
2
3
Kilometers

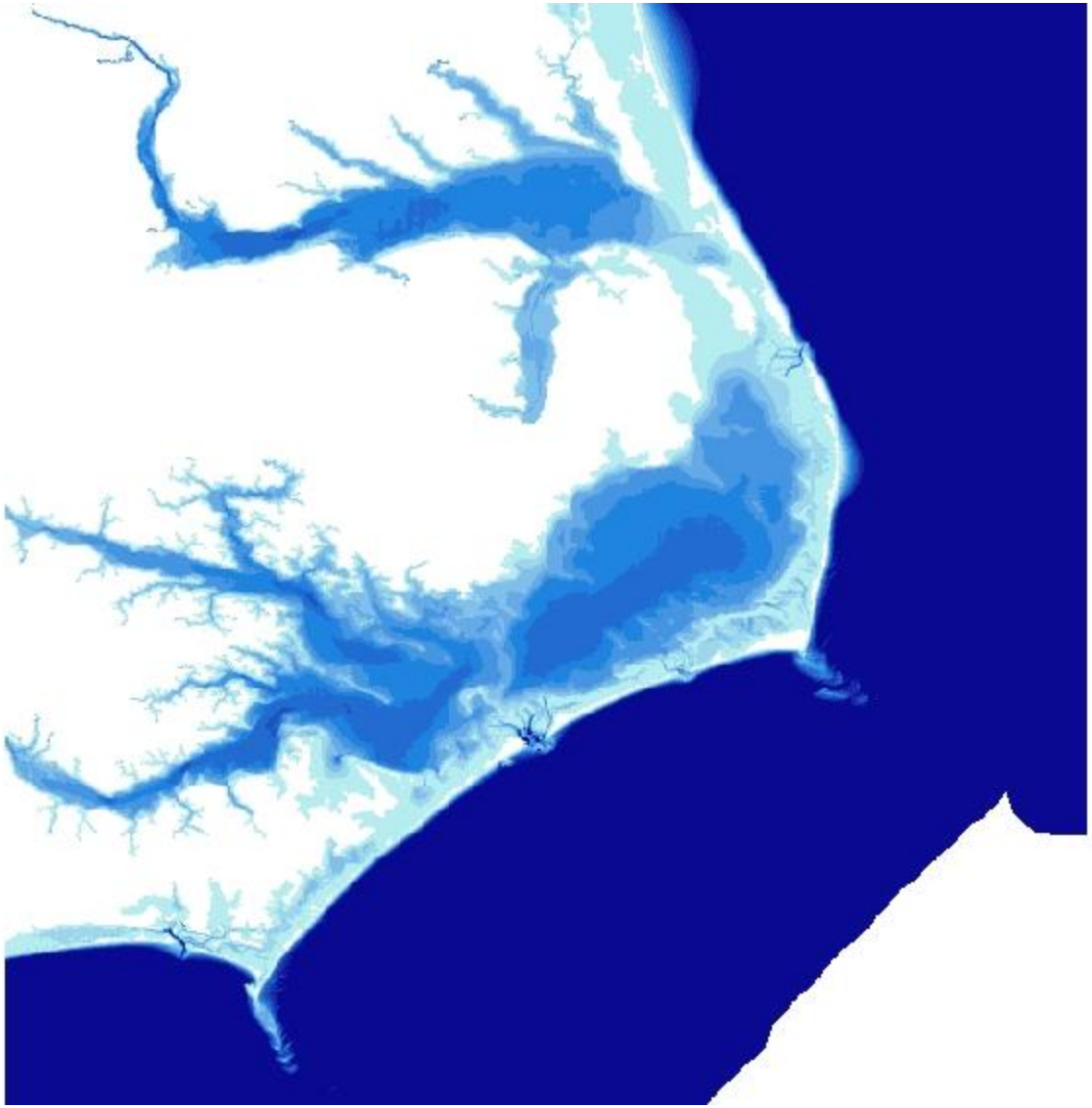

Acquisition
• Continuous sampling during ferry hours
• Ferry based YSI & ISCO
Download
• Nightly by modem
• File truncation and maintenance
Transfer
• Weekly to server
• Dated folders w/ raw data
Transformation
• Sorted 3 ways (1x 10-6, day, time)
• Filtered by SOG ≤ 6 knts
• Combine GPS & YSI
• Create tables for d-base
• include ISCO lab data
Visualization & Analysis
• spatial & temporal
• YSI, ISCO
• GIS based
• time series plots
time series maps
interpolated maps
other data layers
Management
• Works with transformation
• Relational data-base (e.g. MS Access)
• Output queries, forms, tables
Applications
• Satellite ground truthing
• Spatial & temporal trends
• Modeling & analysis
• Web based distribution
FerryMon Data Management
FerryMon
UNC-CH•DUKE•NCDENR•NCDOT


temperature (C)
salinity (psu)
chlorophyll (ug L-1)
distance from Cedar Island (km)
30
20
10
0
5/1/01
5/14/01
5/28/01
6/11/01
6/25/01
30
25
20
15
30
25
20
15
15
10
5
0

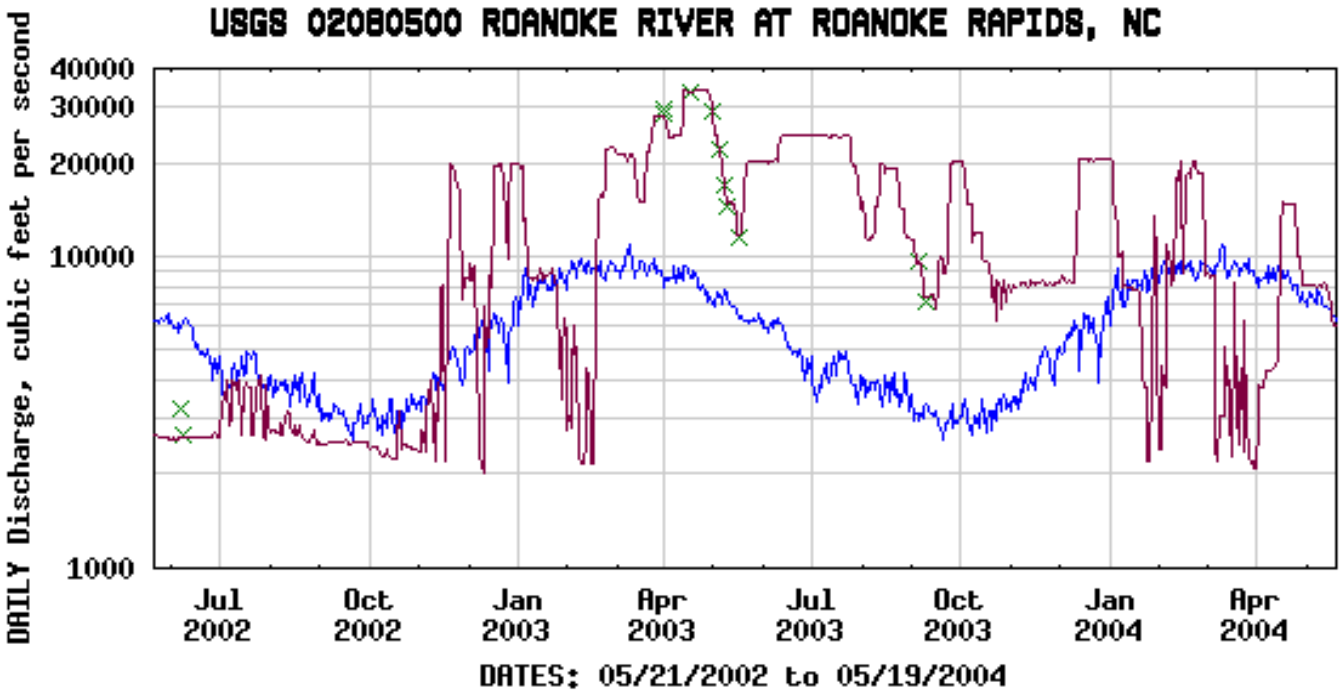
FerryMon Detects a Transient Inlet to the Pamlico Sound.

“I knew Hurricane Floyd --- and Isabel you ain’t no Floyd.”


Hurricane Isabel
6-19 September 2003
Hurricane
Tropical Storm
Tropical Dep.
Extratropical
Subtr. Storm
Subtr. Dep.
Low / Wave
00 UTC Pos/Date
12 UTC Position
915 mb
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
50
45
40
35
30
25
20
15
10
-85
-80
-75
-70
-65
-60
-55
-50
-45
-40
-35
-30

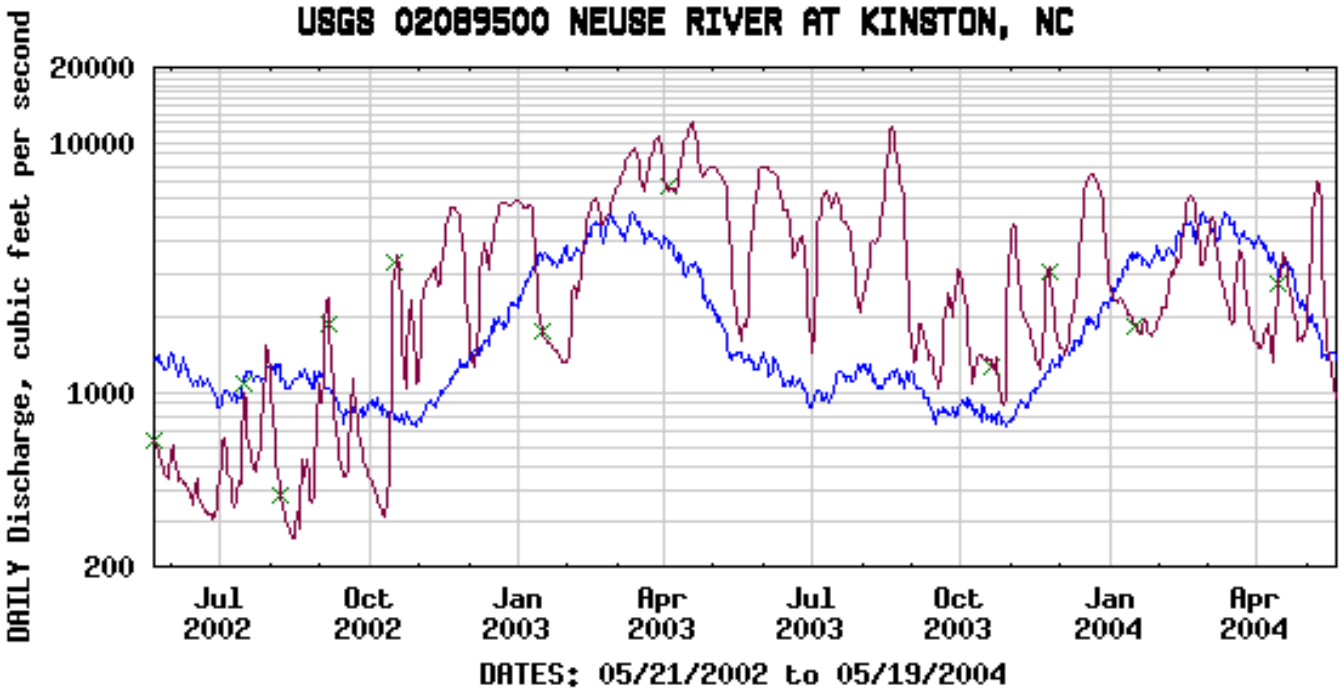


USGS

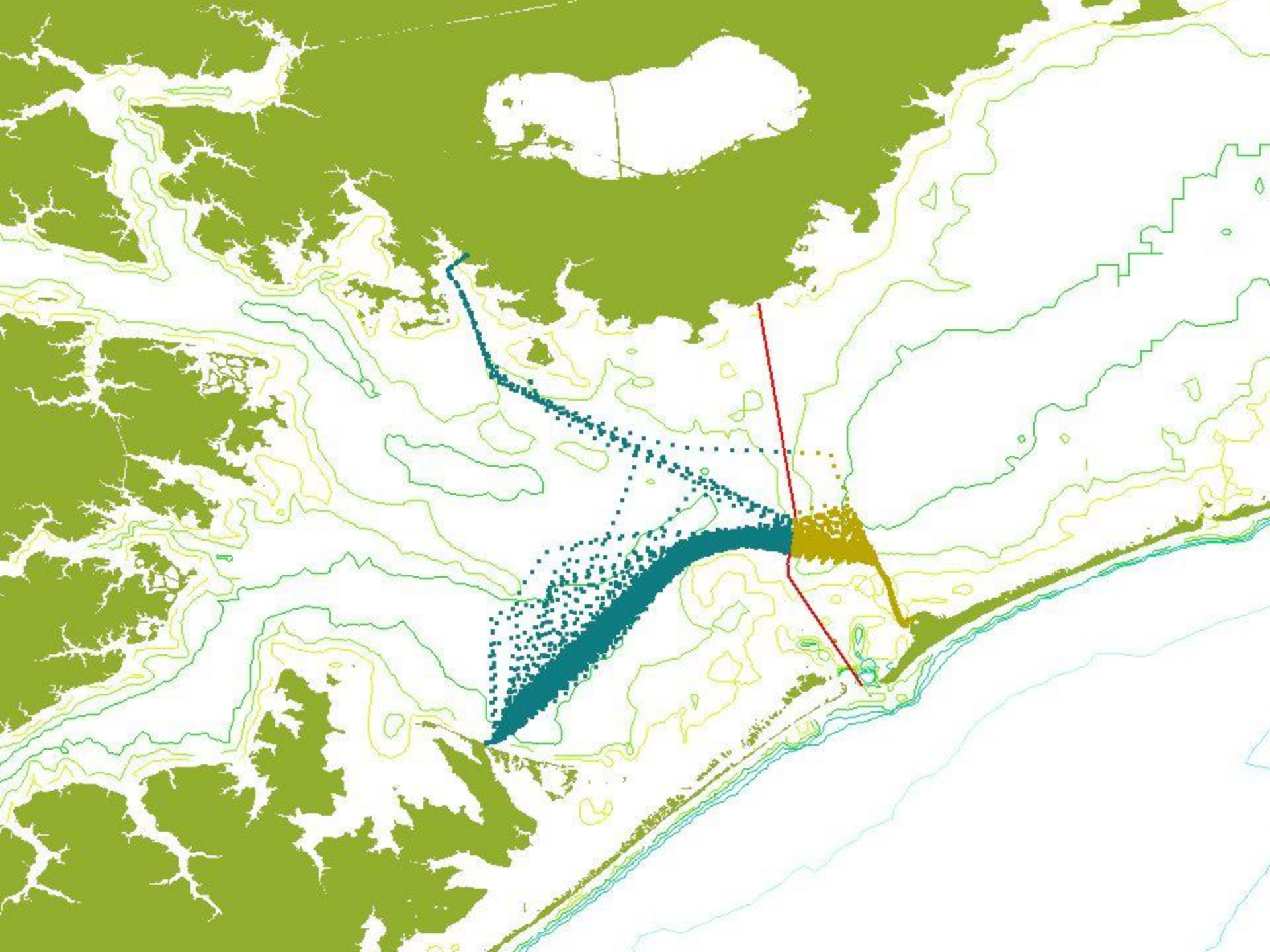


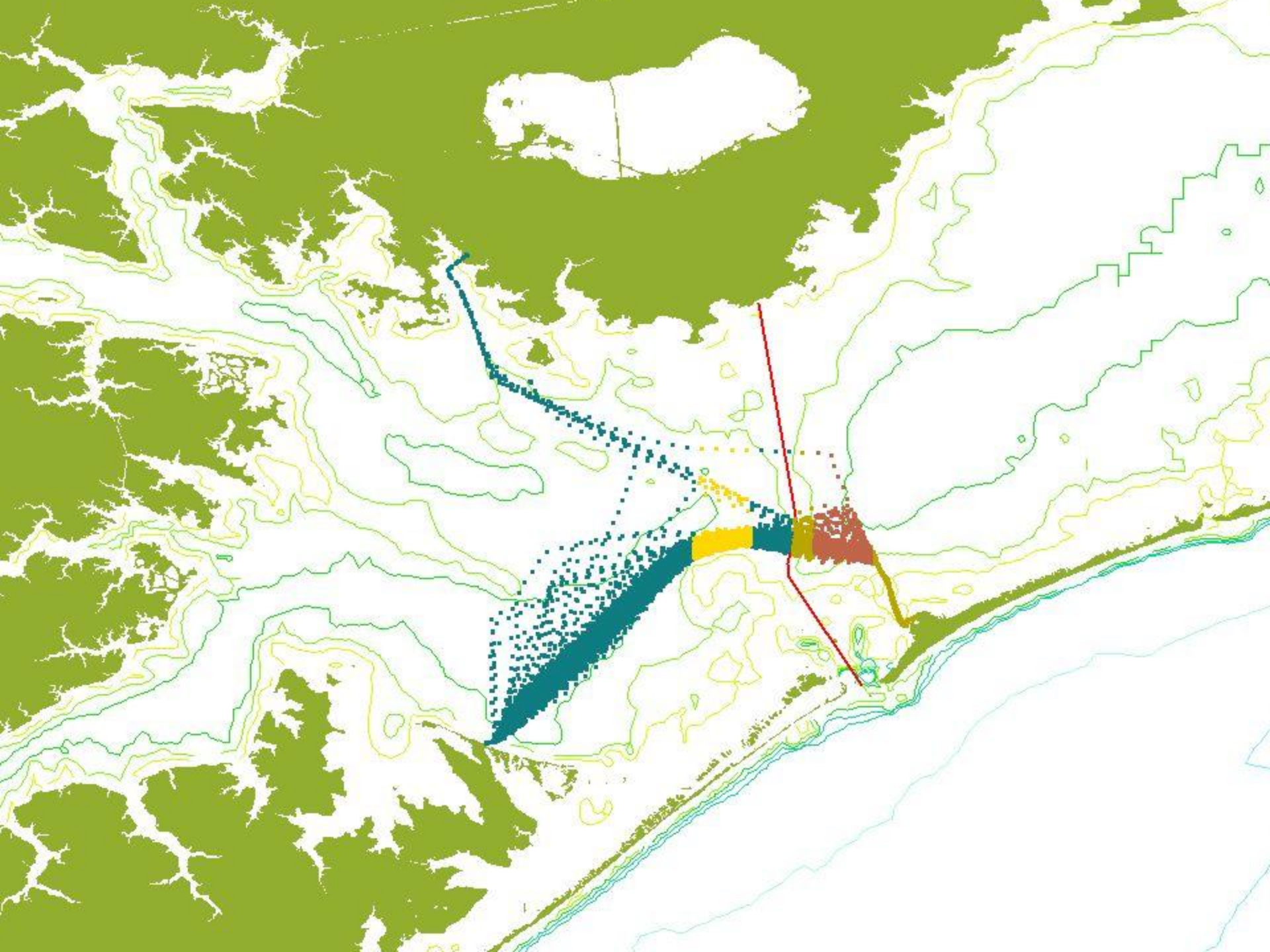
Provisional Data Subject to Revision

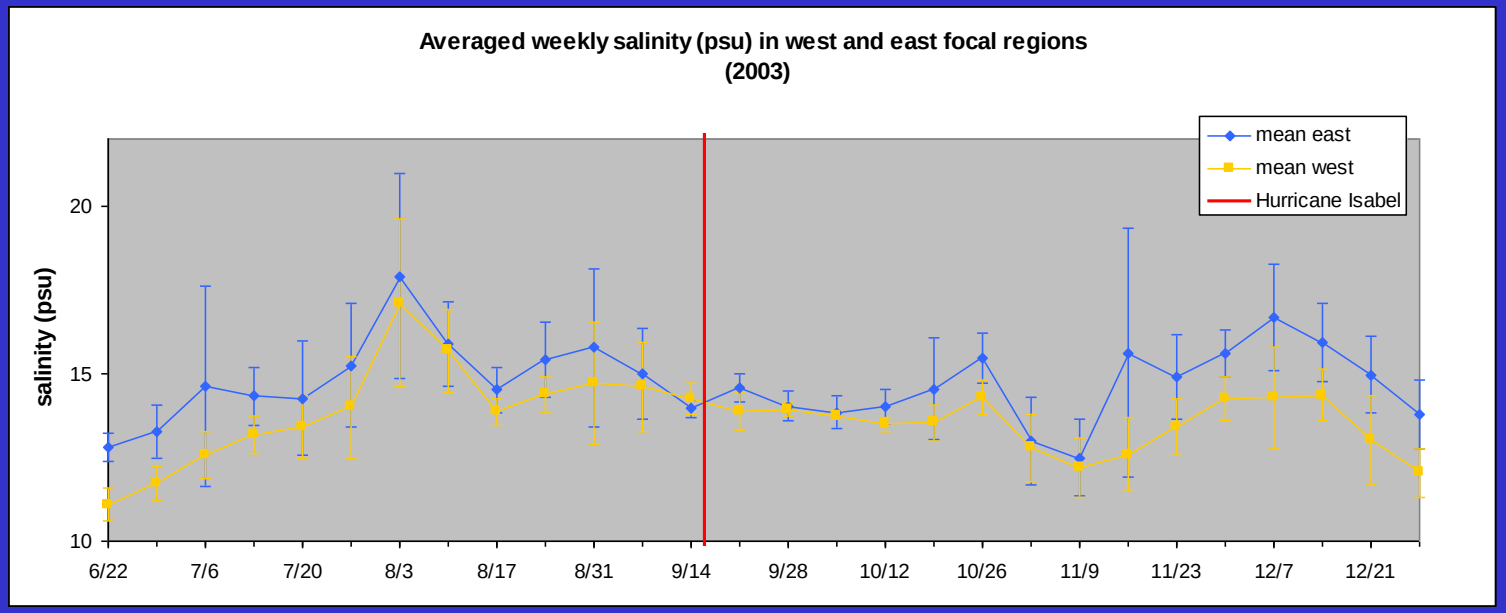
USGS

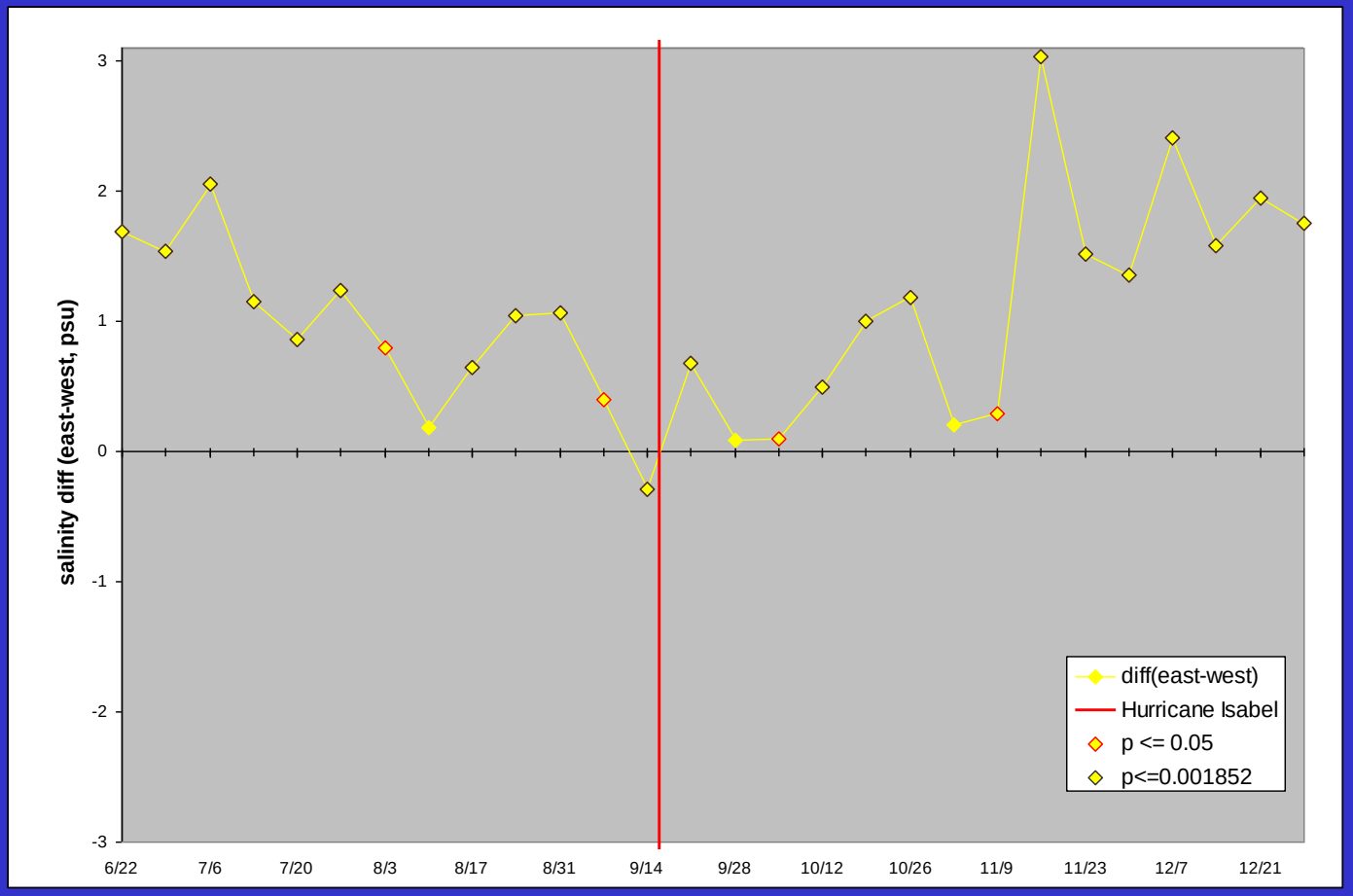


Provisional Data Subject to Revision






Averaged weekly salinity (psu) in west and east focal regions
(2003)
mean east
mean west
Hurricane Isabel
salinity (psu)
20
15
10
6/22
7/6
7/20
8/3
8/17
8/31
9/14
9/28
10/12
10/26
11/9
11/23
12/7
12/21


salinity diff (east-west, psu)
3
2
1
0
-1
-2
-3
6/22
7/6
7/20
8/3
8/17
8/31
9/14
9/28
10/12
10/26
11/9
11/23
12/7
12/21
diff(east-west)
Hurricane Isabel
p <= 0.05
p<=0.001852

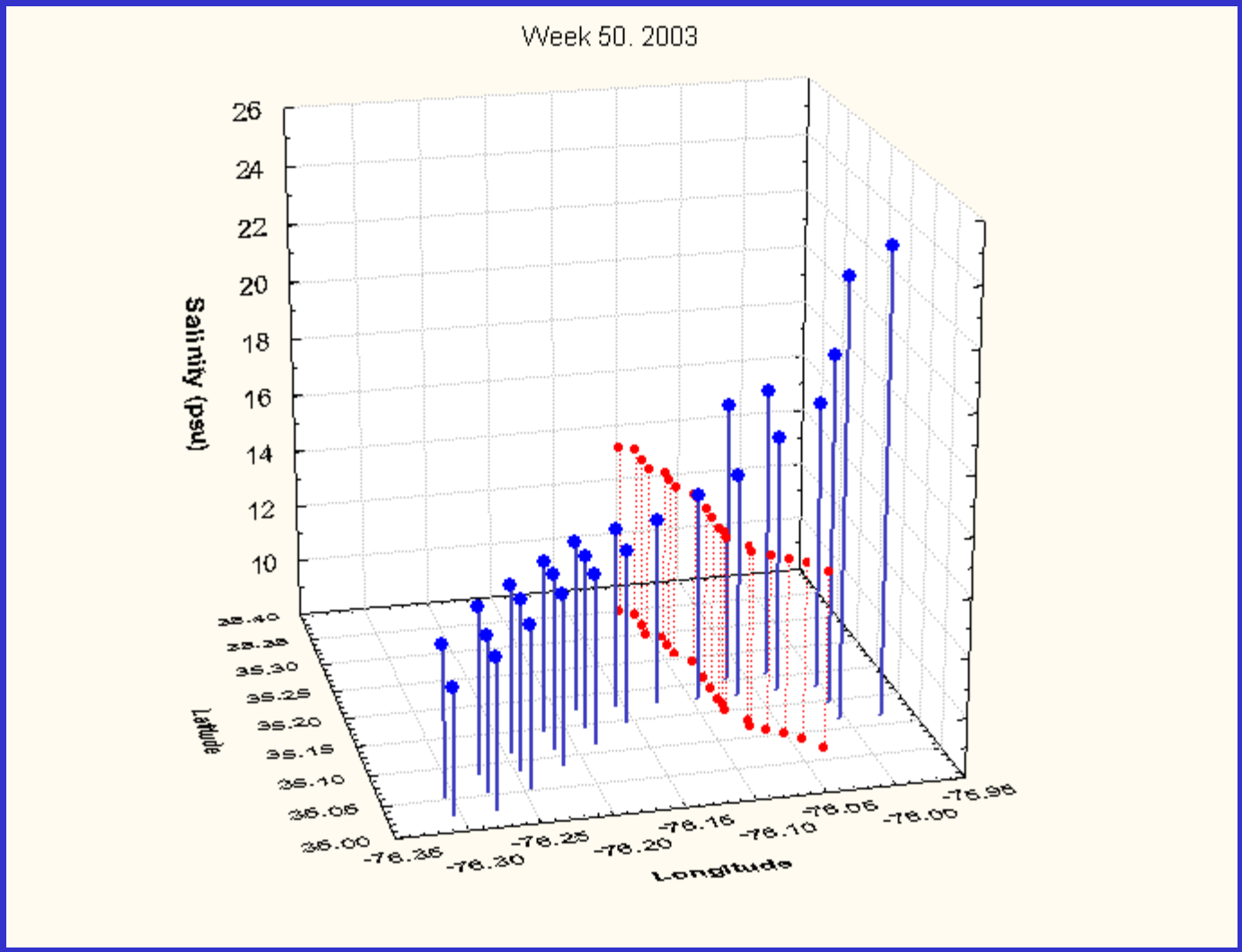
Attributes of the FerryMon observing platform:

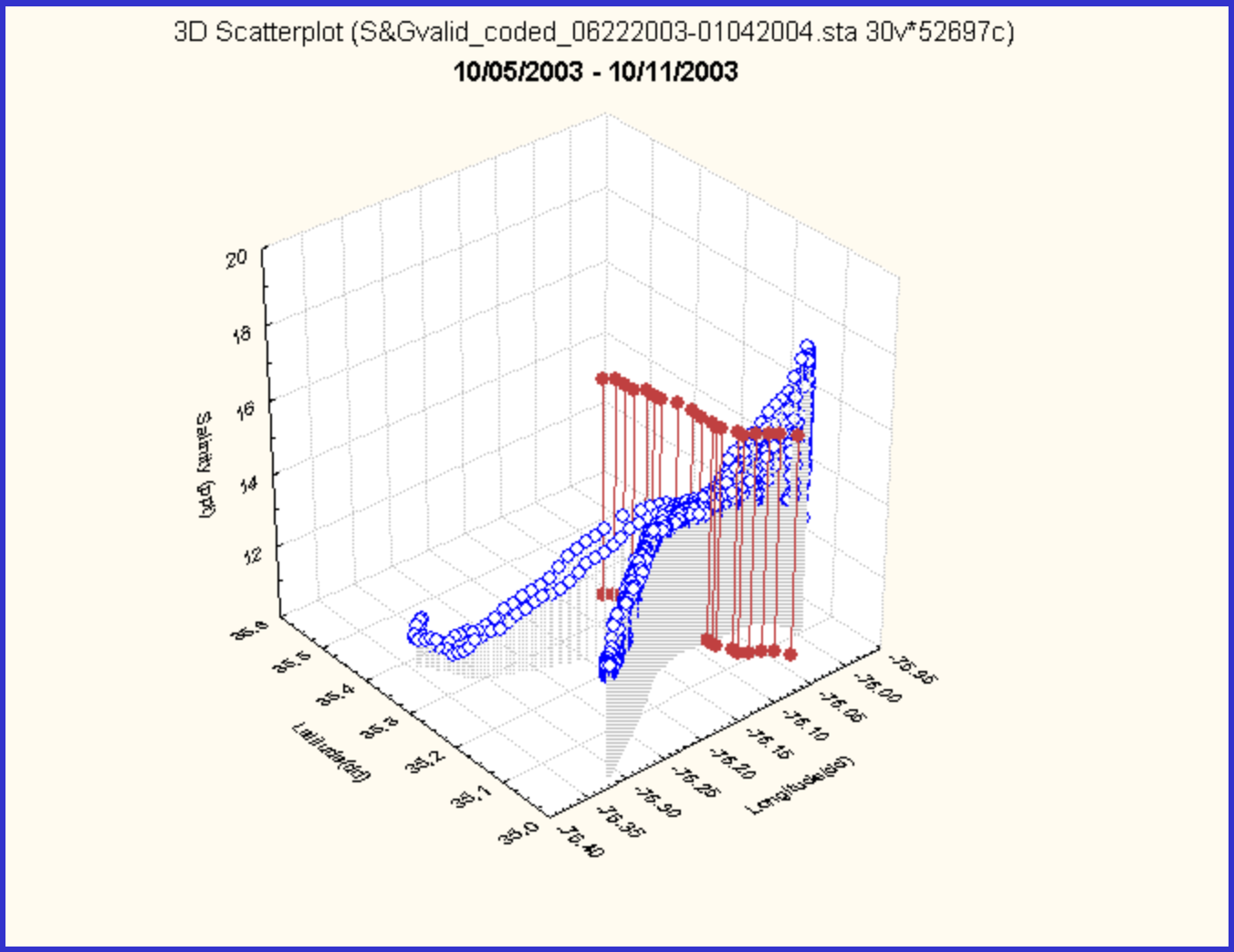
Positive (+)

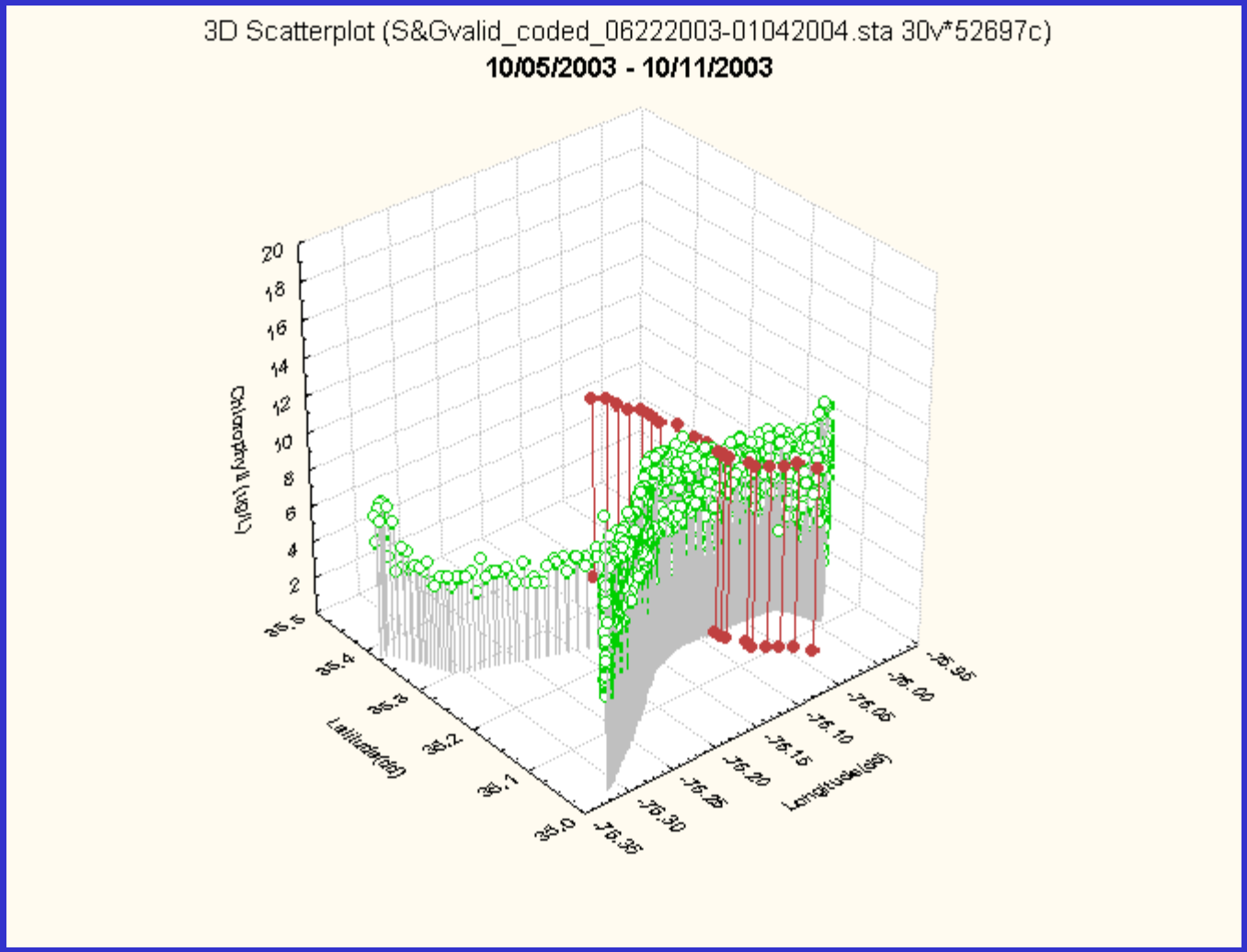
- High spatial and temporal resolution: 3 min., 0.8 km
- Repetitive in time and space: 24/7/52, year after year
- Captures the base, diel, tidal, synoptic, seasonal, annual and interannual scales
- Reliable: cease only when wind velocity > 40kts or dense fog
- Professionally maintained
- High quality: USCG certified to carry passengers for hire
- Free

Negative (-)

- One spatial dimension: surface waters along the route


Week 50, 2003
Salinity (psu)
26
24
22
20
18
16
14
12
10
Latitude
35.40
35.35
35.30
35.25
35.20
35.15
35.10
35.05
35.00
Longitude
-76.35
-76.30
-76.25
-76.20
-76.15
-76.10
-76.05
-76.00
-75.95


3D Scatterplot (S&Gvalid_coded_06222003-01042004.sta 30v*52697c)
10/05/2003 - 10/11/2003
Salinity (ppt)
20
18
16
14
12
Latitude (deg)
35.0
35.1
35.2
35.3
35.4
35.5
Longitude (deg)
-76.40
-76.35
-76.30
-76.25
-76.20
-76.15
-76.10
-76.05
-76.00
-75.95


3D Scatterplot (S&Gvalid_coded_06222003-01042004.sta 30v*52697c)
10/05/2003 - 10/11/2003
Chlorophyll (ug/L)
20
18
16
14
12
10
8
6
4
2
Latitude(deg)
39.5
39.4
39.3
39.2
39.1
39.0
Longitude(deg)
-76.35
-76.30
-76.25
-76.20
-76.15
-76.10
-76.05
-76.00
-75.95

Project Contributors

UNC-CH Marine Sciences Program
NC-DOT Ferry Division
Program
The NC -DENR
NC Sea Grant
Alltel
Duke University Marine Lab
Albemarle-Pamlico National Estuary
USGS
NOAA
YSI Environmental
NC Aquariums
US EPA National Exposure Research Laboratory
UNC - CH Environmental Sciences and Engineering
UNC Water Resources Research Institute
The Neuse River Estuary MODeling and MONitoring project (MODMON)
Atlantic Coast Environmental Indicators Consortium (ACEINC)
Carolina Environmental Program
NC Museum of Natural Sciences
NC Maritime Museum