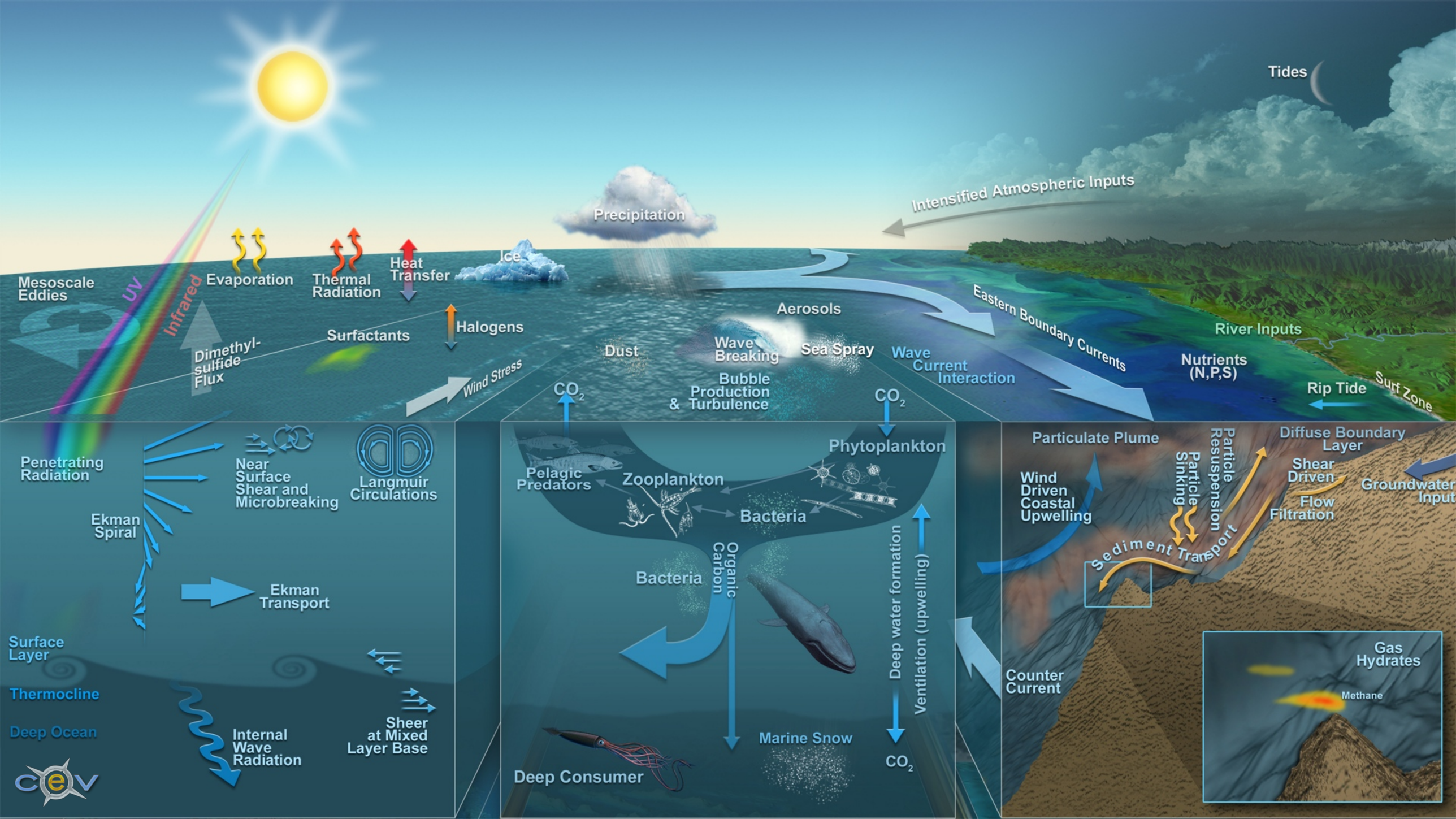
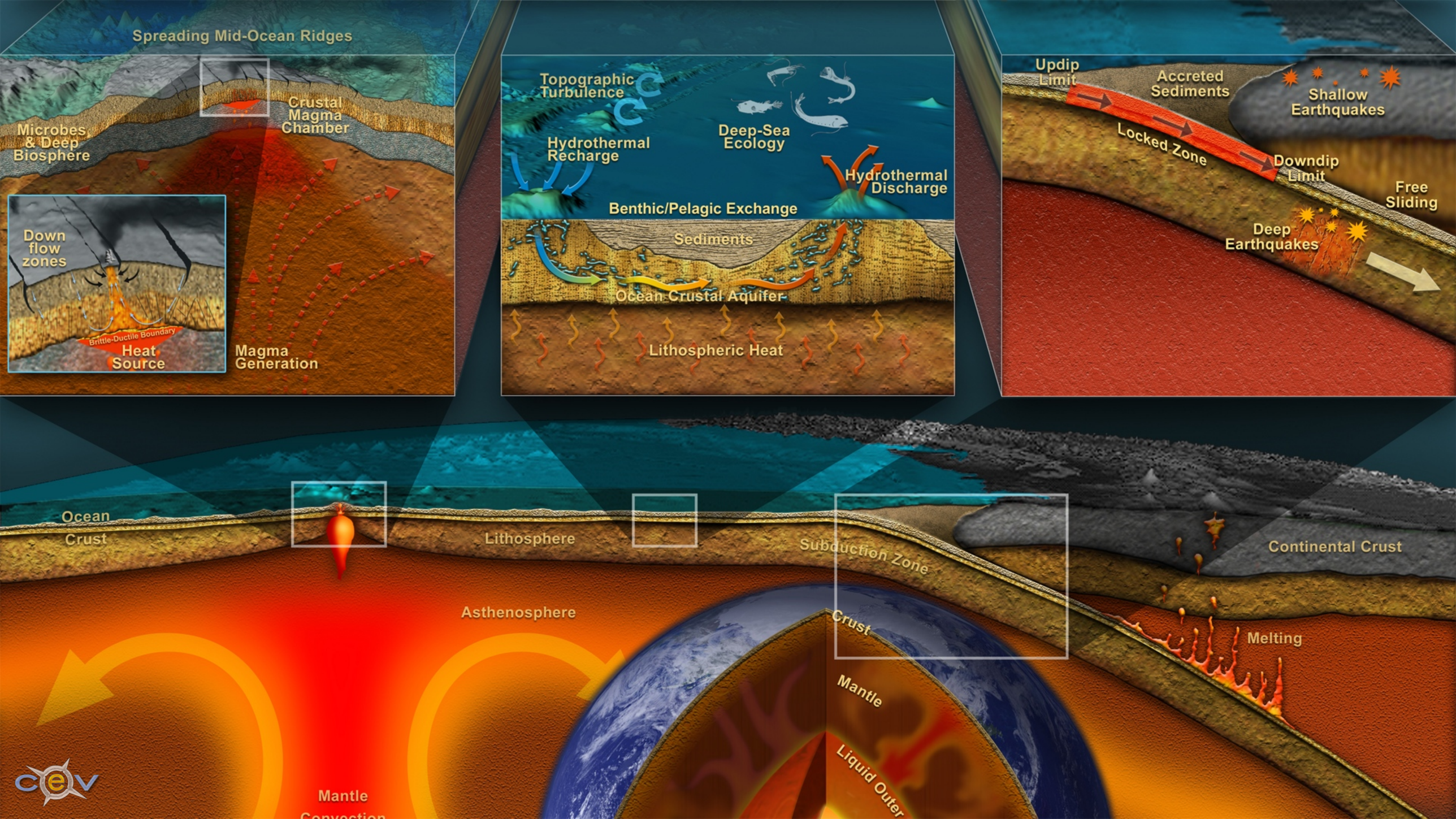
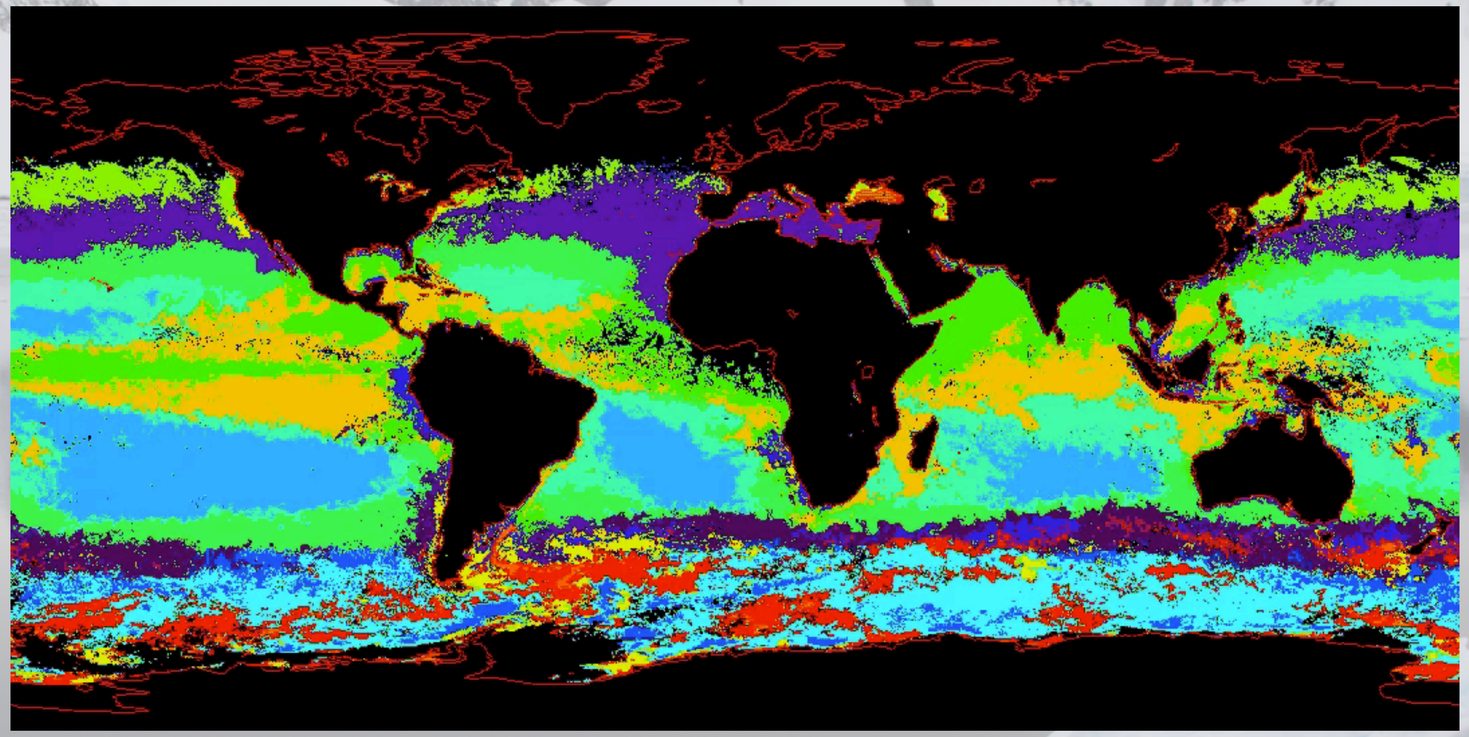
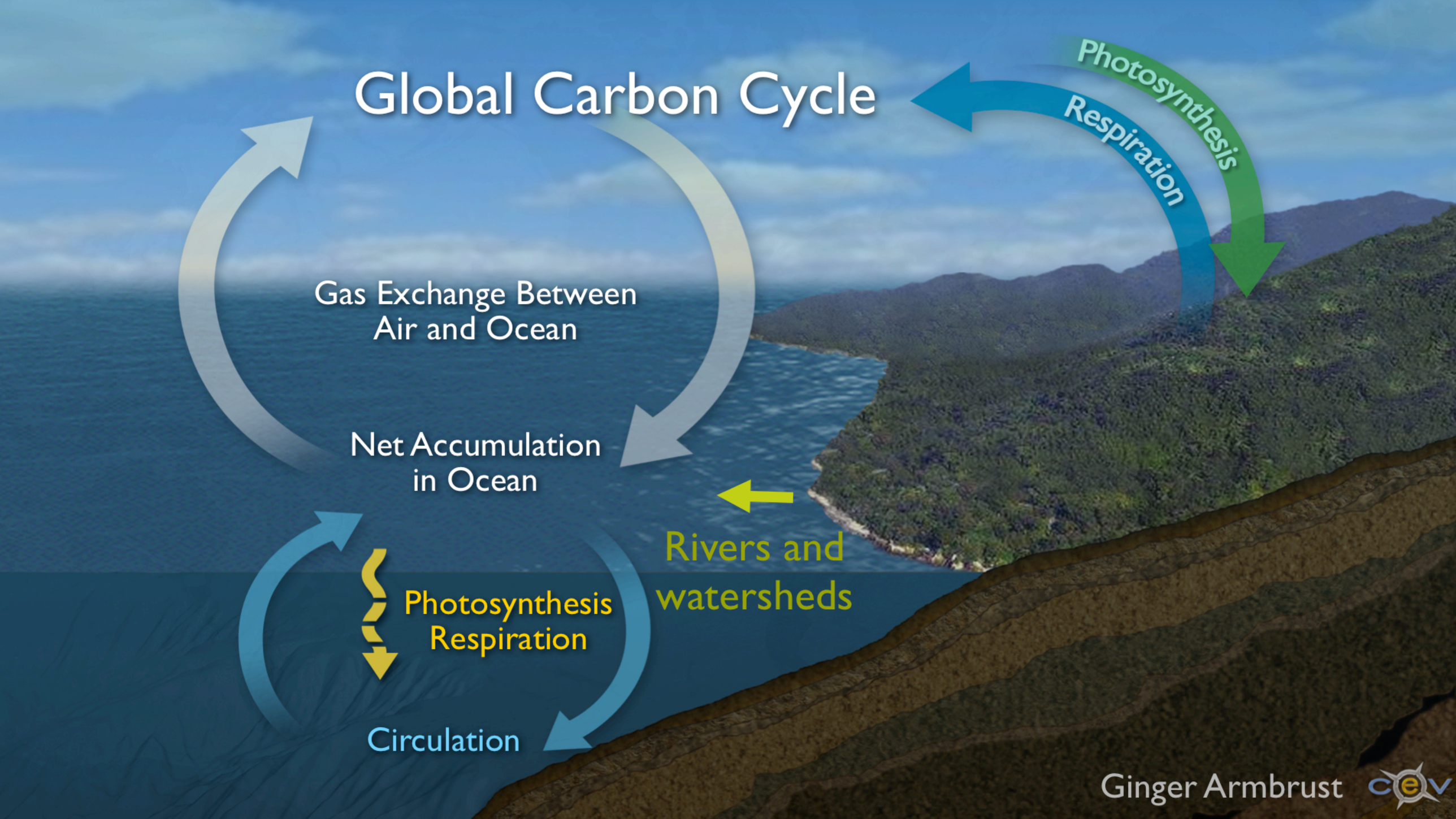
Changing ocean and changing technology

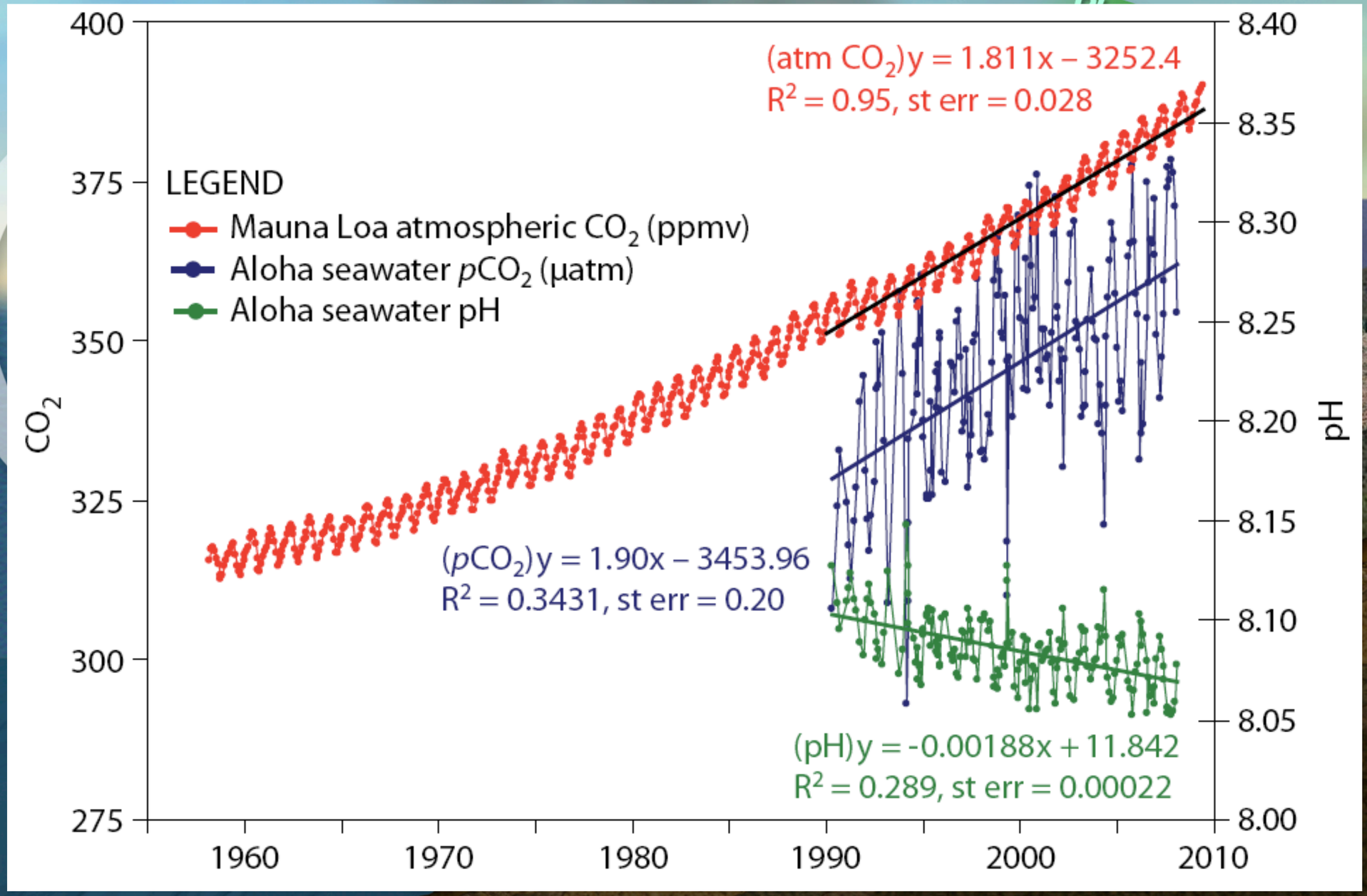
Oscar Schofield (rucool.marine.rutgers.edu)


Tides
Precipitation
Intensified Atmospheric Inputs
Mesoscale Eddies
UV
Infrared
Evaporation
Thermal Radiation
Heat Transfer
Ice
Halogens
Surfactants
Dimethyl-sulfide Flux
Wind Stress
Aerosols
Dust
Wave Breaking
Sea Spray
Bubble Production & Turbulence
Wave Current Interaction
Eastern Boundary Currents
River Inputs
Nutrients (N,P,S)
Rip Tide
Surf Zone
CO_2
CO_2
Penetrating Radiation
Near Surface Shear and Microbreaking
Langmuir Circulations
Ekman Spiral
Ekman Transport
Surface Layer
Thermocline
Deep Ocean
Internal Wave Radiation
Sheer at Mixed Layer Base
Phytoplankton
Pelagic Predators
Zooplankton
Bacteria
Bacteria
Organic Carbon
Deep water formation
Ventilation (upwelling)
Marine Snow
Deep Consumer
CO_2
Particulate Plume
Wind Driven Coastal Upwelling
Particle Sinking
Particle Resuspension
Sediment Transport
Diffuse Boundary Layer
Shear Driven
Flow Filtration
Groundwater Input
Counter Current
Gas Hydrates
Methane

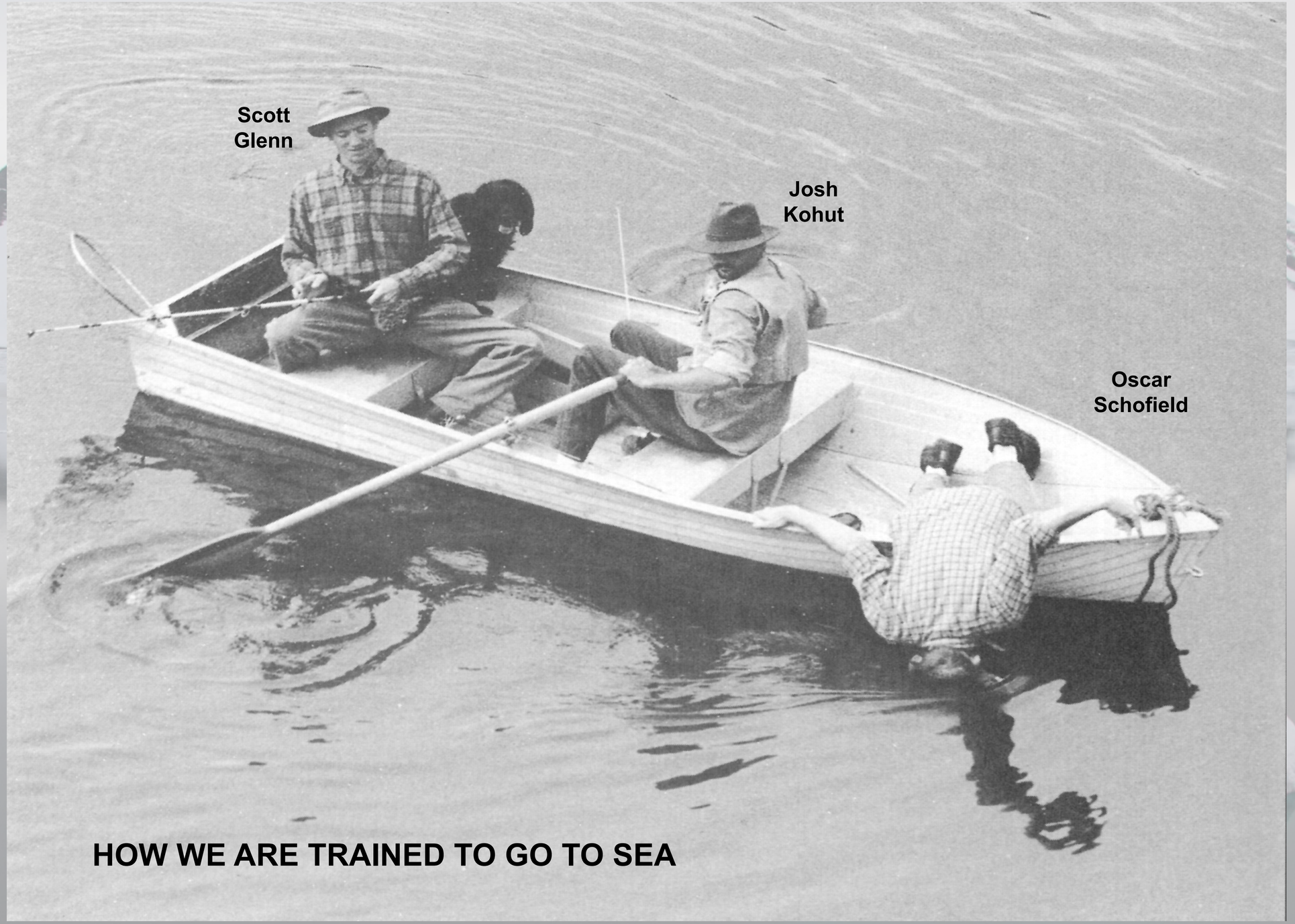

Spreading Mid-Ocean Ridges
Microbes & Deep Biosphere
Crustal Magma Chamber
Down flow zones
Brittle-Ductile Boundary
Heat Source
Magma Generation
Topographic Turbulence
Hydrothermal Recharge
Deep-Sea Ecology
Hydrothermal Discharge
Benthic/Pelagic Exchange
Sediments
Ocean Crustal Aquifer
Lithospheric Heat
Updip Limit
Accreted Sediments
Shallow Earthquakes
Locked Zone
Downdip Limit
Free Sliding
Deep Earthquakes
Ocean Crust
Lithosphere
Subduction Zone
Continental Crust
Asthenosphere
Crust
Mantle
Liquid Outer
Melting
Mantle Convection




Global Carbon Cycle
Photosynthesis
Respiration
Gas Exchange Between
Air and Ocean
Net Accumulation
in Ocean
Rivers and
watersheds
Photosynthesis
Respiration
Circulation
Ginger Armbrust

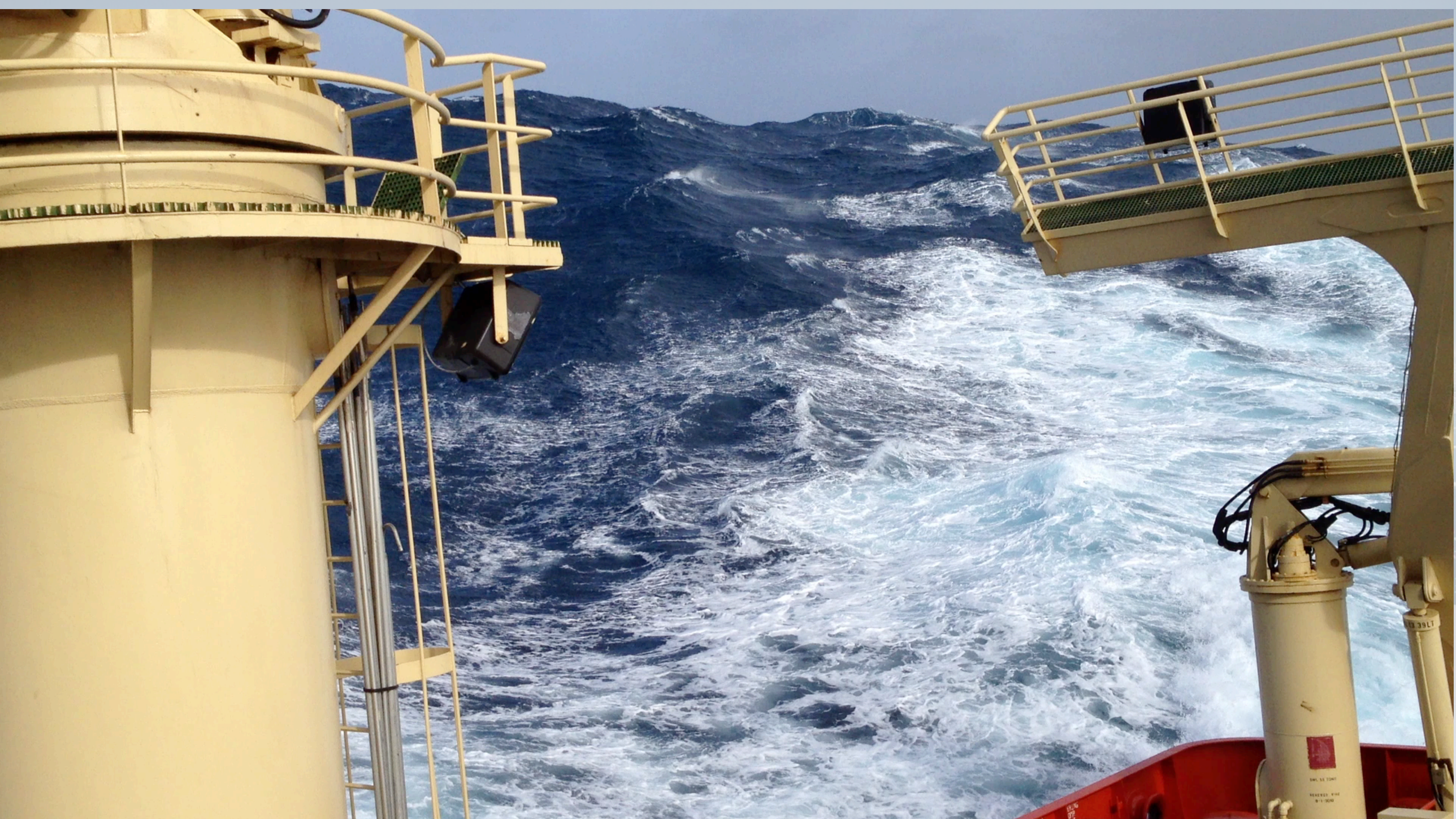


Ginger Armbrust



HOW WE ARE TRAINED TO GO TO SEA

Ocean is hard to sample



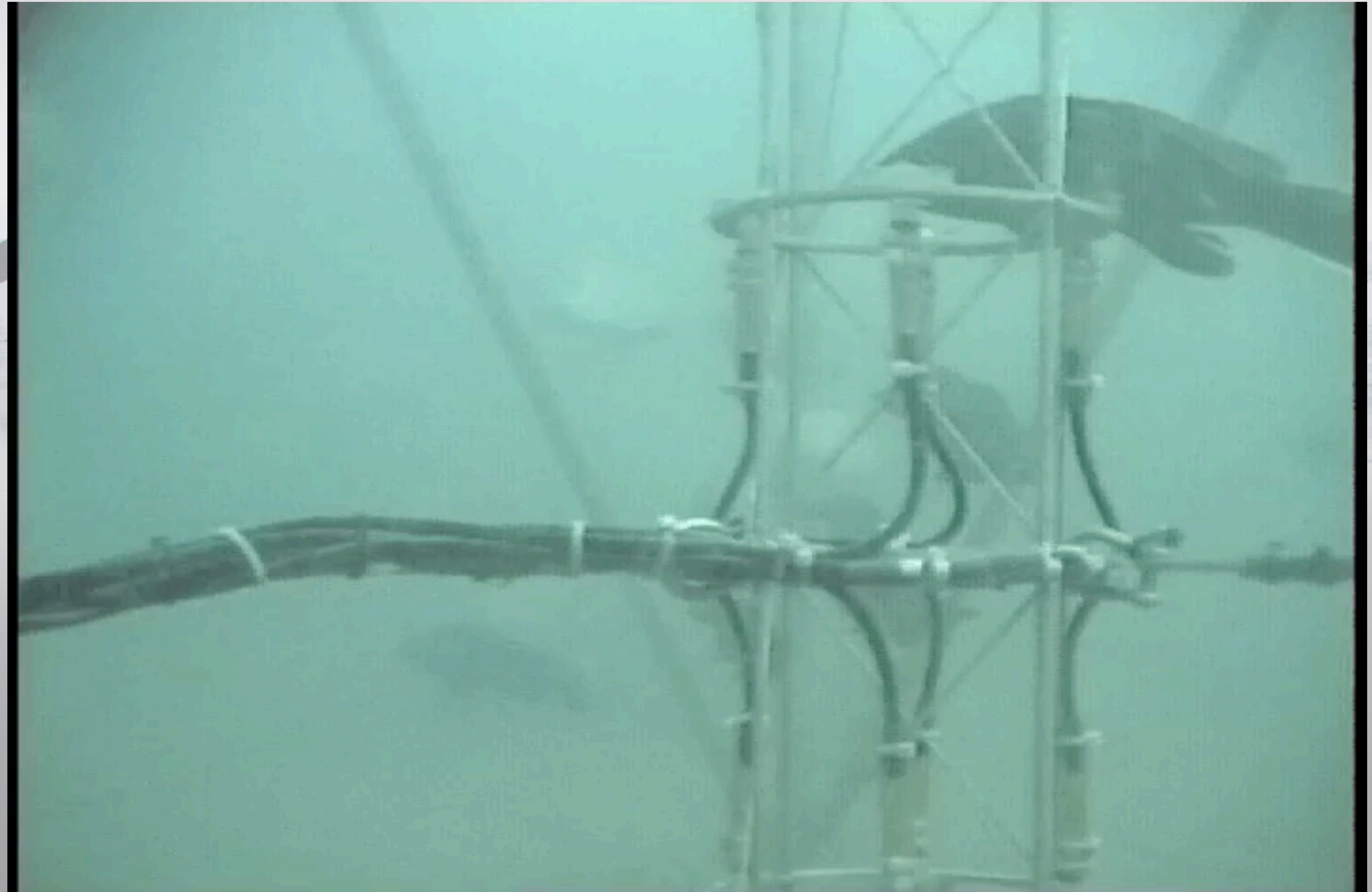
NEW WIRE
NSF

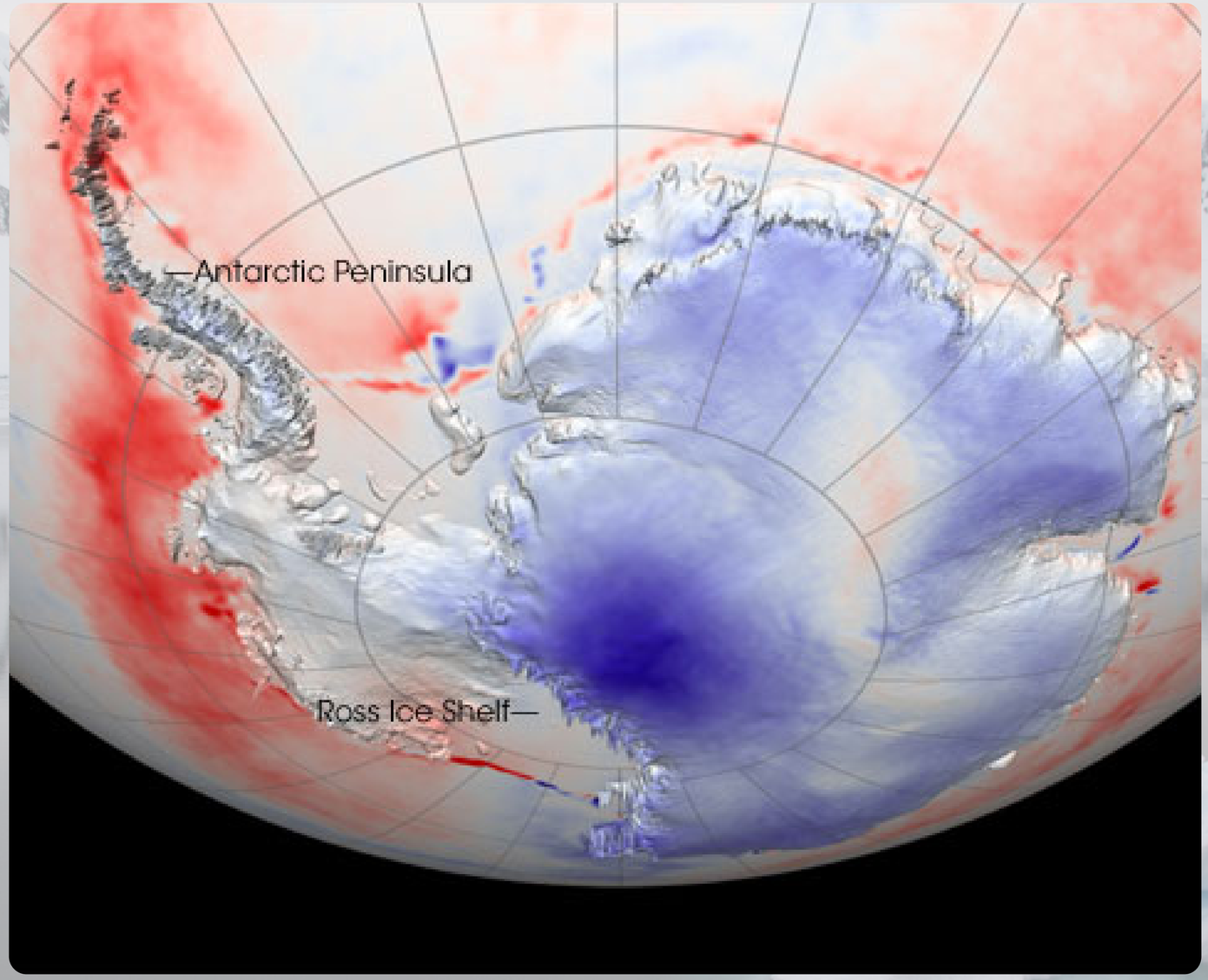
Sediment Transport Studies at LEO Site –early 1990's

Benthic Acoustic Stress Sensor (BASS) Tripod
Before and After Summer Deployment at LEO

BASS Tripod
For LEO-15

Late 1990's

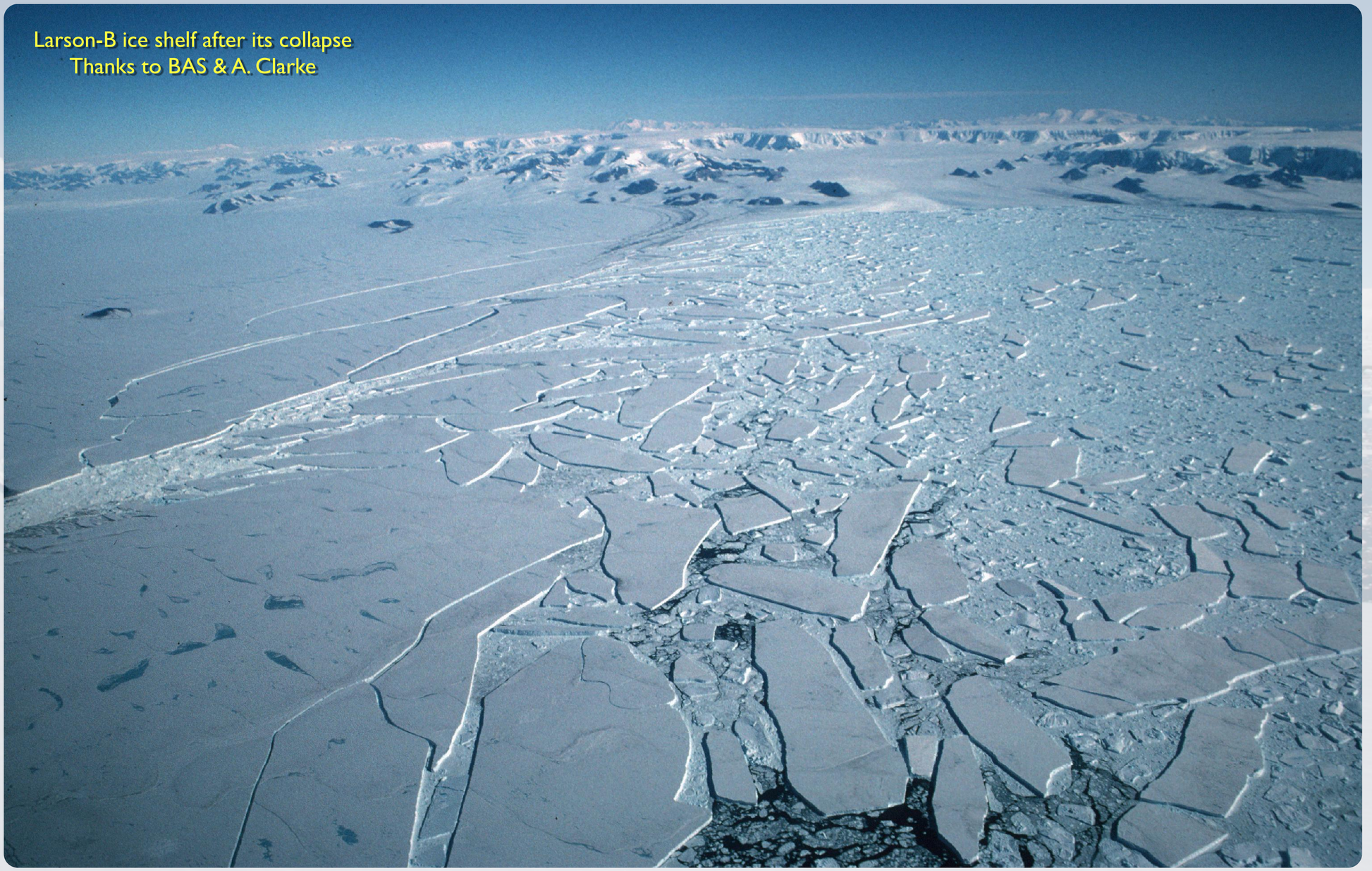




Temperature Trends (degrees C per year)

-0.2 0.2

The WAP peninsula is experiencing the largest winter warming on Earth



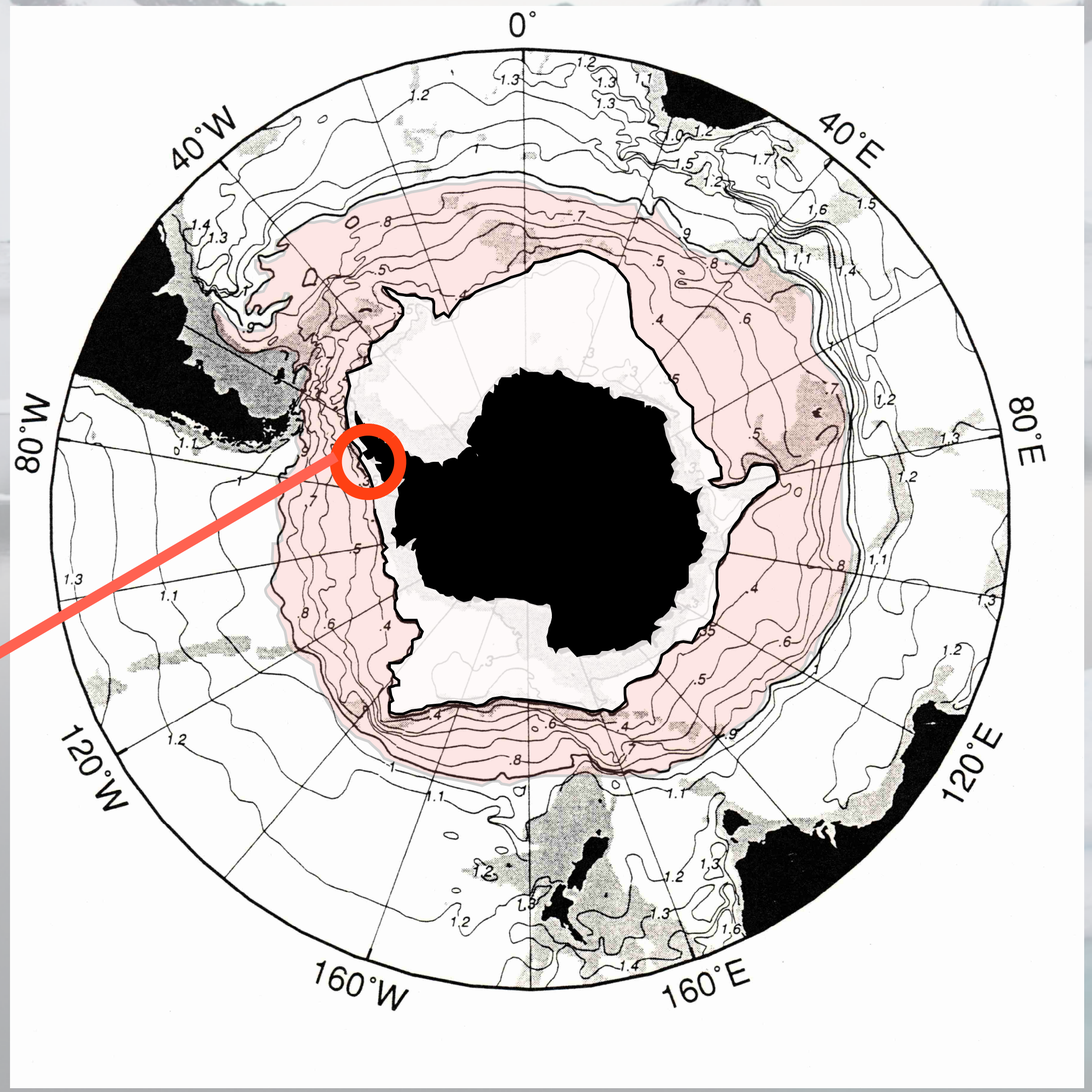
Melt pools on surface of King George VI Sound

(from a BAS twin otter, January 2004)

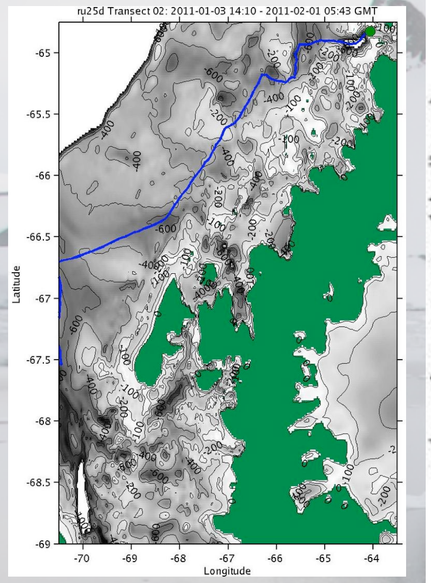
Palmer Station in the present
photo by Bill Fraser

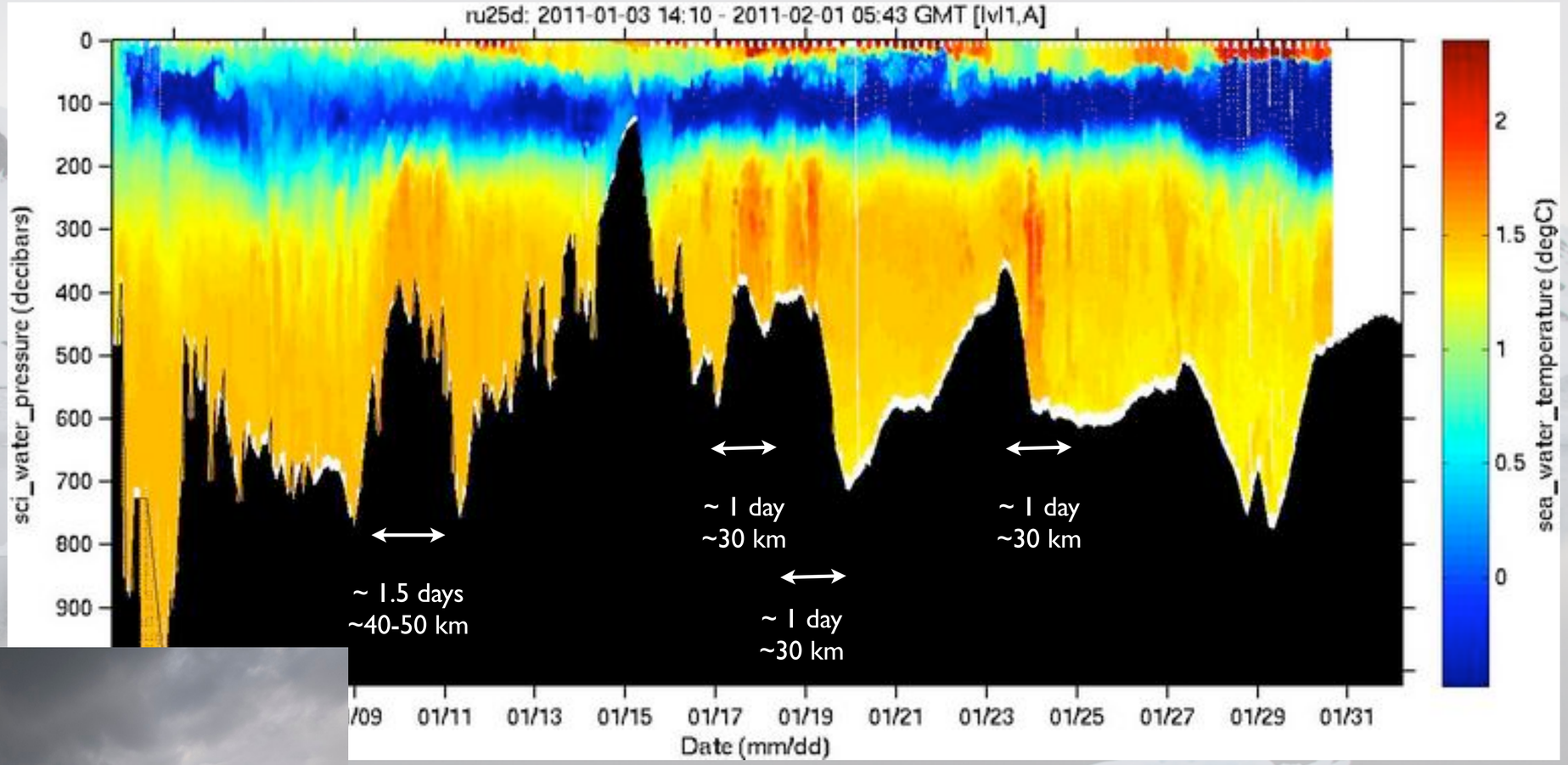
Plants at Palmer Station, the greening of Antarctica

Heat input from Antarctic Circumpolar Current (ACC - world's largest ocean current = ~30,000 Niagara Falls). The heat is driven onto the shelf by intensification of upwelling-favorable winds.



The WAP is the only location in the Antarctic where the ACC is adjacent to the shelf break. The ACC is Antarctica's warmest water

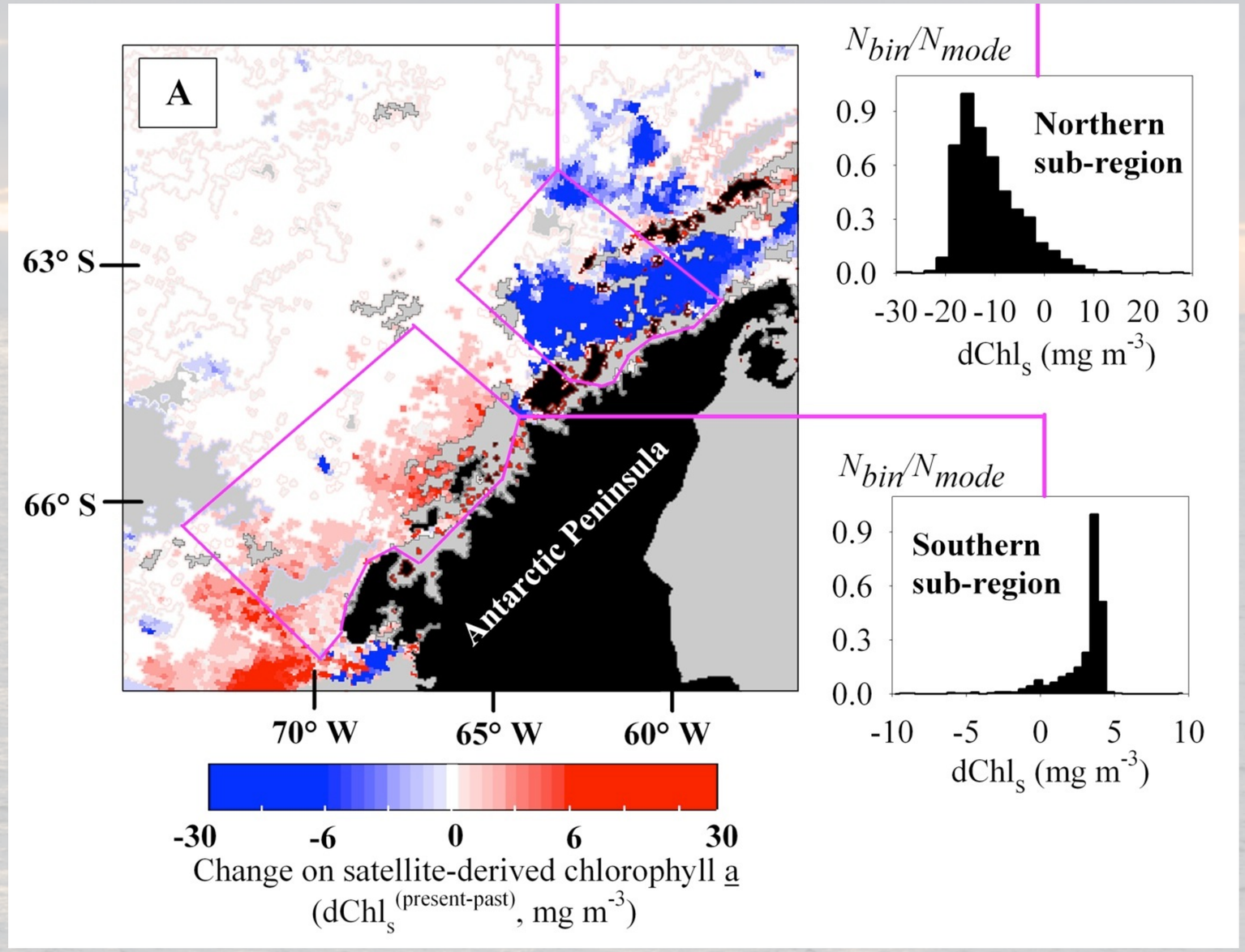




2011: Eddies moving across shelf?

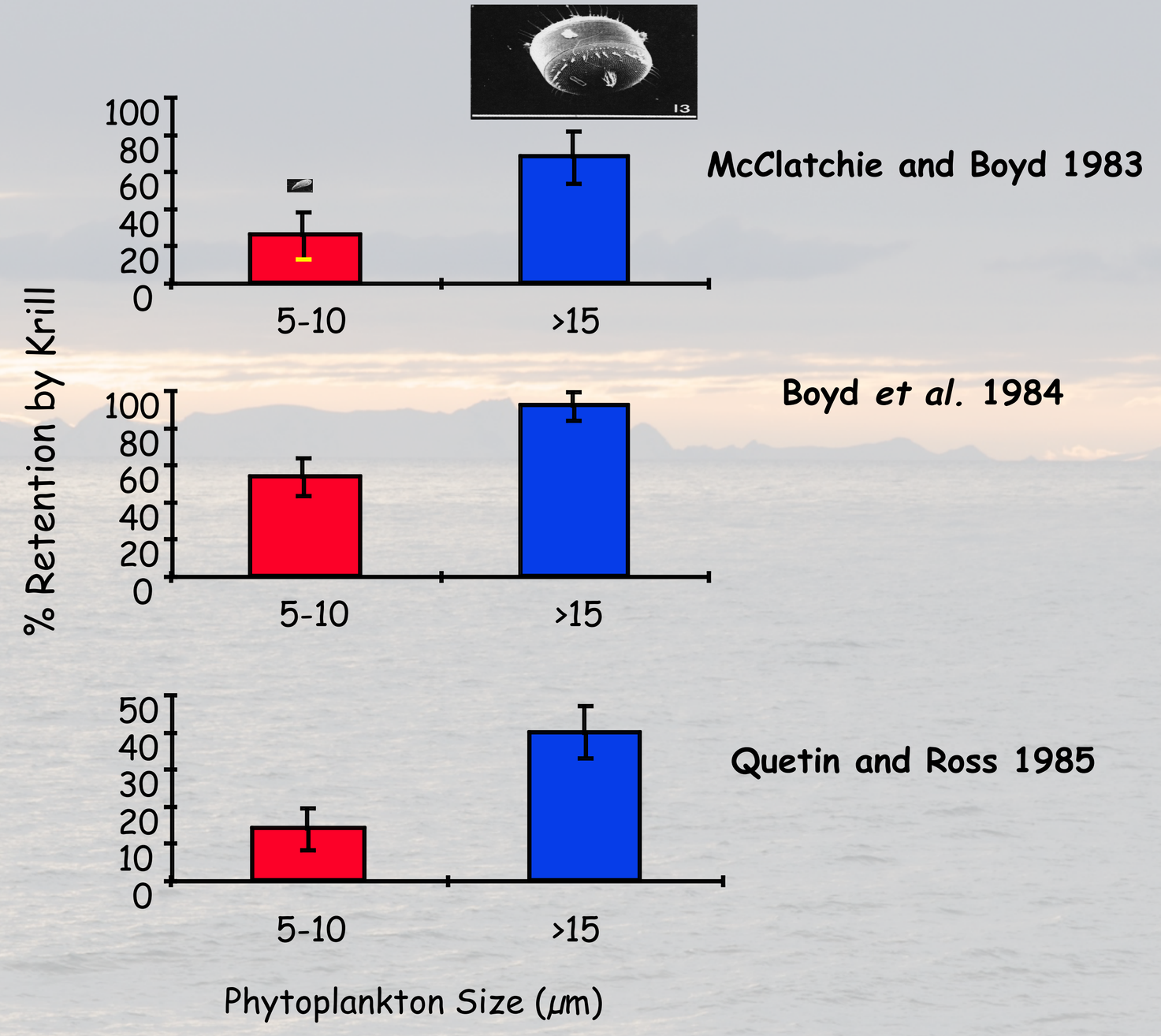
The decadal changes have resulted changes in the phytoplankton

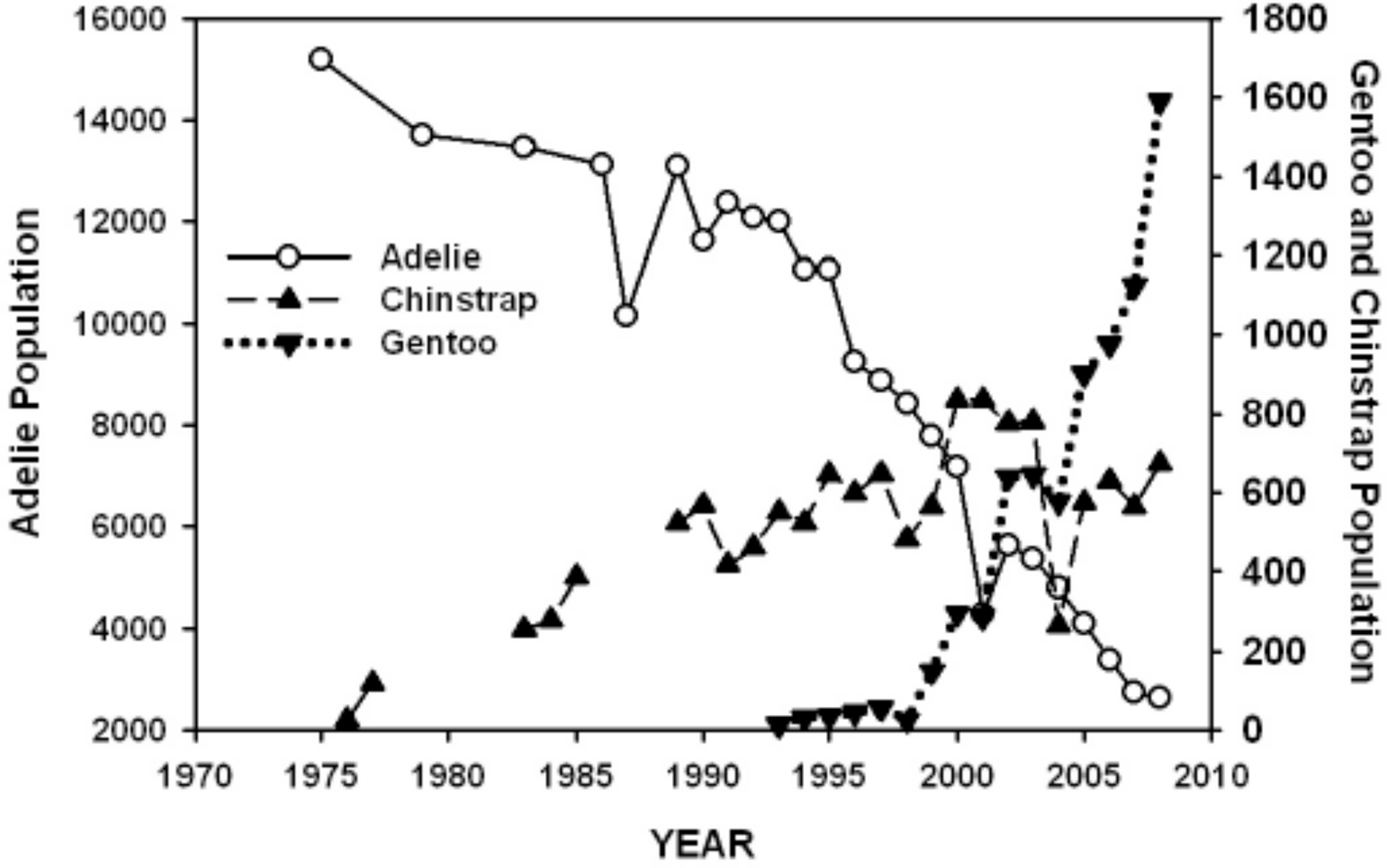
Montes Hugo et al. Science 2009

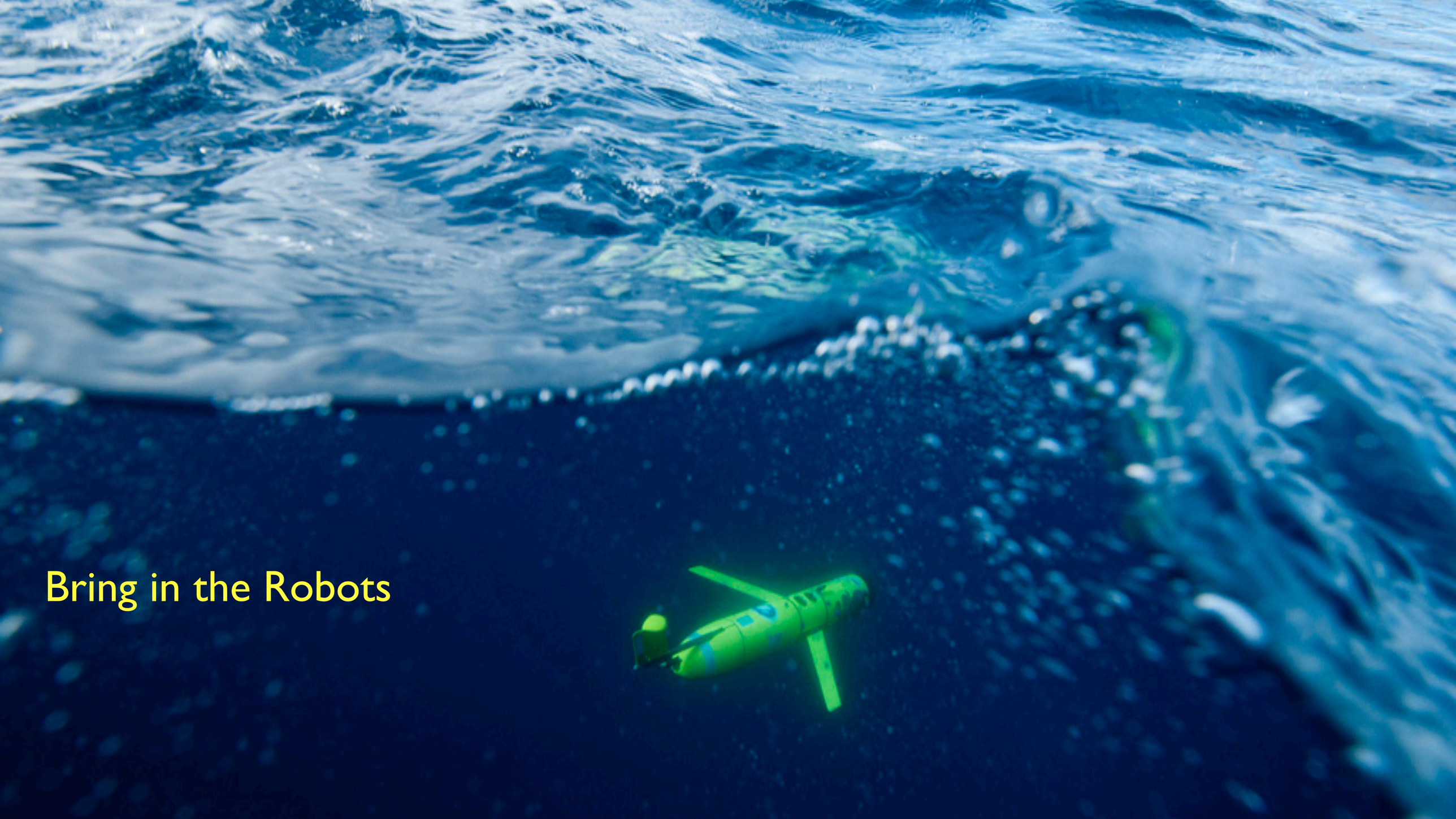


Zooplankton are dominated by krill or salps

Krill greatest biomass of any animal on earth


% Retention by Krill
100
80
60
40
20
0
5-10
>15
McClatchie and Boyd 1983
100
80
60
40
20
0
5-10
>15
Boyd et al. 1984
50
40
30
20
10
0
5-10
>15
Quetin and Ross 1985
Phytoplankton Size (μm)

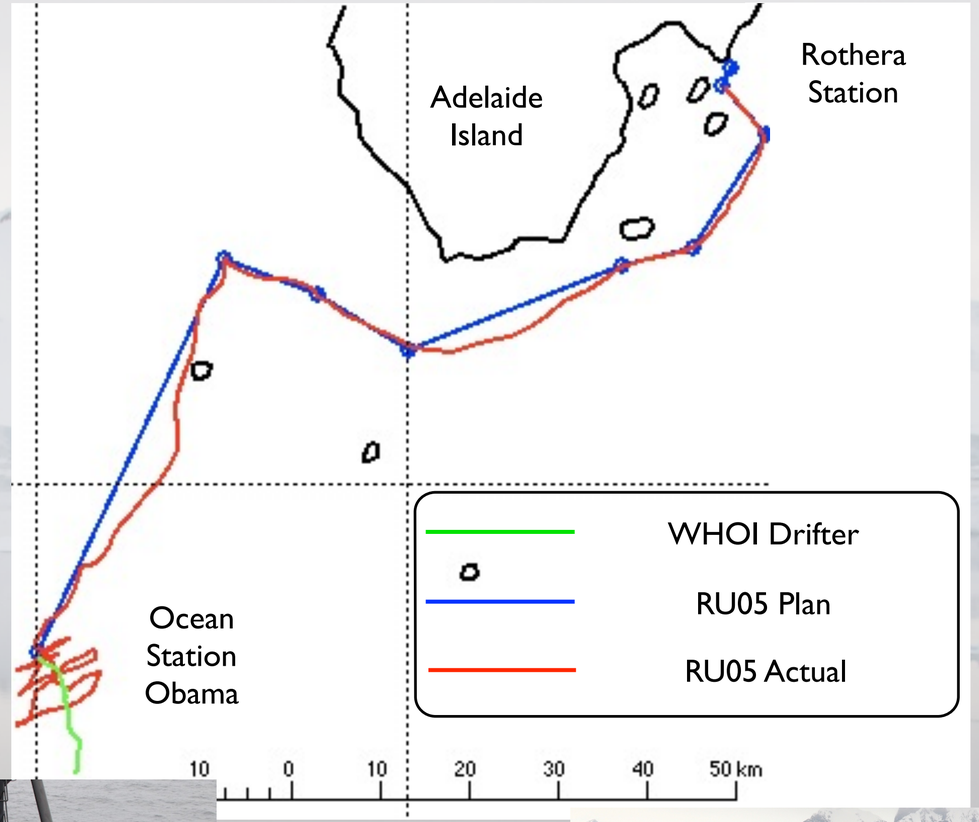

Adelie Population
Gentoo and Chinstrap Population
YEAR
Adelie
Chinstrap
Gentoo
16000
14000
12000
10000
8000
6000
4000
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1970
1975
1980
1985
1990
1995
2000
2005
2010


Bring in the Robots

Old Day Communication

HAM Operator Coms Palmer Station 1988

Brave New Day



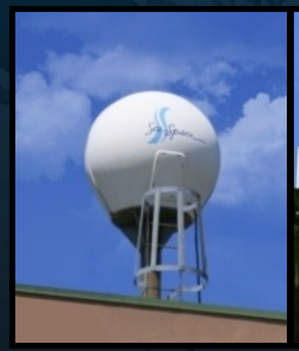
RV Gould

Rothera Base

Real time comms

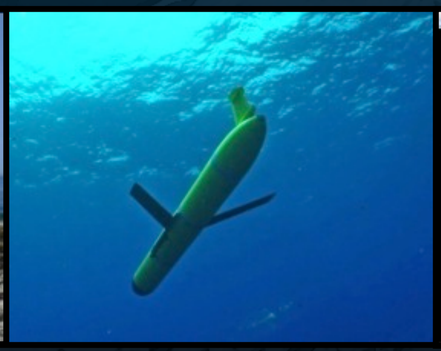
Rutgers COOLroom

The COOL Room

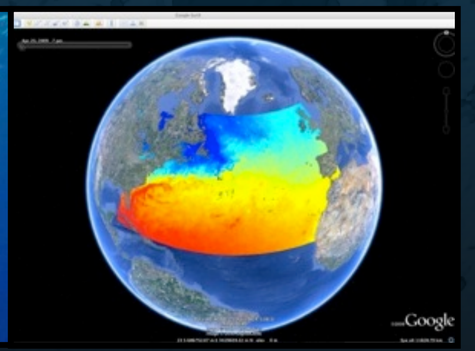


Satellite Data Acquisition Stations

CODAR Network

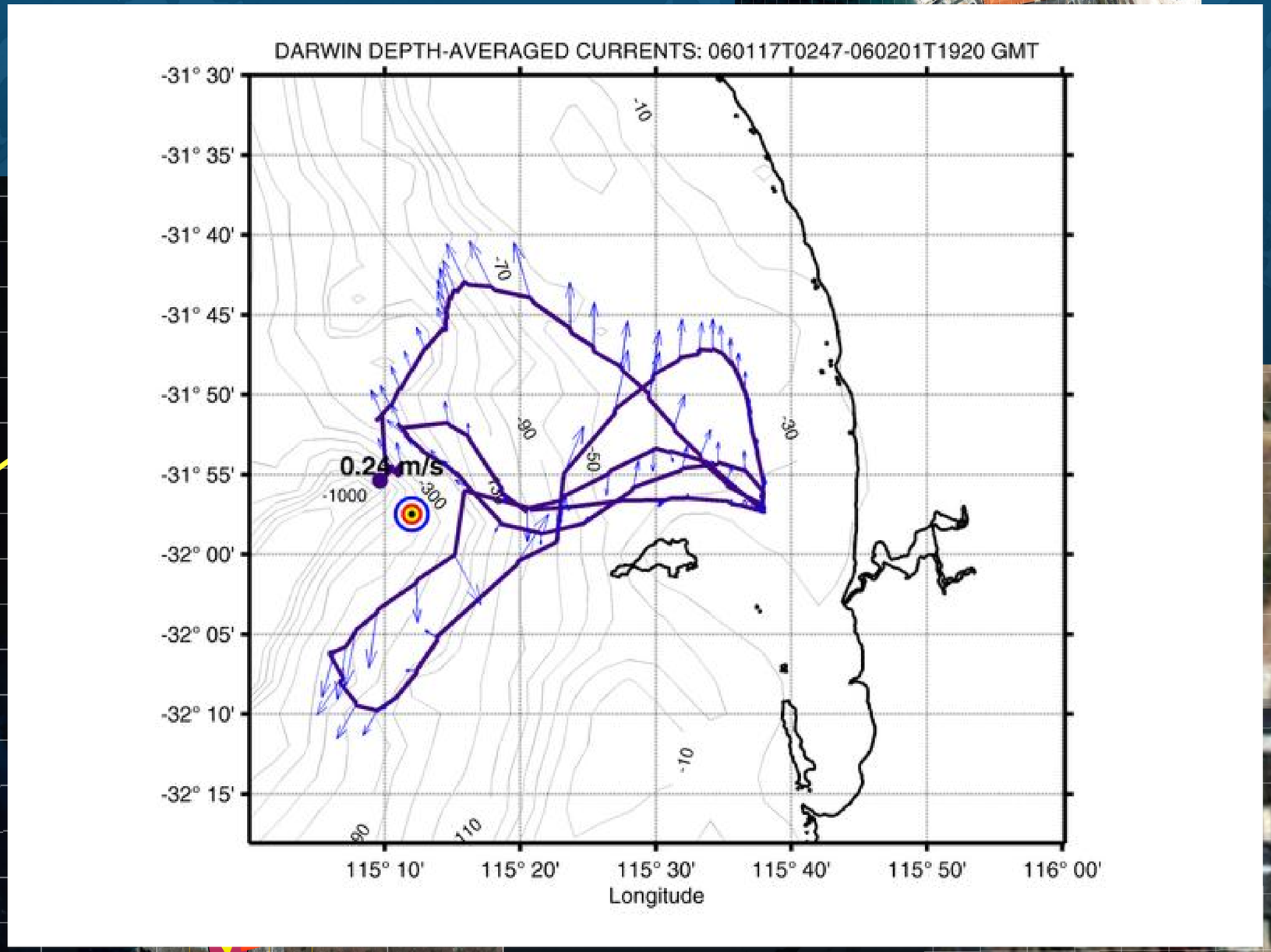


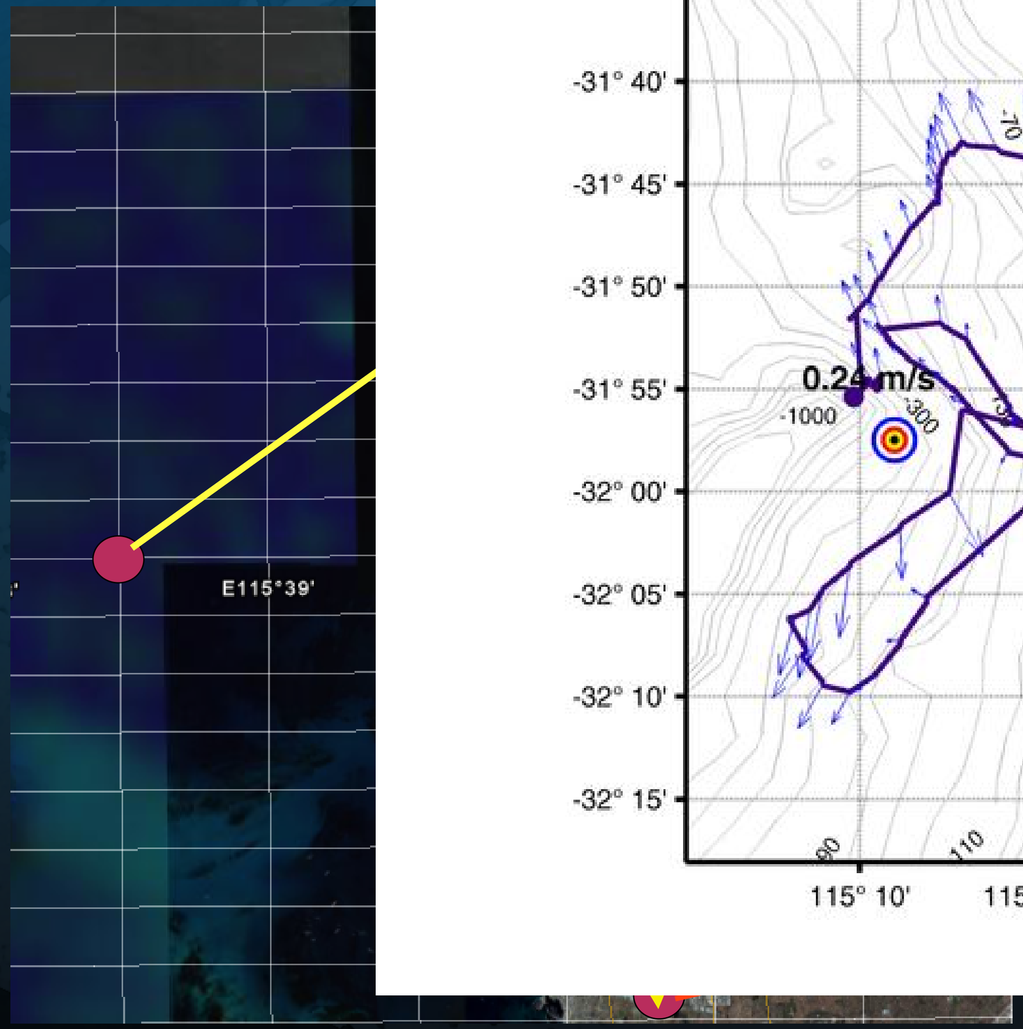
Glider Fleet

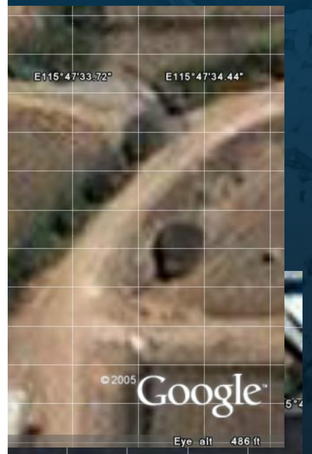


3-D Forecasts

Just another day in the Cool Room: Darwin's Odyssey







The new social media changes who and how people can be at sea? The cultural expt. continues

Atlantic Crossing

TELEDYNE WEBB RESEARCH
A Teledine Technologies Company

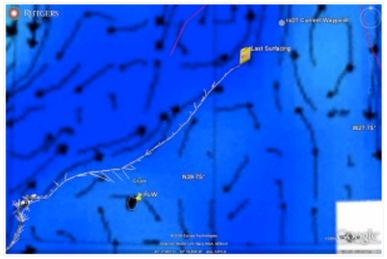
RUTGERS UNIVERSITY

Previous Entries

07 sep **Scarlet turns towards Spain.**

Posted by: Scott in: Atlantic Crossing

As The Scarlet Knight heads northeast, with current correction turned off, she is doing an amazing job of following the wiggles in the geostrophic currents. A great confidence builder for the roadmaps in the weaker currents of the filament field.



With the current now turning more to the east this morning, it was time to change the waypoint and start flying downstream towards Spain. The new path will take us across this northward flowing warm filament. Then when we cross the sea surface temperature front in about 160 km, we fly into the southward flowing cold filament. We repeat this filament crossing over and over again for about 6 times, and that will take us into the 200 nautical mile limit of Spanish waters. Distance to the Spanish coast just dropped to below 1700 km with today's noon surfacing. The black line on the eastern side of the image is 10 W, the north-south line the ships use for transiting the region. The 10 W line is something we should not approach or try to cross without local knowledge. We hope to contact our friends at Puertos del Estado http://www.puertos.es/en/index.html in Madrid in the morning (their afternoon) to start the strategy discussion.

▶ I-COOL Mission Blogs

- Atlantic Crossing
- Espresso & Biospace
- LTER Antarctic Summer
- Middle Atlantic Bight: MURI
- NORUS
- NURC Med Cruise 09
- Thermal Glider Flight

▶▶ Historic Blogs

- Across the Pond
- Flight to Halifax
- Spain Summer 2008

RECENT POSTS

- Scarlet turns towards Spain.
- The American Football Field
- Europe Reinforces the Team
- Less than 1800 km - as the crow flies.
- Heading to the mountains!

COOL Web Links

- Active Glider Navigation Page
- Active Gliders Transects
- Atlantic Glider Track w/SST
- Atlantic Mission Public Site
- East Coast Enhanced SST
- Glider Fleet Imagery
- Gulf Stream Forecast
- National Hurricane Center
- North Atlantic SST
- Northeast SST
- RU COOL Data Page
- RU COOL Web Site
- RUCOOL Glider Fleet Status
- Waves and Ship Reports

COOL KMZ Files

facebook Home Profile Friends Inbox Oscar Schofield Settings Logout Search

View Photos of RU (15)
View Videos of RU (1)
Send RU a Message
Poke RU

I'm a lean mean ocean observing machine!

Information

Relationship Status: Single
Birthday: January 15
Current City: New Brunswick, NJ

Mutual Friends

50 friends in common See All

Danielle Holden, Katye Altieri, Nicole Raineault

Friends

185 friends See All

Luana Gibbons, Rylon Whitcomb, Philip Lexow

Louis Bowers, Paul Juno, Karl Boettger

Ru Glider New blog post: Scarlet turns towards Spain. http://www.i-cool.org/?p=3291 via Twitter – 16 hours ago

Info Photos Boxes Notes

Wall

Write something...

Attach Share

Filters

Ru Glider New blog post: Scarlet turns towards Spain. http://www.i-cool.org/?p=3291
16 hours ago via Twitter · Comment · Like

Ru Glider New blog post: Less than 1800 km – as the crow flies. http://www.i-cool.org/?p=3264
September 4 at 3:16pm via Twitter · Comment · Like

Ru Glider New blog post: Heading to the mountains! http://www.i-cool.org/?p=3246
September 3 at 11:21pm via Twitter · Comment · Like

Ru Glider New blog post: The Amazing HYCOM http://www.i-cool.org/?p=3242
September 2 at 9:35pm via Twitter · Comment · Like

Ru Glider New blog post: East of Flores http://www.i-cool.org/?p=3235
September 2 at 6:17am via Twitter · Comment · Like

Ru Glider New blog post: Approaching the Island of Corvo http://www.i-cool.org/?p=3229
September 1 at 1:22am via Twitter · Comment · Like

Ru Glider New blog post: Scarlet & Drake http://www.i-cool.org/?p=3224
August 31 at 8:31am via Twitter · Comment · Like

Ru Glider New blog post: Lessons (Re)Learned http://www.i-cool.org/?p=3219
August 30 at 11:44pm via Twitter · Comment · Like

Ru Glider New blog post: Drake cruisin' like an easy Sunday afternoon http://www.i-cool.org/?p=3211
August 30 at 8:45pm via Twitter · Comment · Like

Ru Glider New blog post: Scarlet redlines the power curve. http://www.i-cool.org/?p=3207
August 30 at 12:58pm via Twitter · Comment · Like

Create an Ad

Demosphere International, Inc.

Demosphere is the leading provider of web-based administrative tools for soccer and other sports organizations.

Become a Fan

How YOU Doin?

Are you the next Don? Play Mafia Wars and show your friends that you deserve some respect.

Like

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CREATE AN AD

Advertise your products, services and events to over 250 million Facebook users based on location, age, gender, interests and more!

Like

More Ads

View Photos of Me (14)
Edit My Profile

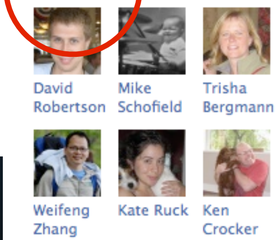
Life is great. Family, friends, good wine, and the sea.

Information

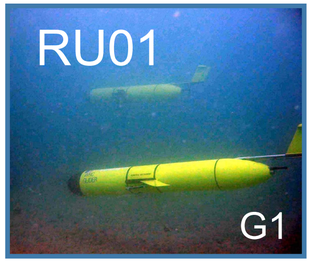
Relationship Status: Married
Current City: New Brunswick, NJ
Website: http://rucool.marine.rutgers.edu

Friends

167 friends See All


David Robertson, Mike Schofield, Trisha Bergmann, Weifeng Zhang, Kate Ruck, Ken Crocker

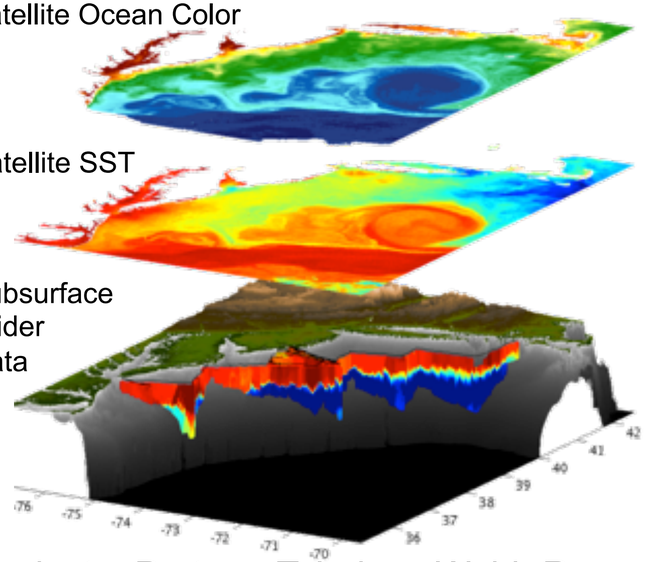
Subsurface glider network

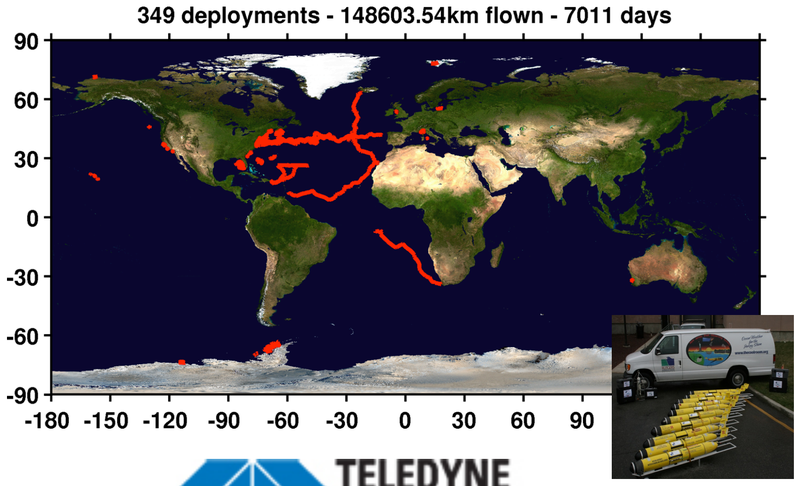


Satellite Ocean Color

Satellite SST

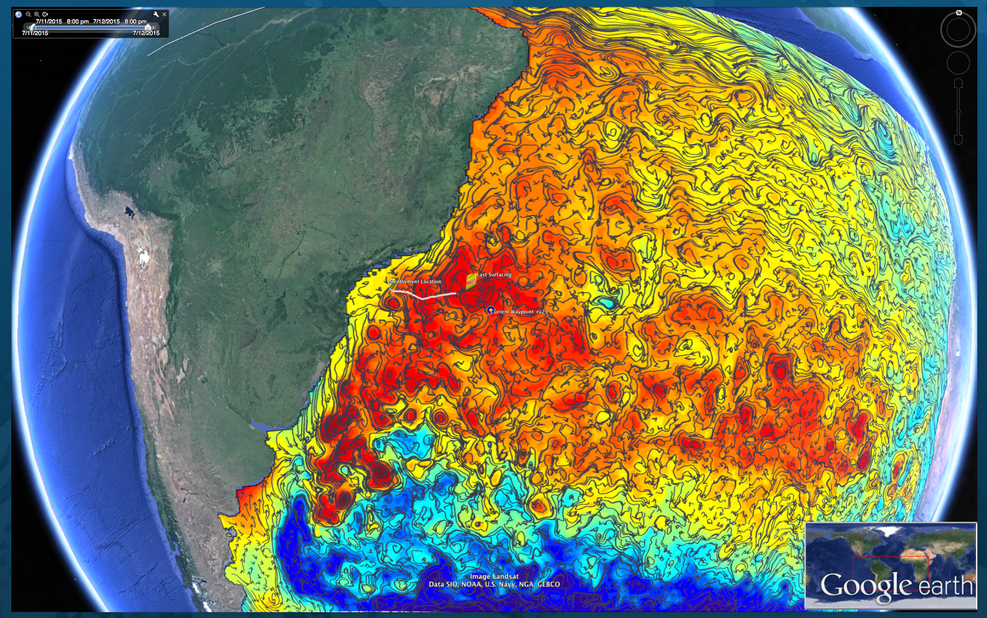
Subsurface Glider Data

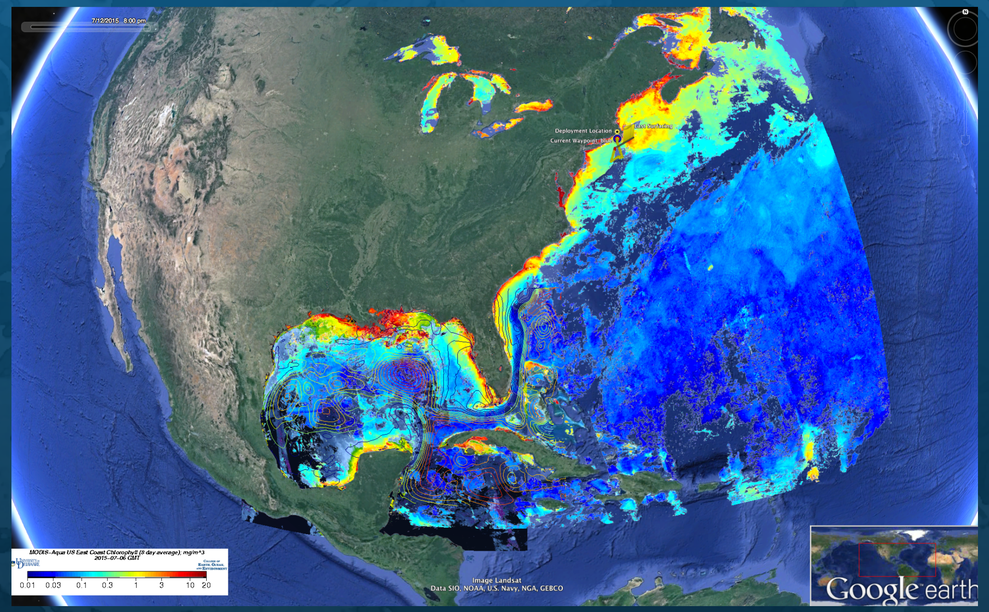


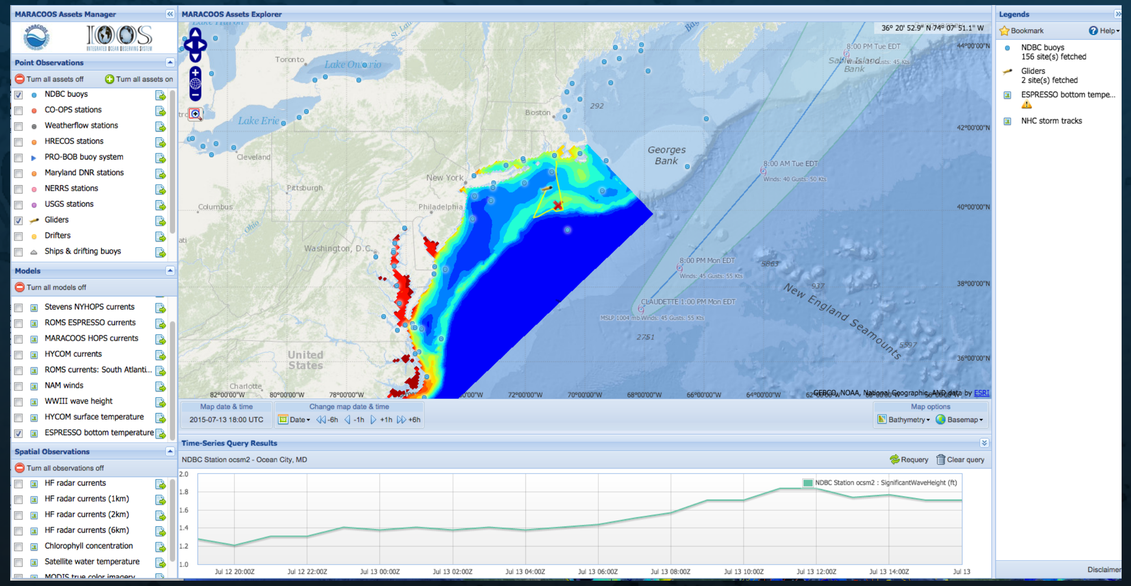


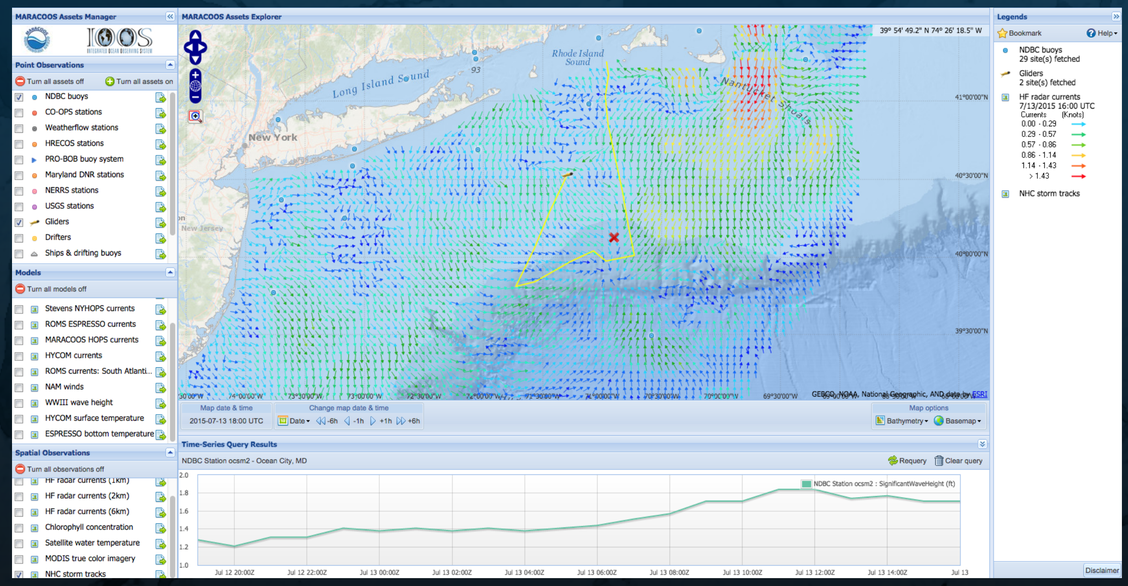
Industry Partner: Teledyne Webb Research

TELEDYNE
WEBB RESEARCH
Everywhereyoulook™


7/11/2015 8:00 pm 7/12/2015 8:00 pm
7/11/2015
7/12/2015
Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google earth


7/12/2015 8:00 pm
Deployment Location
Current Waypoint
MODIS-Aqua US East Coast Chlorophyll (8 day average), mg/m^3
2015-07-06 GMT
0.01 0.03 0.1 0.3 1 3 10 20
Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google earth


MARACOOS Assets Manager
MARACOOS Assets Explorer
Point Observations
Turn all assets off
Turn all assets on
NDBC buoys
CO-OPS stations
Weatherflow stations
HRECOS stations
PRO-BOB buoy system
Maryland DNR stations
NERRS stations
USGS stations
Gliders
Drifters
Ships & drifting buoys
Models
Turn all models off
Stevens NYHOPS currents
ROMS ESPRESSO currents
MARACOOS HOPS currents
HYCOM currents
ROMS currents: South Atlanti...
NAM winds
WWIII wave height
HYCOM surface temperature
ESPRESSO bottom temperature
Spatial Observations
Turn all observations off
HF radar currents
HF radar currents (1km)
HF radar currents (2km)
HF radar currents (6km)
Chlorophyll concentration
Satellite water temperature
MODIS true color imagery
Legends
Bookmark
Help
NDBC buoys
156 site(s) fetched
Gliders
2 site(s) fetched
ESPRESSO bottom tempe...
NHC storm tracks
36° 20' 52.9" N 74° 07' 51.1" W
Georges Bank
New England Seamounts
Map date & time
2015-07-13 18:00 UTC
Change map date & time
Date
-6h
-1h
+1h
+6h
Map options
Bathymetry
Basemap
Time-Series Query Results
NDBC Station ocsm2 - Ocean City, MD
Requery
Clear query
NDBC Station ocsm2 : SignificantWaveHeight (ft)
Disclaimer


MARACOOS Assets Manager
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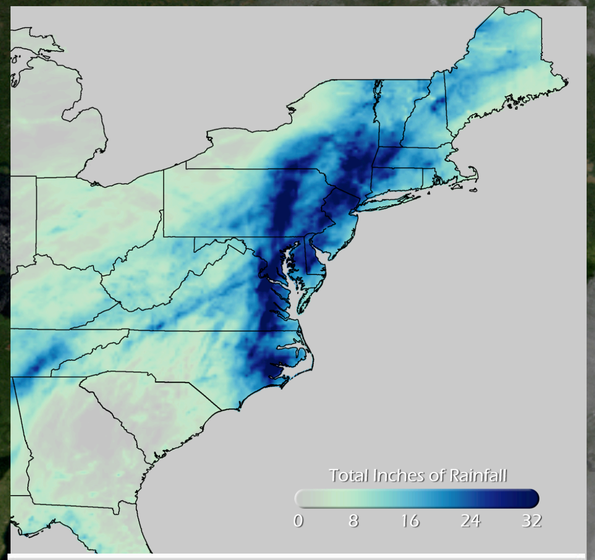
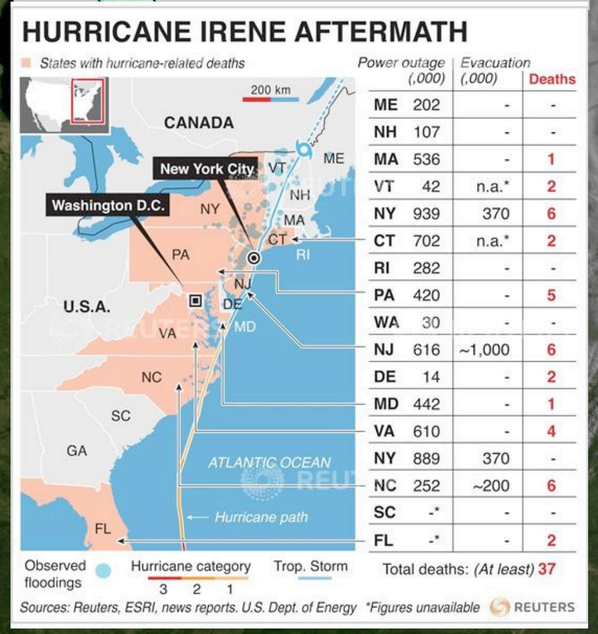
Turn all models off
Stevens NYHOPS currents
ROMS ESPRESSO currents
MARACOOS HOPS currents
HYCOM currents
ROMS currents: South Atlanti...
NAM winds
WWIII wave height
HYCOM surface temperature
ESPRESSO bottom temperature
Spatial Observations
Turn all observations off
HF radar currents (1km)
HF radar currents (2km)
HF radar currents (6km)
Chlorophyll concentration
Satellite water temperature
MODIS true color imagery
NHC storm tracks
Legends
Bookmark
Help
NDBC buoys
29 site(s) fetched
Gliders
2 site(s) fetched
HF radar currents
7/13/2015 16:00 UTC
Currents (Knots)
0.00 - 0.29
0.29 - 0.57
0.57 - 0.86
0.86 - 1.14
1.14 - 1.43
> 1.43
NHC storm tracks
39° 54' 49.2" N 74° 26' 18.5" W
Long Island Sound
New York
Map date & time
2015-07-13 18:00 UTC
Change map date & time
Date
-6h
-1h
+1h
+6h
Map options
Bathymetry
Basemap
Time-Series Query Results
NDBC Station ocsm2 - Ocean City, MD
Requery
Clear query
NDBC Station ocsm2 : SignificantWaveHeight (ft)
Disclaimer

Hurricane Irene





- First tropical storm to threaten NYC since Hurricane Gloria in 1985
- Flooding records broken in 26 rivers
- Caused at least 56 deaths
- Damage nearly $8 billion

The Miami Herald > Weather >

Hurricanes

Sunday, 02.19.12 Welcome Guest •

HOME | NEWS | SPORTS | ENTE

Miami-Dade | Broward | Keys |

Posted on Friday, 09.02.11

HURRICANE SEASON

Intensity remain

Like 1

The National Hurricane Ce
it wasn't the first time — bu
the increasing standards of

BY CURTIS MORGAN
MORGAN@MIAMIHERALD.COM

The New York Times

U.S.

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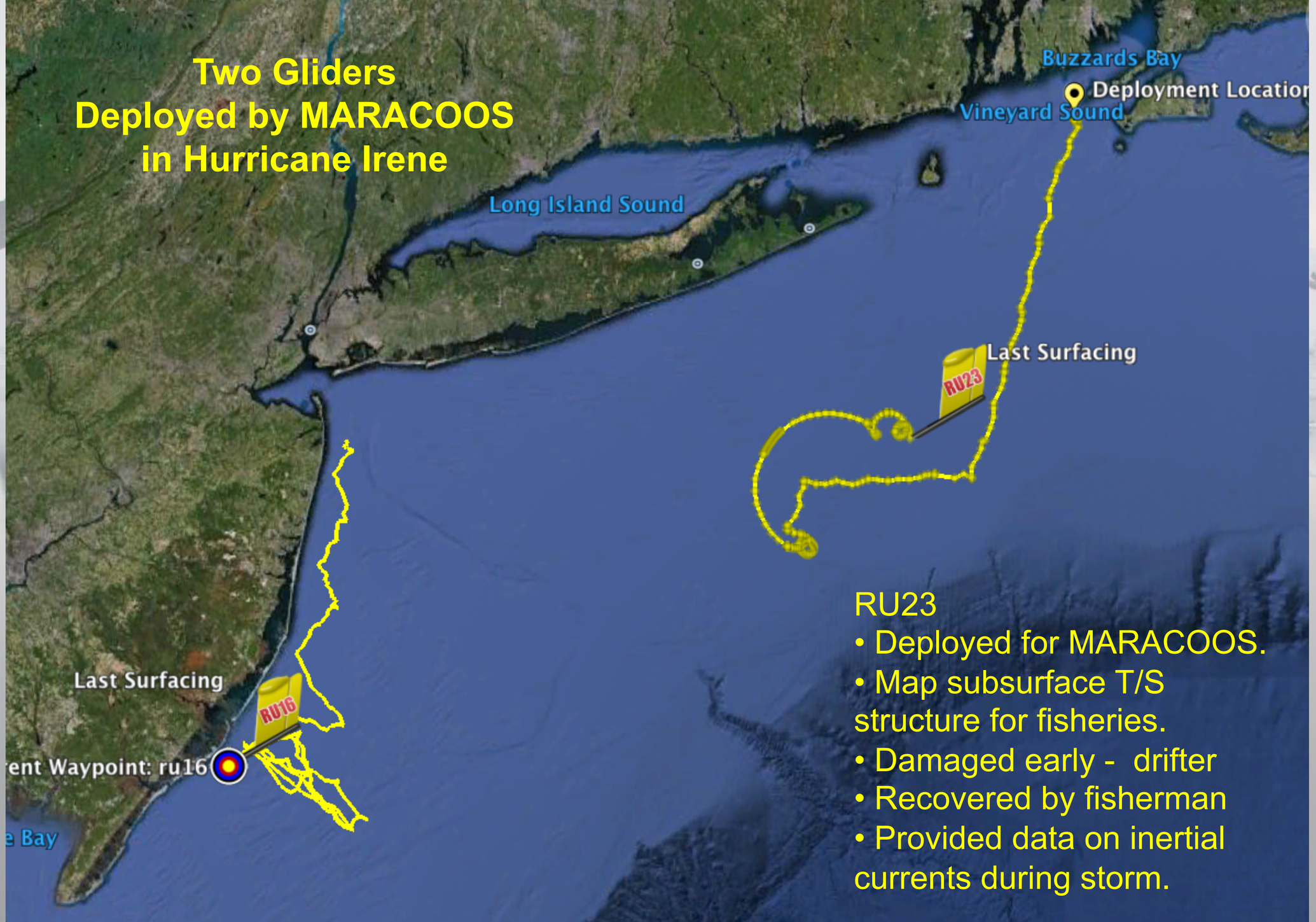
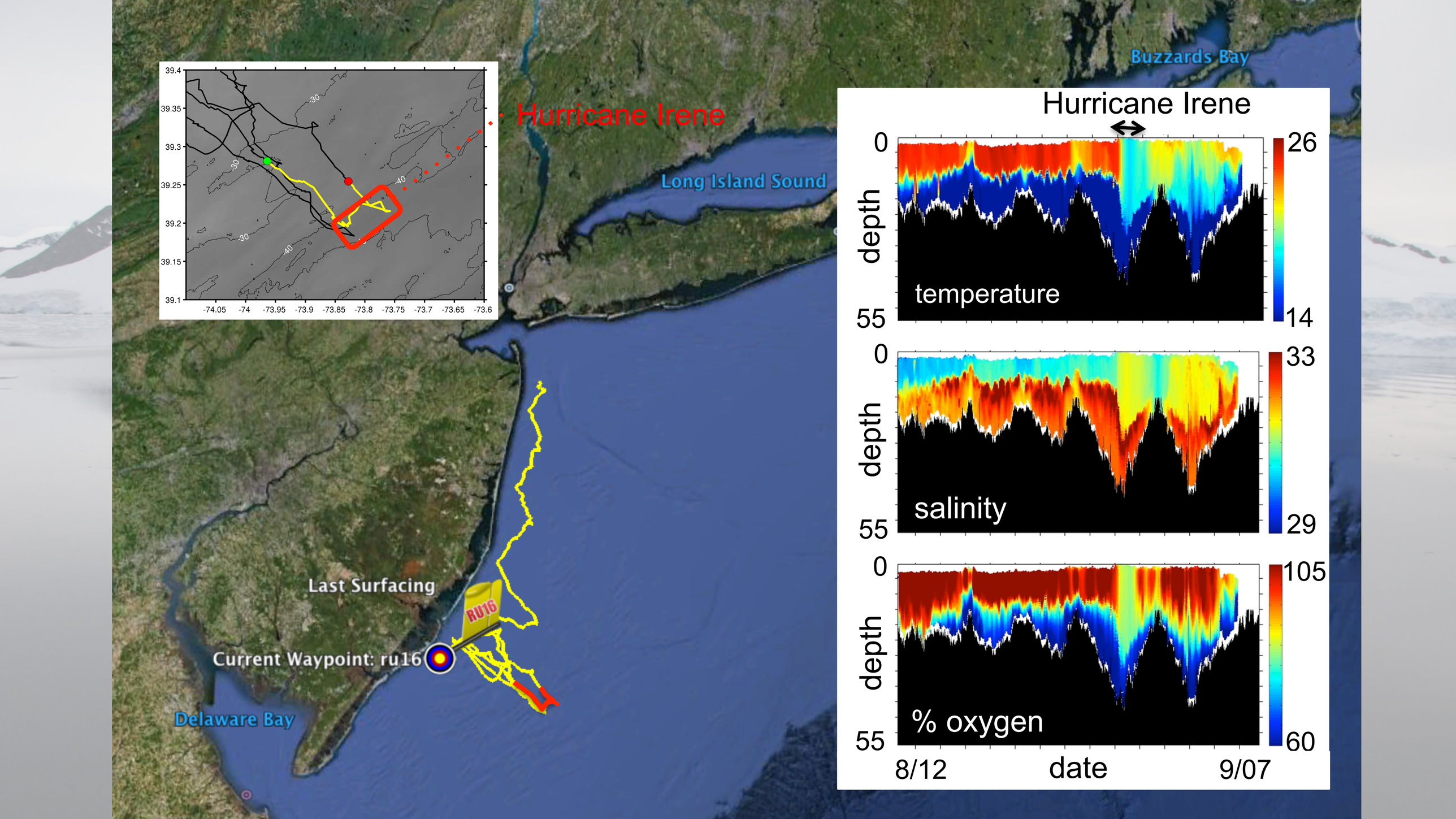
Challenges in Predicting the Intensity of Storms

Andy Newman/Associated Press

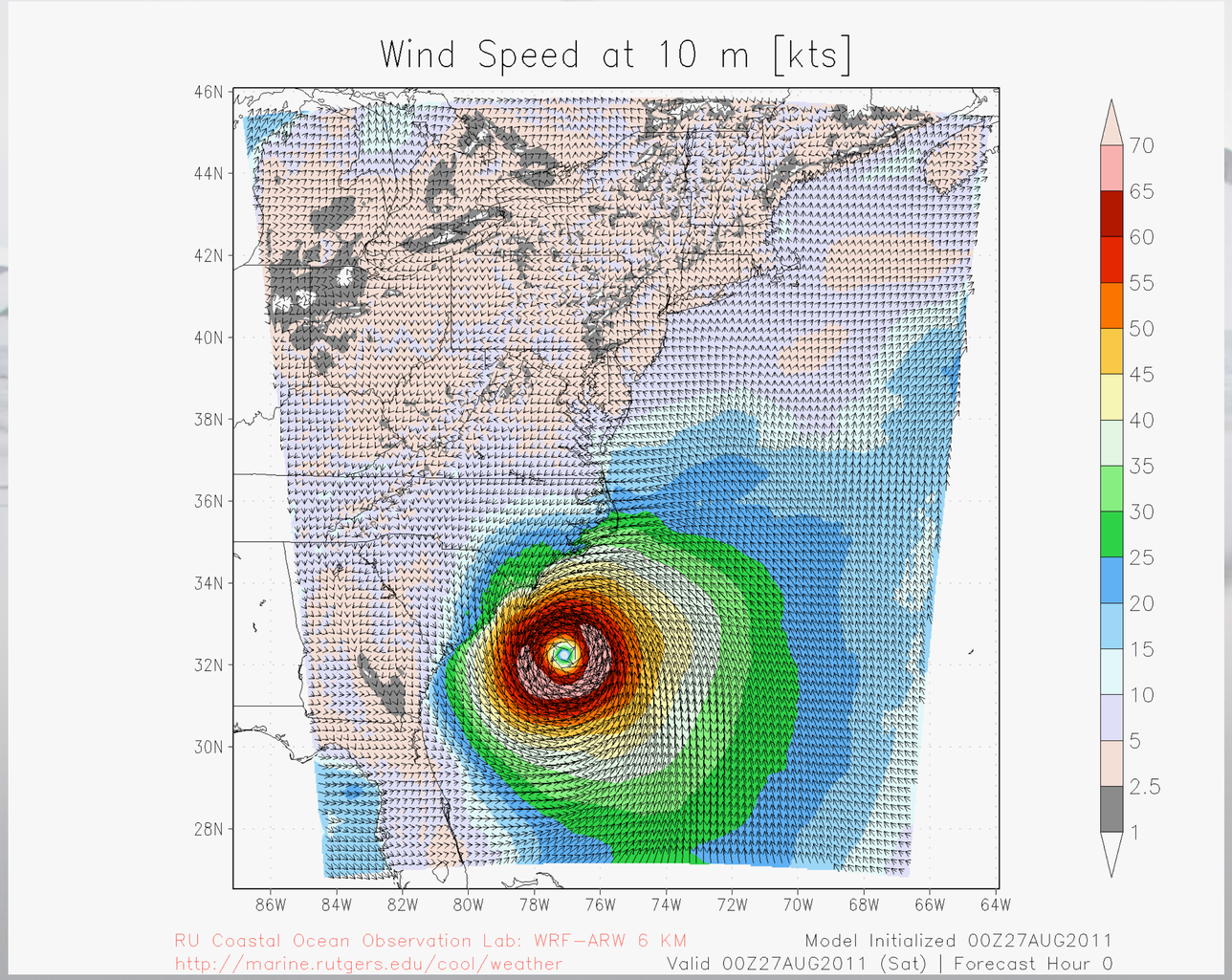
Scientists say that it is much easier to accurately predict what path a hurricane will take.

By HENRY FOUNTAIN
Published: August 27, 2011

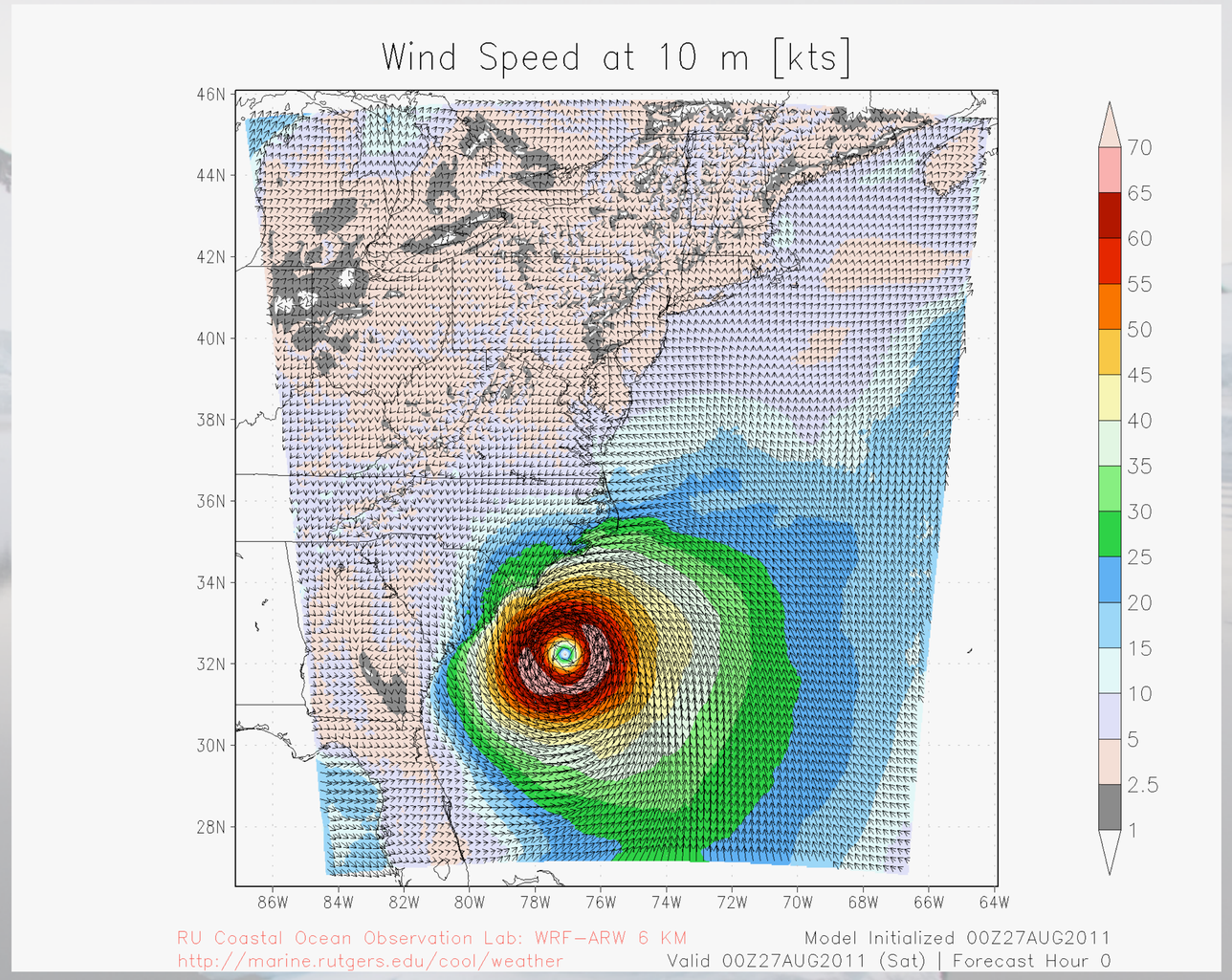

Two Gliders
Deployed by MARACOOS
in Hurricane Irene
Buzzards Bay
Deployment Location
Vineyard Sound
Long Island Sound
Last Surfacing
RU23
Last Surfacing
RU16
ent Waypoint: ru16
e Bay
RU23
• Deployed for MARACOOS.
• Map subsurface T/S structure for fisheries.
• Damaged early - drifter
• Recovered by fisherman
• Provided data on inertial currents during storm.


Buzzards Bay
Hurricane Irene
Long Island Sound
Last Surfacing
RU16
Current Waypoint: ru16
Delaware Bay
39.4
39.35
39.3
39.25
39.2
39.15
39.1
-74.05
-74
-73.95
-73.9
-73.85
-73.8
-73.75
-73.7
-73.65
-73.6
-30
-40
Hurricane Irene
depth
0
55
temperature
26
14
salinity
33
29
% oxygen
105
60
8/12
date
9/07

Warm water (standard)



Cold water (glider)



Conclusions:

Minor variations in the ocean state can have profound impacts on polar ecosystems

These profound changes are occurring in many polar oceans, changes appear to be accelerating

New technologies offer a mode to study and understand these changes, so it is time hopefully to speed up our uphill quest to know where this planet is going