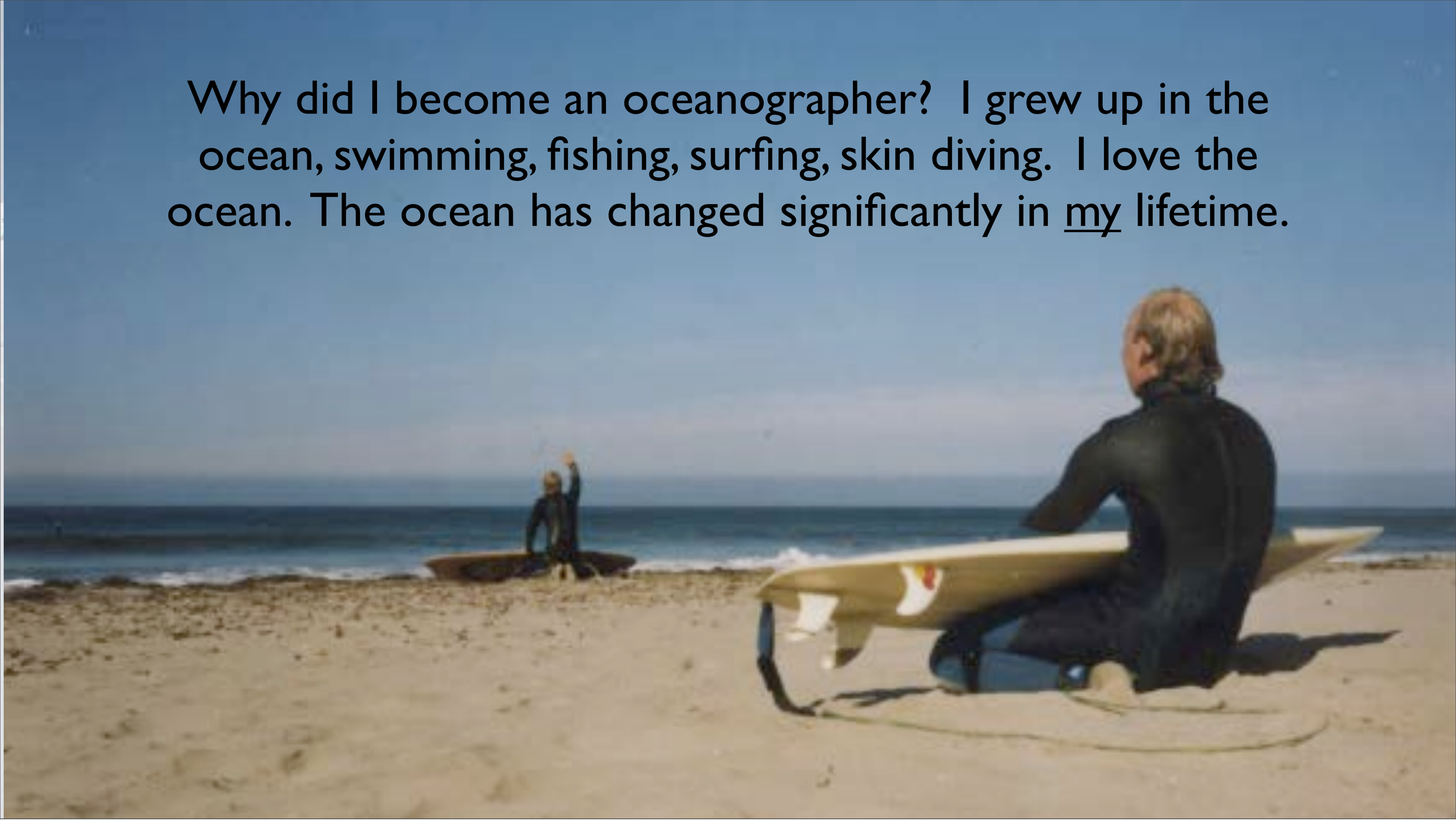
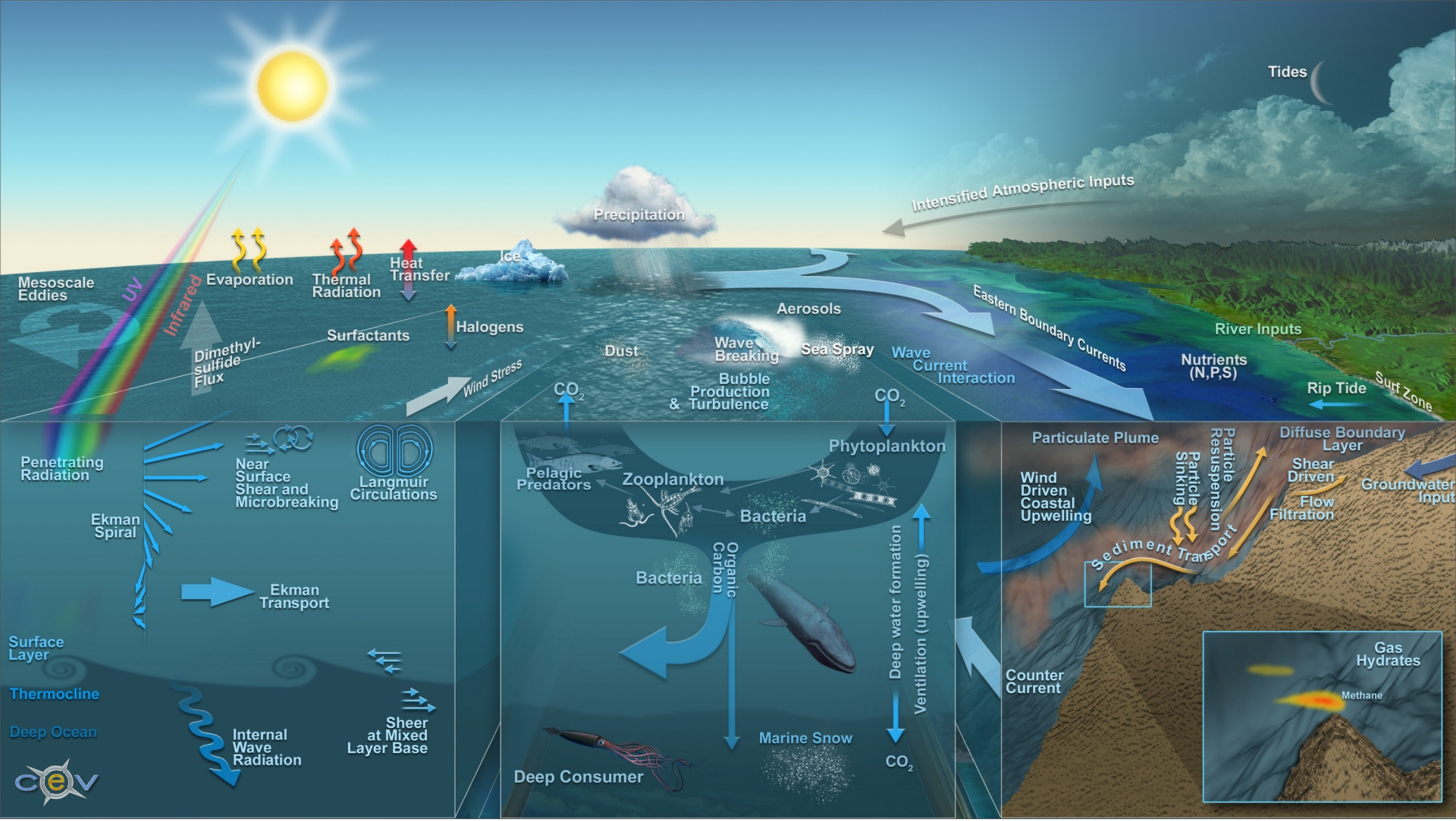
HOT DAYS ALONG IN ANTARCTICA

Why did I become an oceanographer? I grew up in the ocean, swimming, fishing, surfing, skin diving. I love the ocean. The ocean has changed significantly in my lifetime.



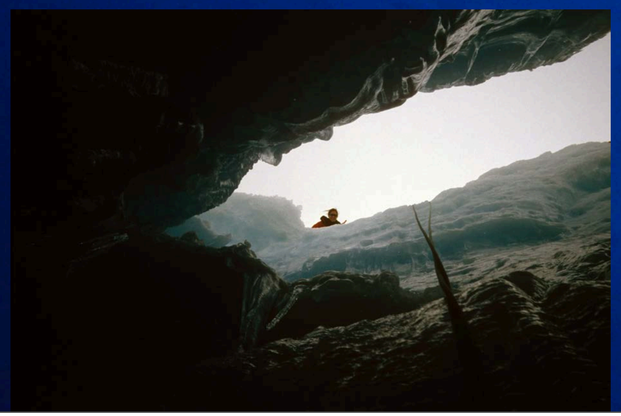
I also found being a scientist is the COOLEST JOB!!! I get paid to explore and understand the world


Tides
Precipitation
Intensified Atmospheric Inputs
Mesoscale Eddies
UV
Infrared
Evaporation
Thermal Radiation
Heat Transfer
Ice
Halogens
Surfactants
Dimethyl-sulfide Flux
Wind Stress
Dust
CO_2
Aerosols
Wave Breaking
Sea Spray
Bubble Production & Turbulence
Wave Current Interaction
CO_2
Eastern Boundary Currents
River Inputs
Nutrients (N,P,S)
Rip Tide
Surf Zone
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
Diffuse Boundary Layer
Shear Driven
Flow Filtration
Groundwater Input
Sediment Transport
Counter Current
Gas Hydrates
Methane

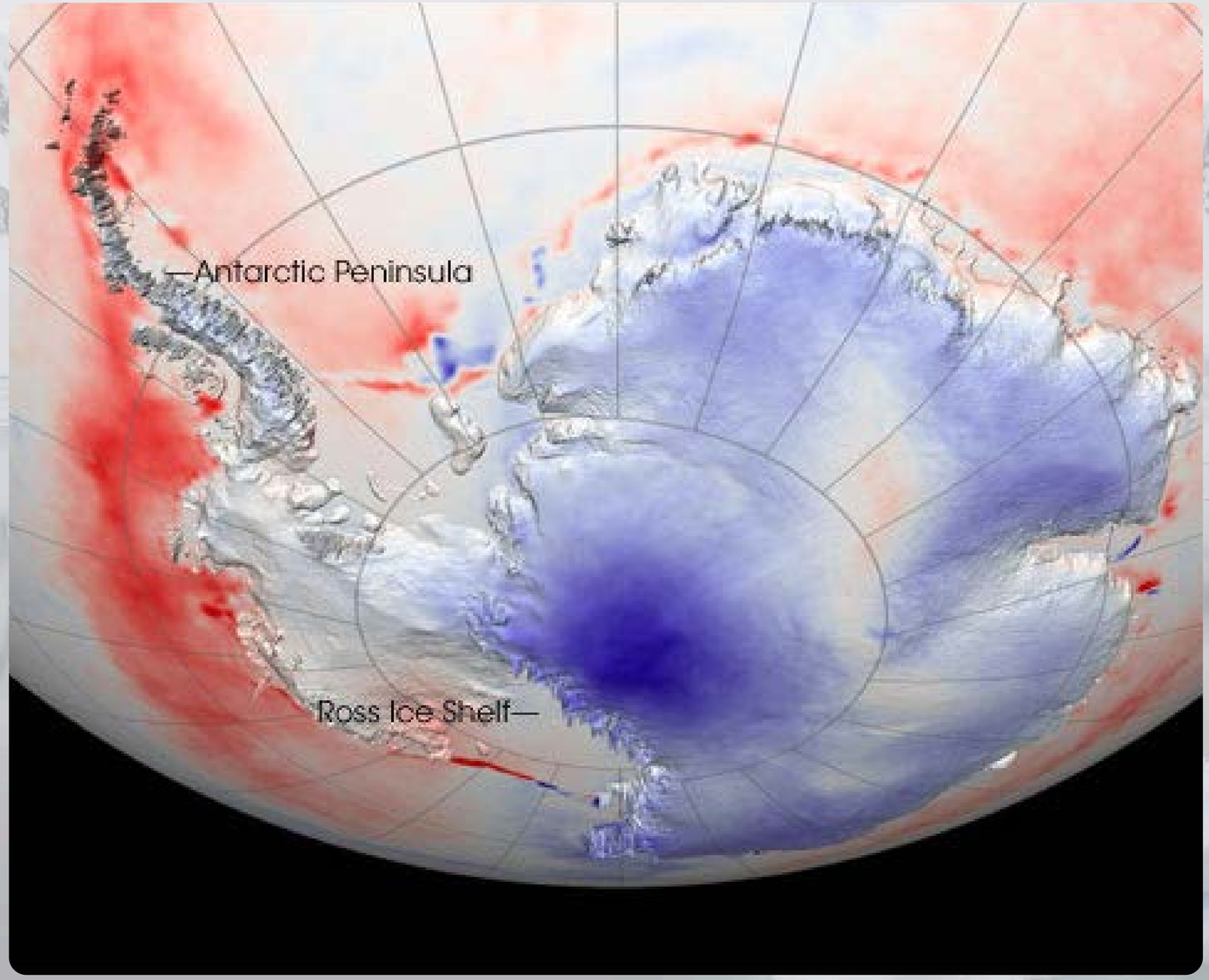
Spreading Mid-Ocean Ridges
Microbes & Deep Biosphere
Crustal Magma Chamber
Down flow zones
Brittle-Ductile Boundary
Heat Source
Magma Generation
Topographic Turbulence
Hydrothermal Recharge
Deep-Sea Ecology
Hydrothermal Discharge
Benthic/Pelagic Exchange
Sediments
Ocean Crustal Aquifer
Lithospheric Heat
Updip Limit
Accreted Sediments
Shallow Earthquakes
Locked Zone
Downdip Limit
Free Sliding
Deep Earthquakes
Ocean Crust
Lithosphere
Asthenosphere
Subduction Zone
Continental Crust
Melting
Crust
Mantle
Liquid Outer
Mantle Convection
Thursday, May 31, 12

1990

As a grad student



2010

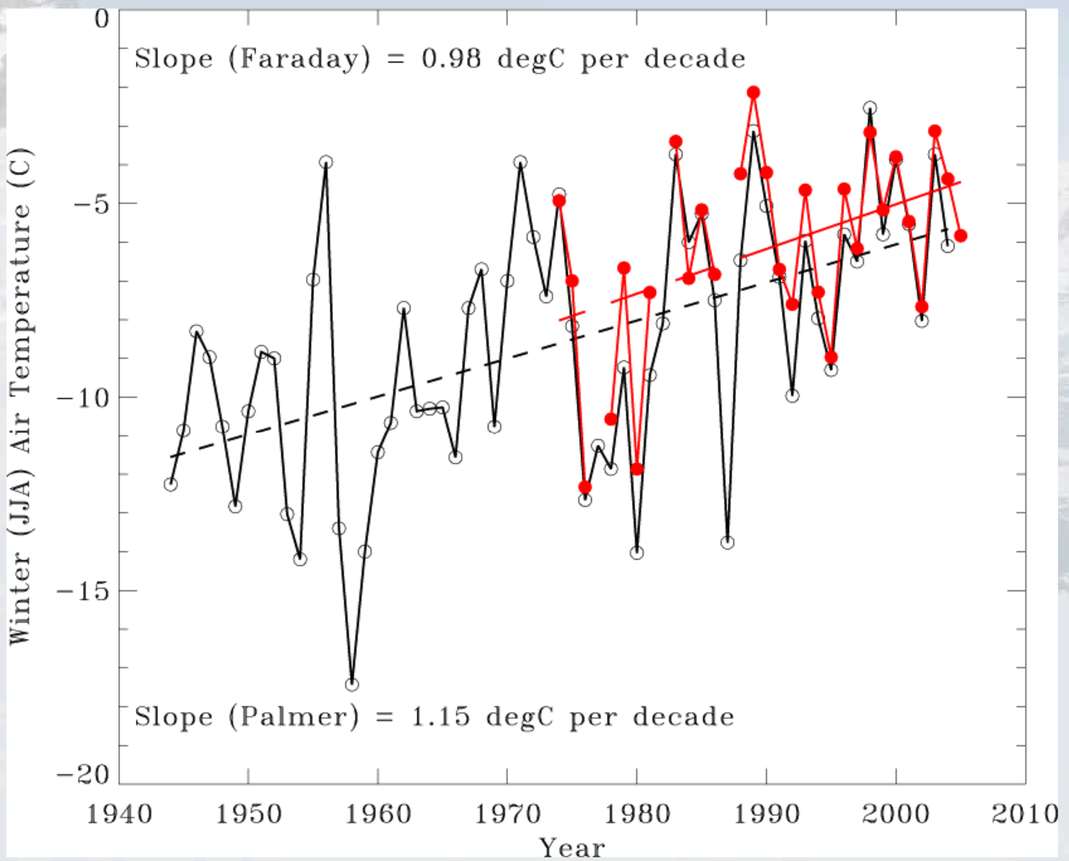


Temperature Trends (degrees C per year)

-0.2 0.2

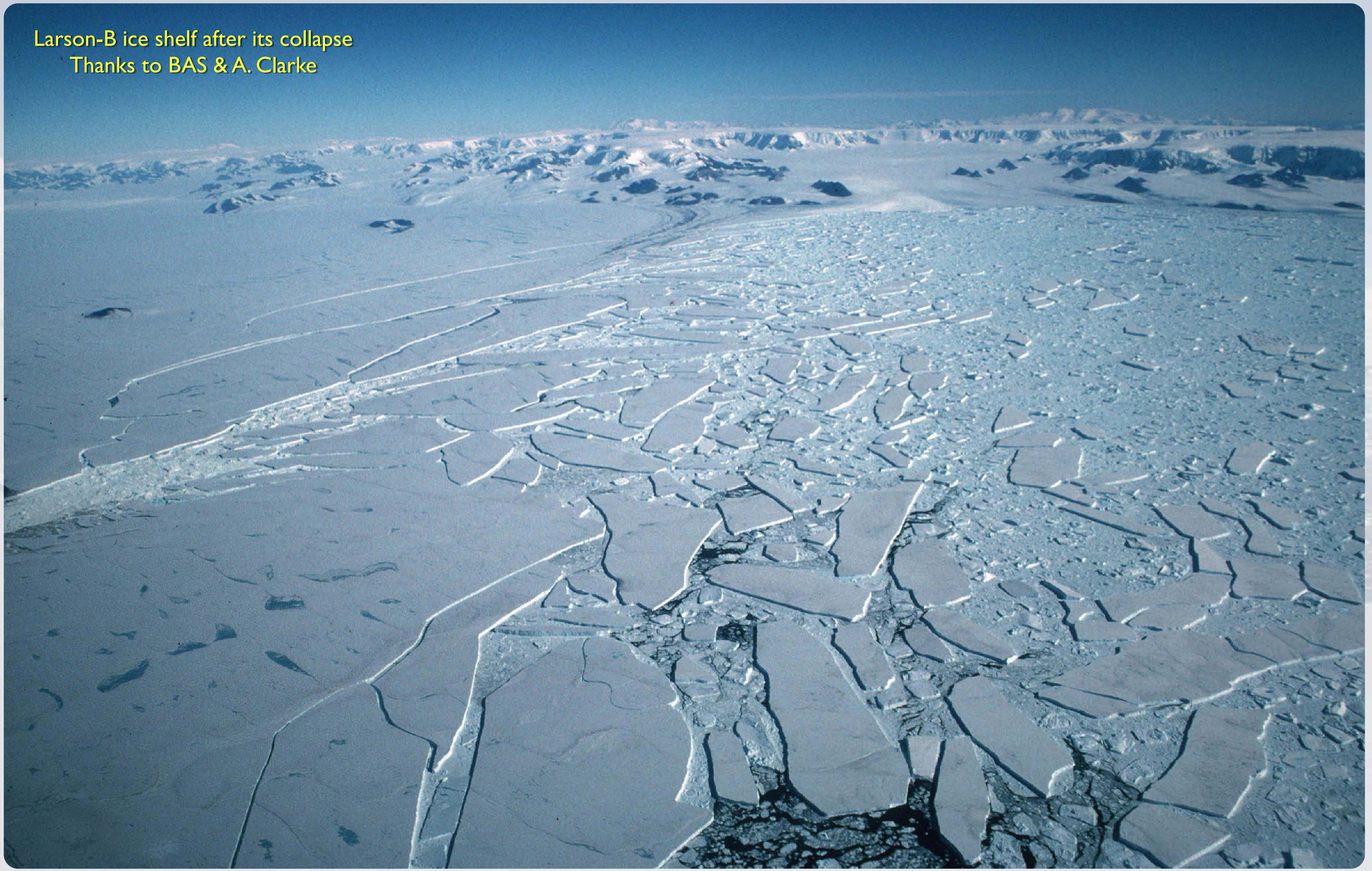
The WAP peninsula is experiencing the largest winter warming on Earth

Mean Winter Temperatures

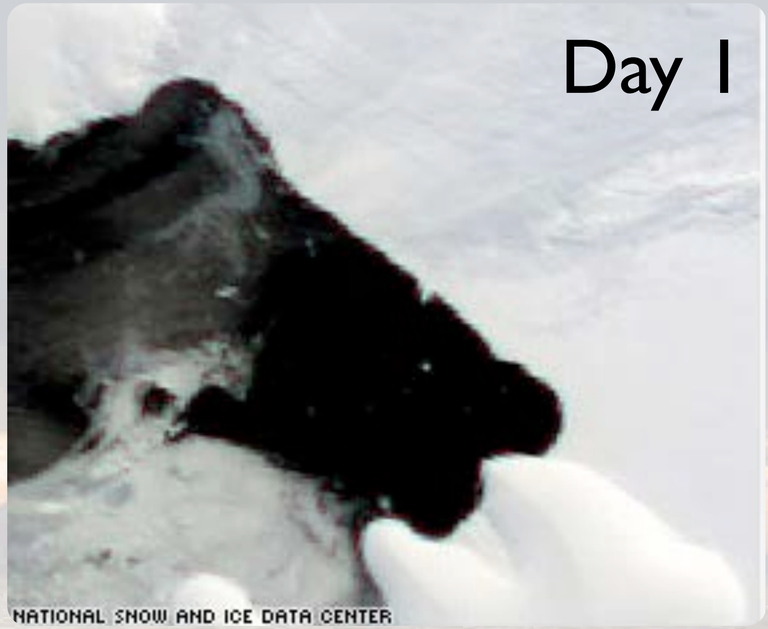


Black is British Faraday & Ukraine Vernadsky Station
Red is US Palmer Station

The WAP peninsula is experiencing the largest winter warming on Earth

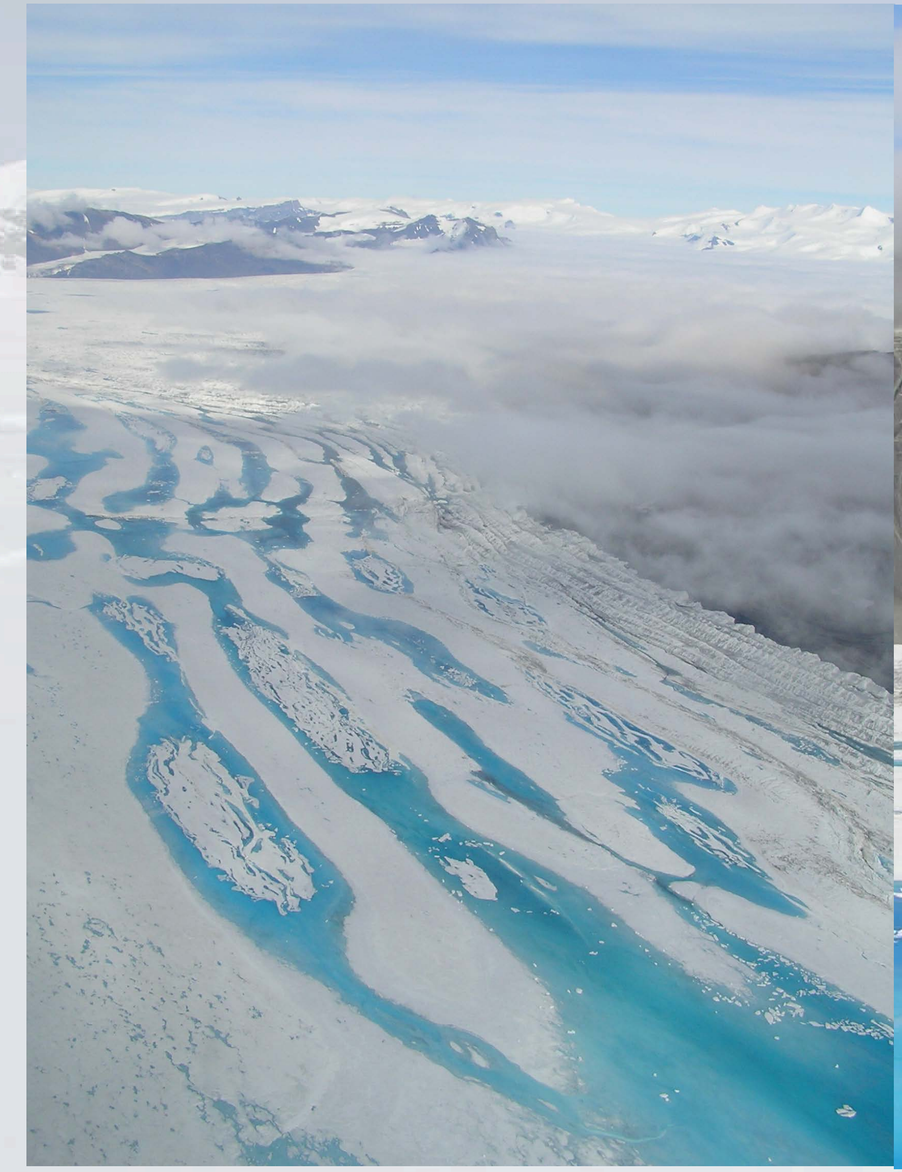


In 2008 the Wilkes Ice Sheet followed the Larson Ice Shelf and began to collapse



Melt pools on surface of King George VI Sound

(from a BAS twin otter, January 2004)

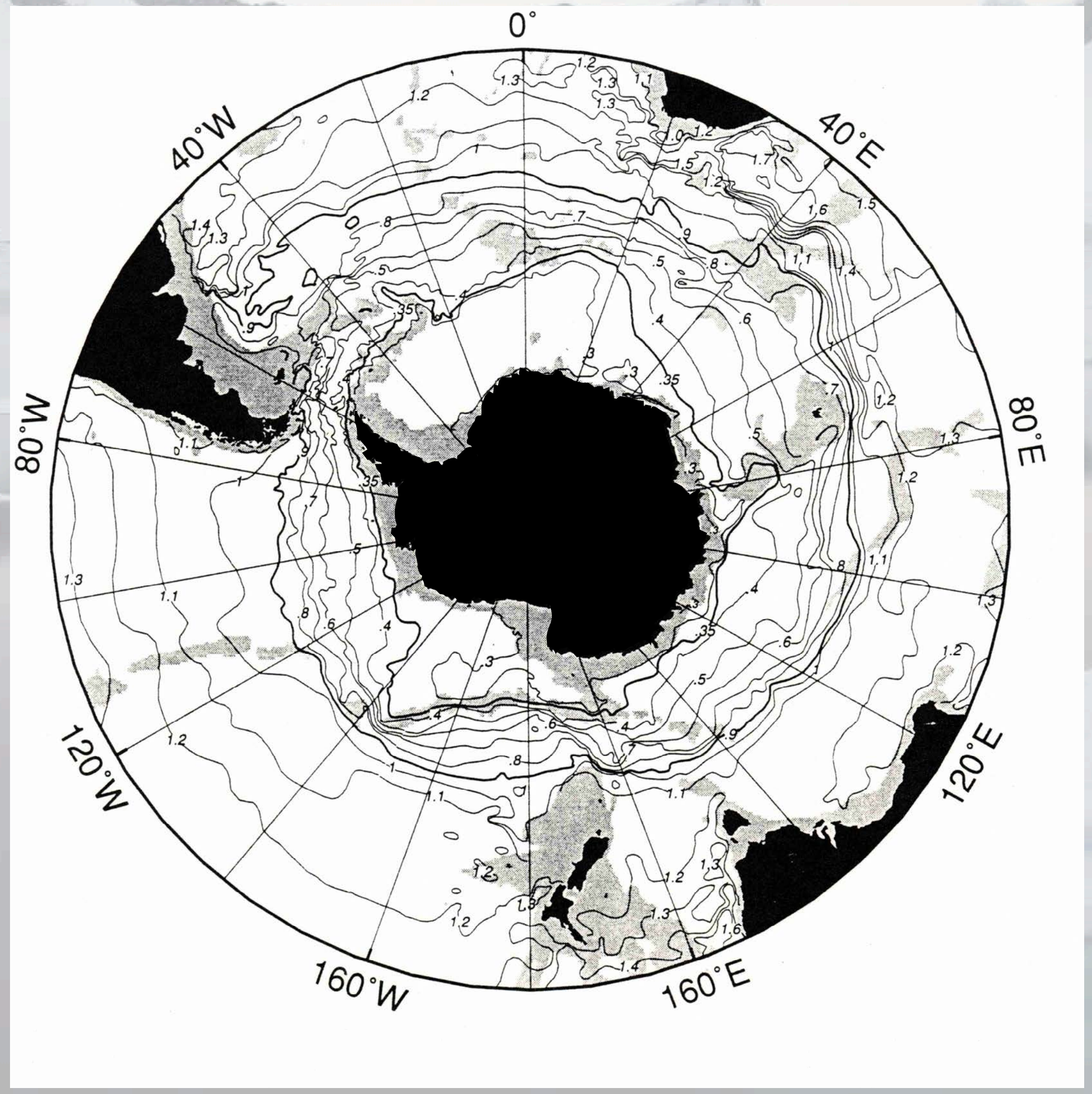


Palmer Station in the present

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.



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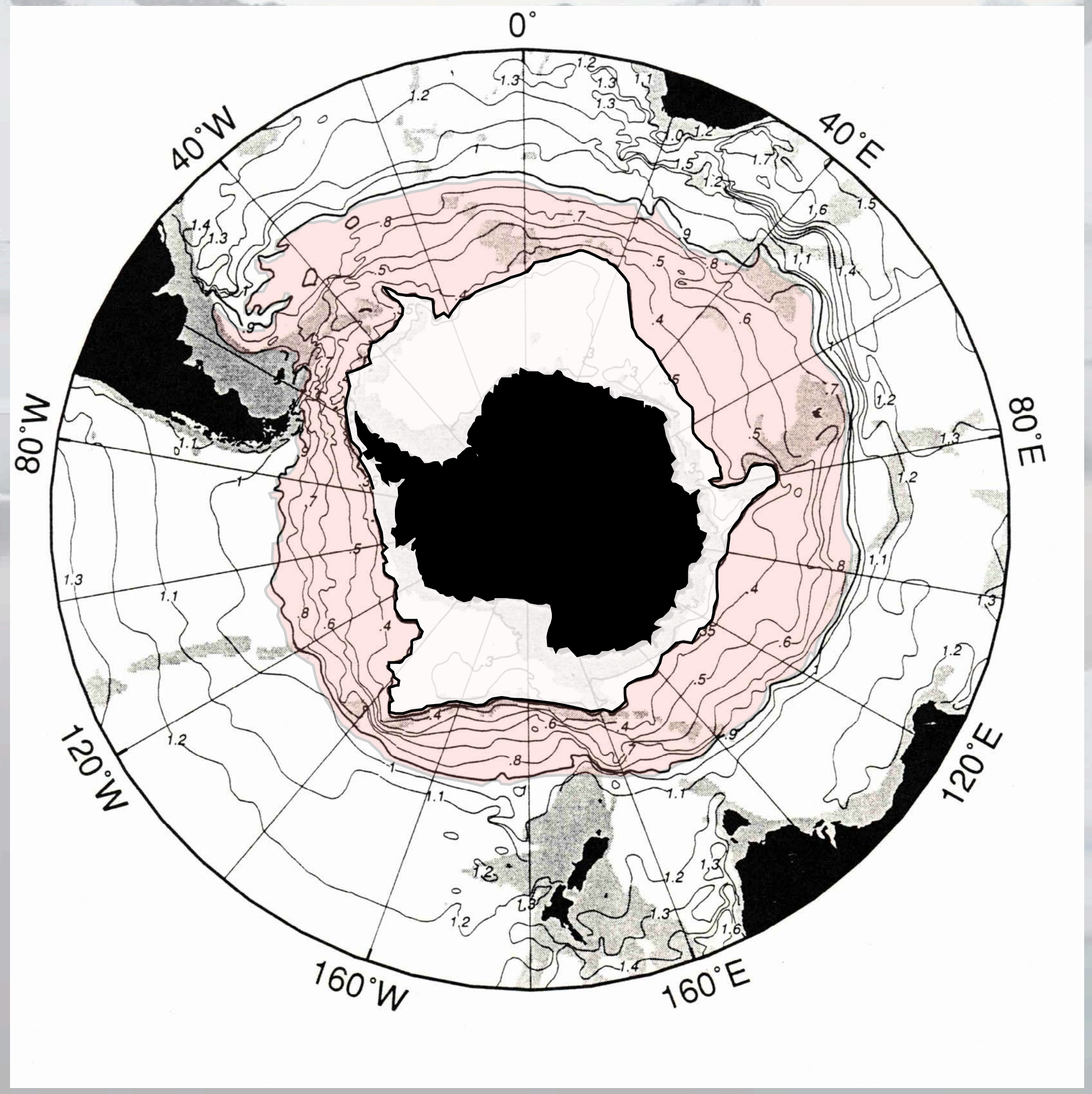

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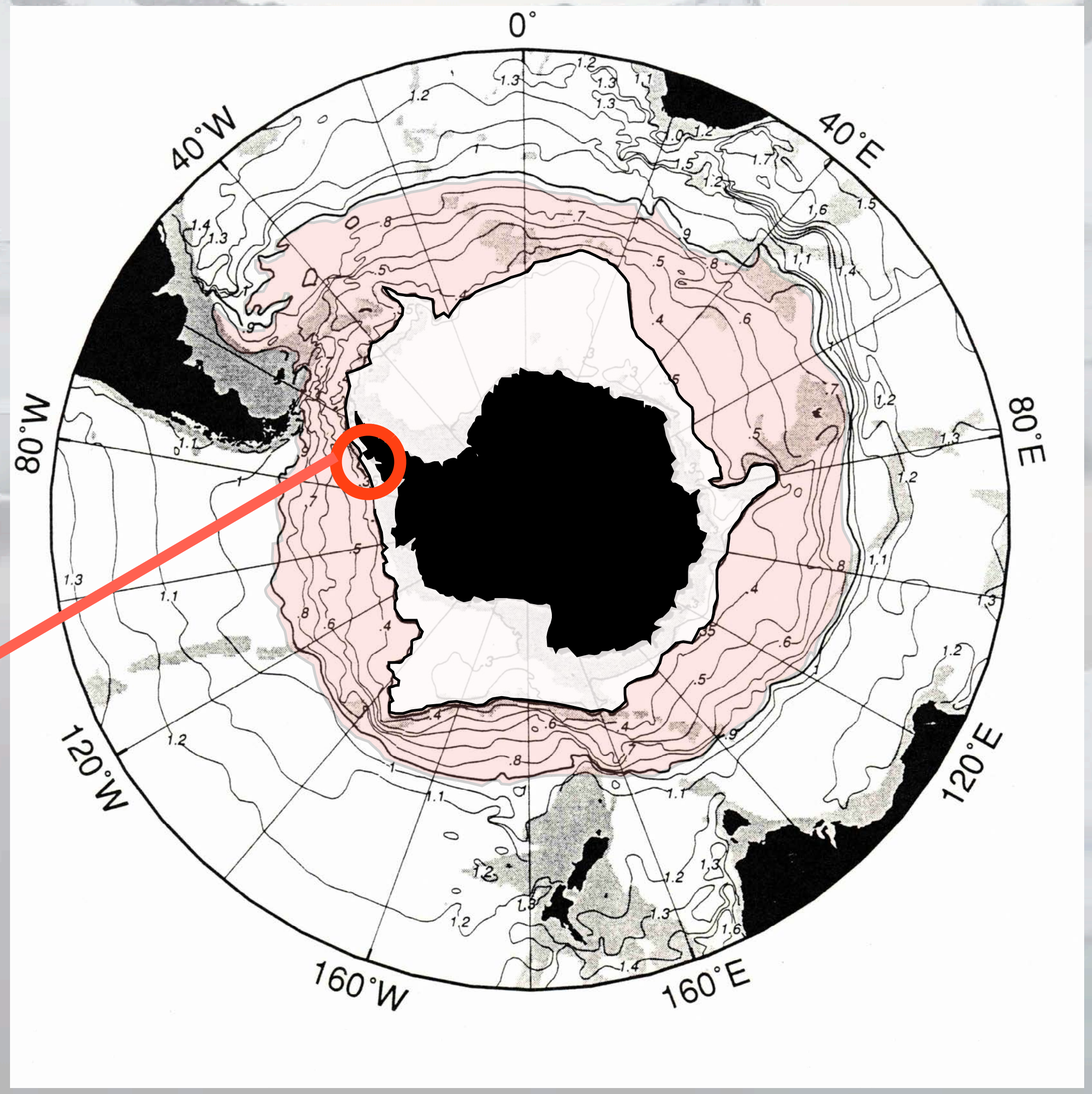
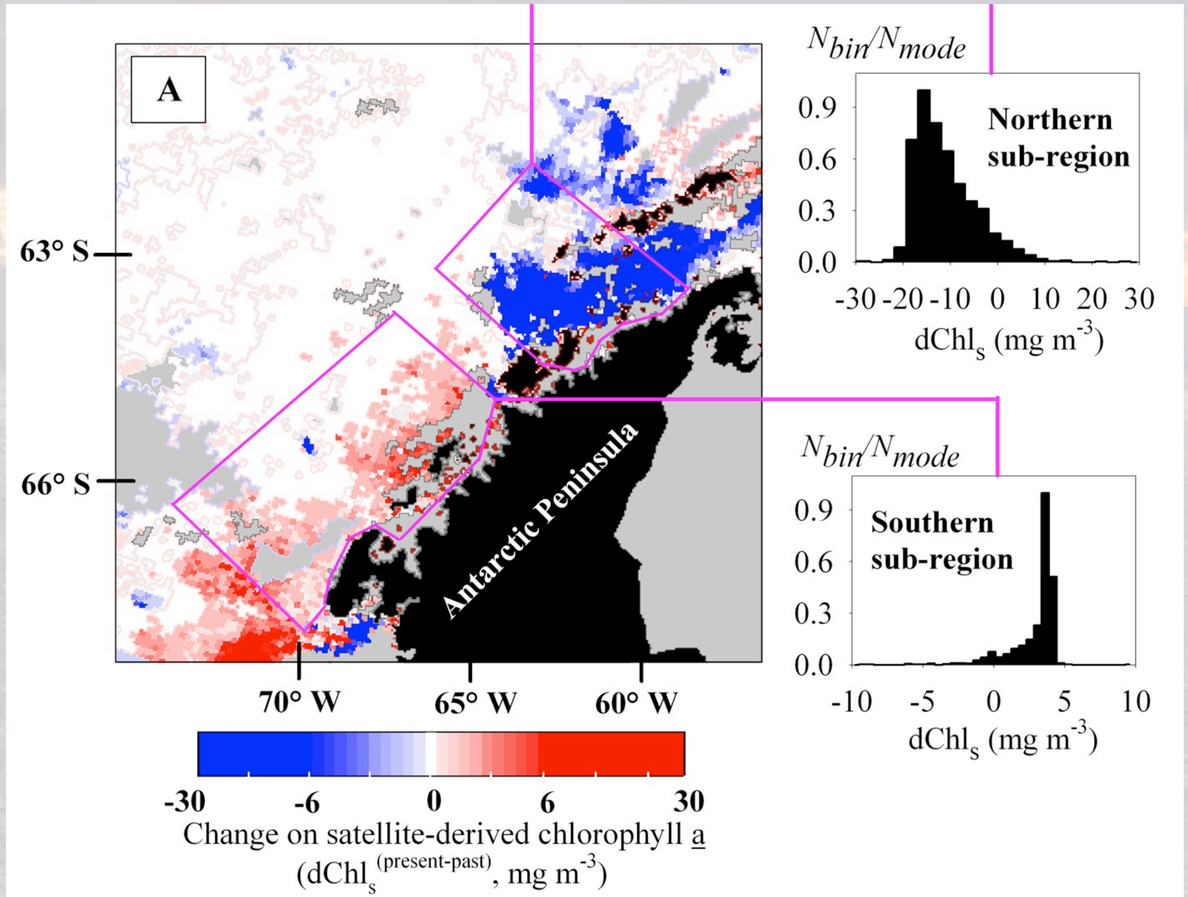


The WAP is the only location in the Antarctic where the ACC is adjacent to the shelf break. The ACC is Antarctica's warmest water

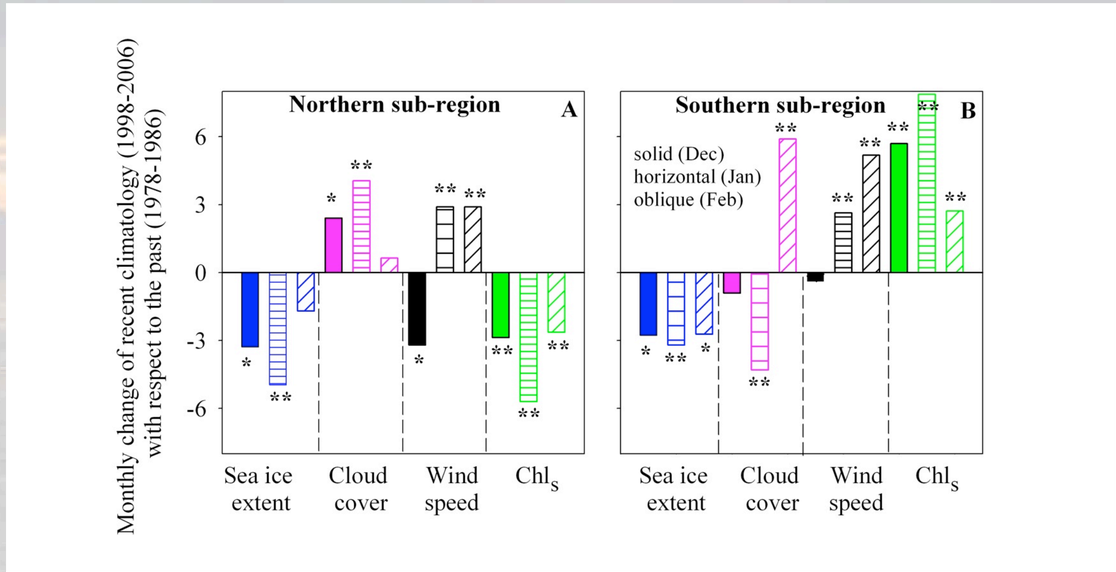

NEW WIRE
DATE


NSF
L

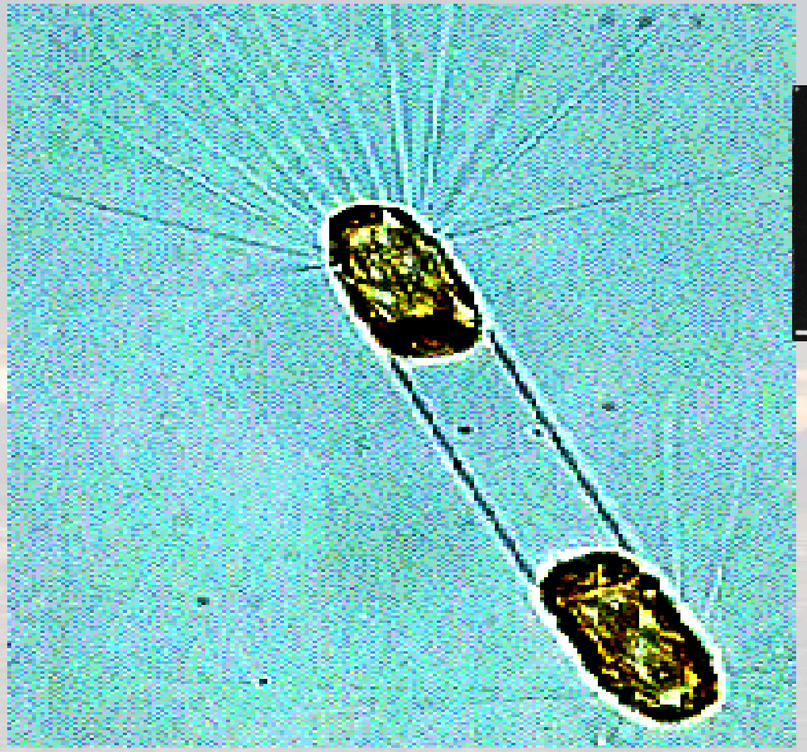
The decadal changes have resulted changes in the phytoplankton



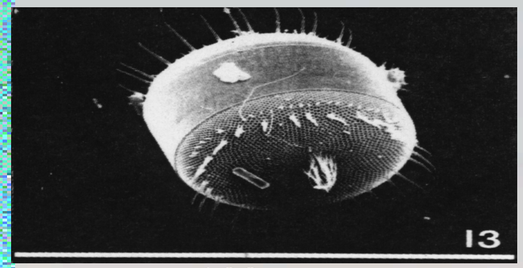
Montes Hugo et al. Science 2009



The changes driven by a decline in sea ice, wind and sun



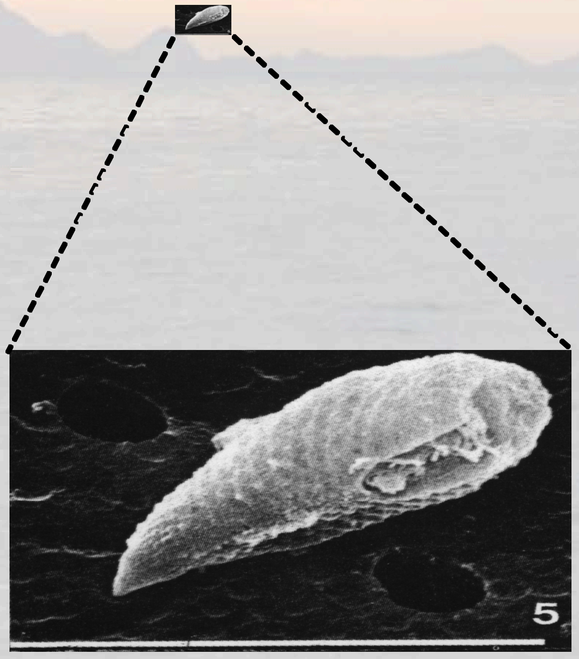
Corethron criophilum



100µm

Thalassiosira antarctica

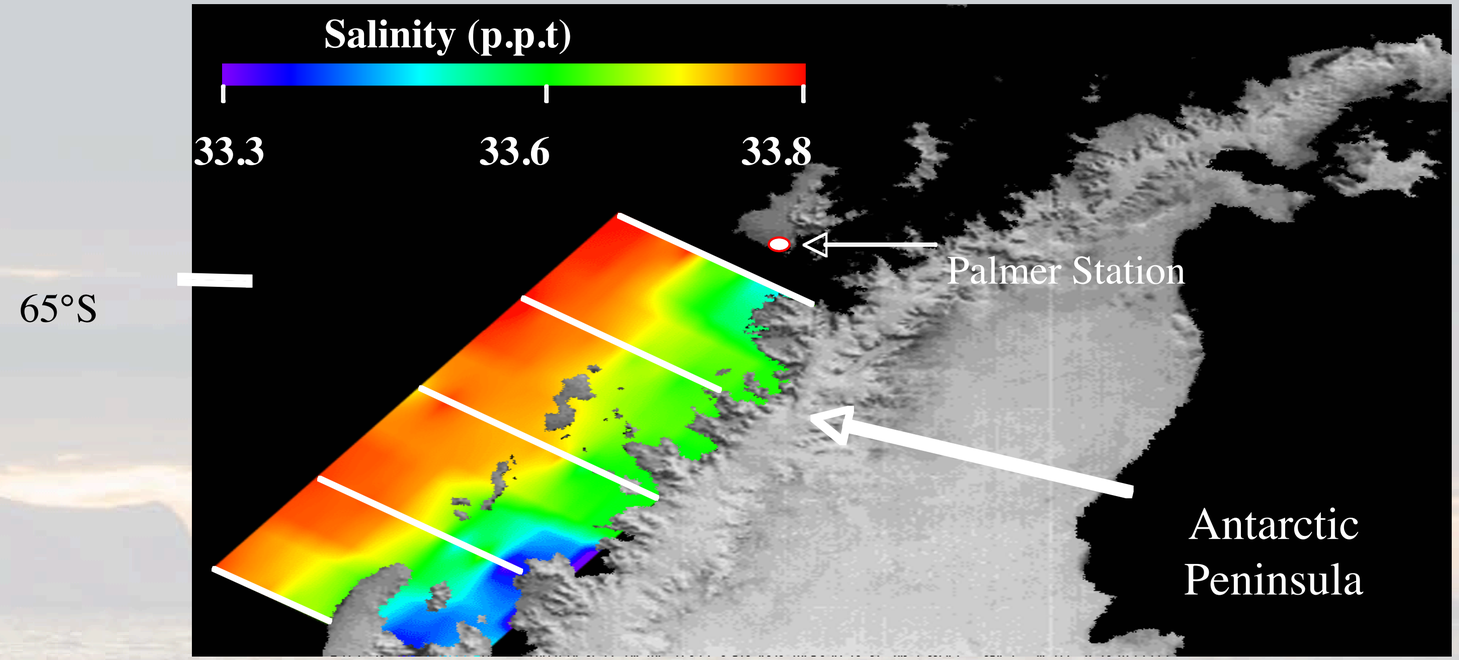
Palmer Cryptophytes --> 8 ± 2µm



10µm

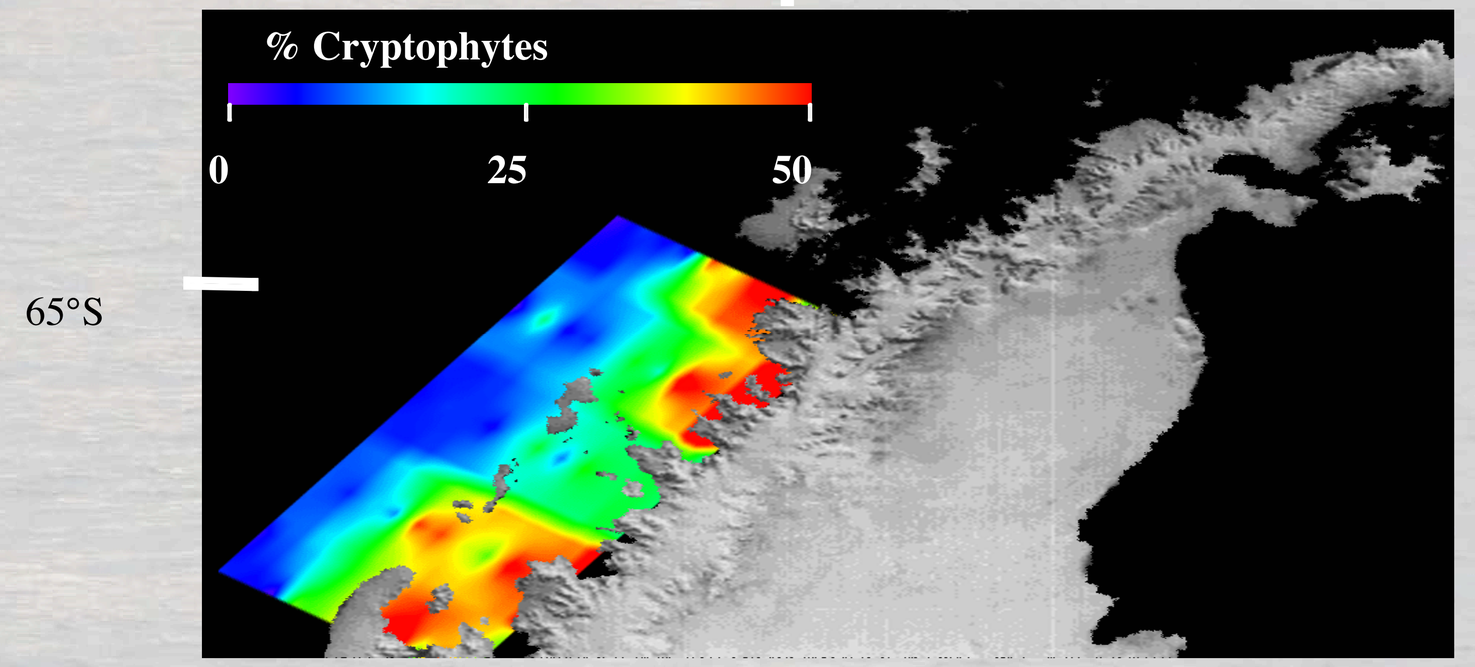
Cryptomonas cryophila

SEM Micrographs from*McMinn and Hodgson* 1993



65°S

64°W



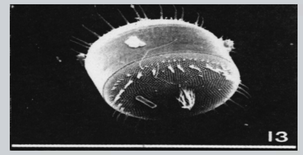
65°S

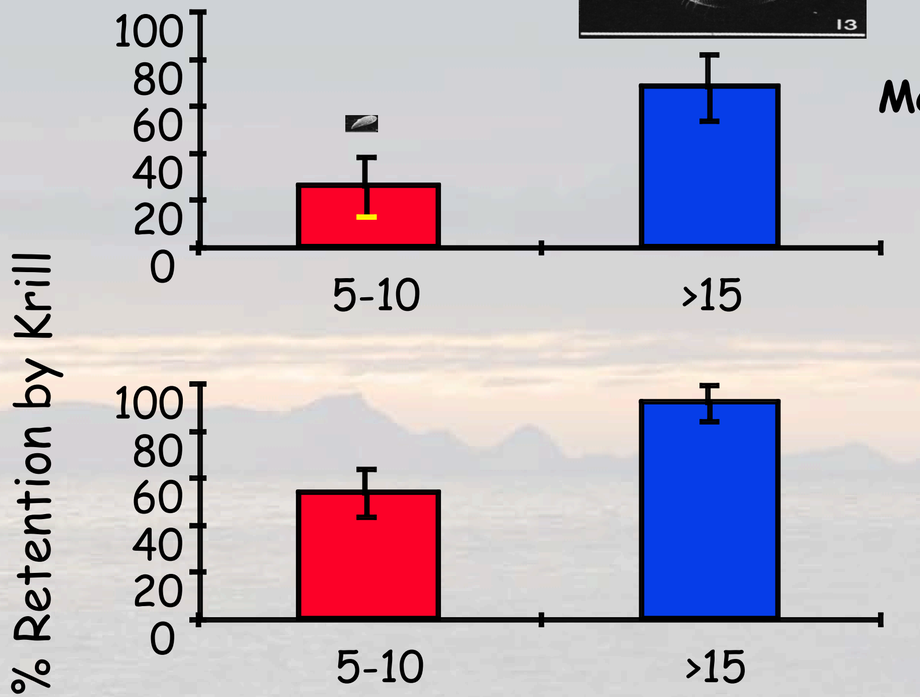
Moline et al.
GBC 2004

Zooplankton are dominated by krill or salps

Krill greatest biomass of any animal on earth

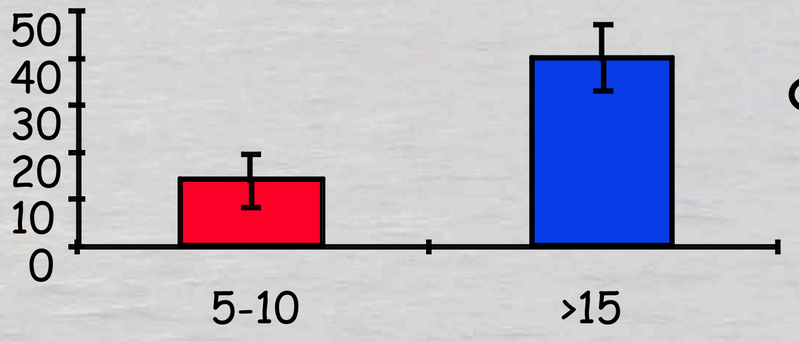
What does a krill want to eat?





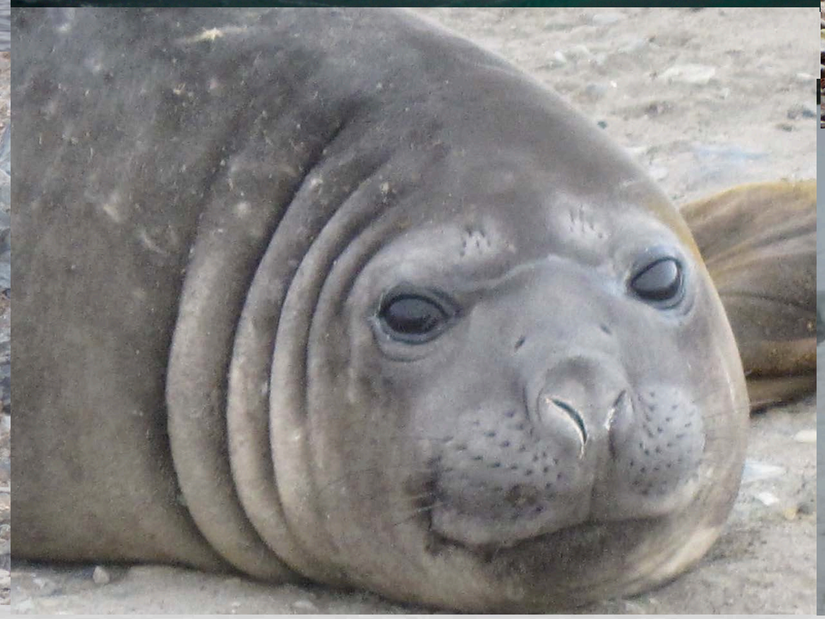
McClatchie and Boyd 1983

Boyd *et al.* 1984



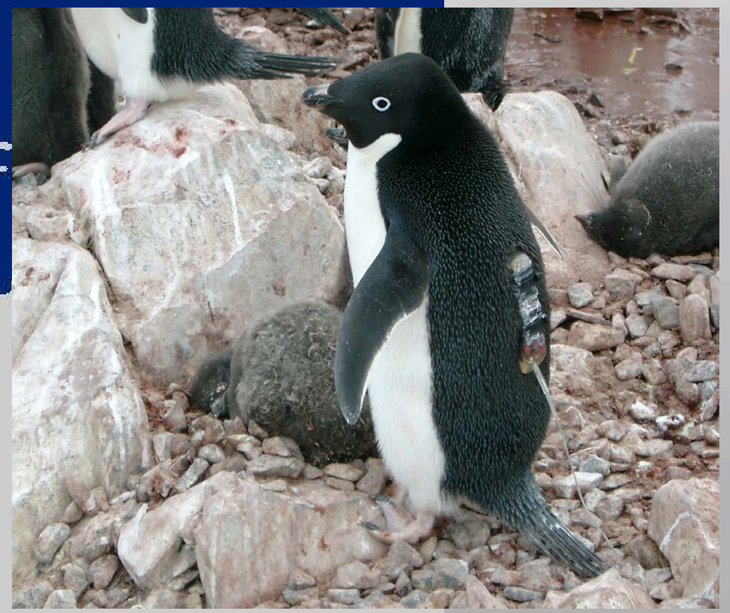
Quetin and Ross 1985

Is there an impact on higher trophic levels?

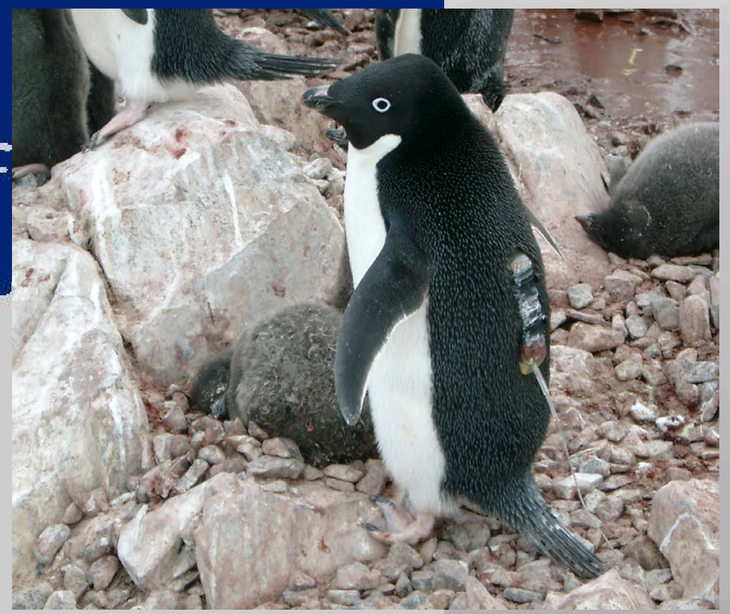


Thursday, May 31, 12

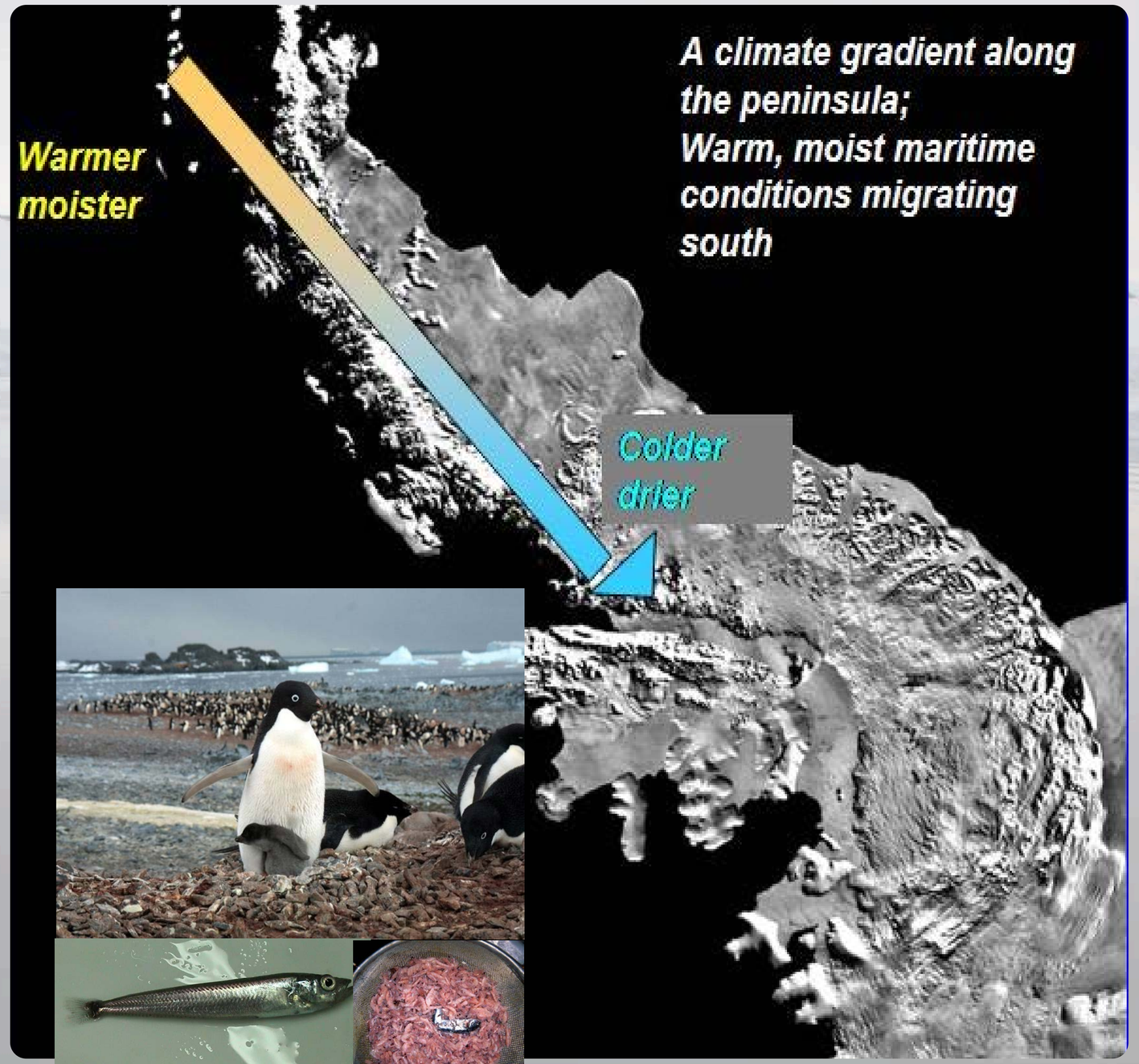
Anvers Island



Anvers Island

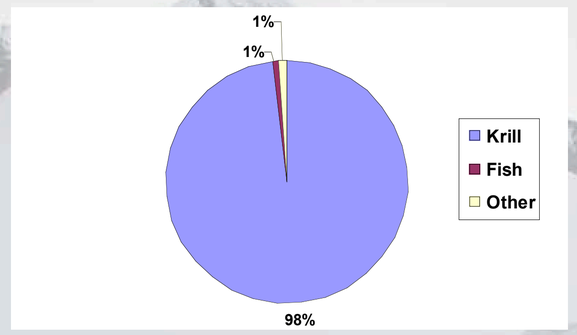


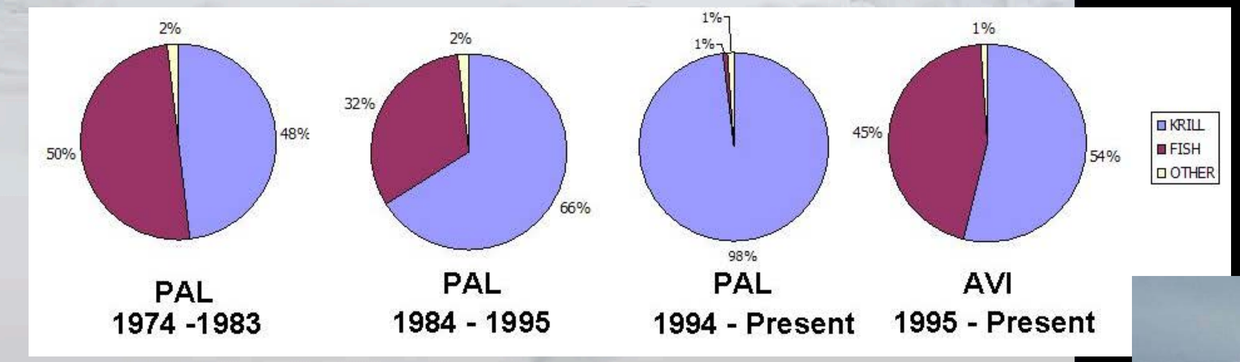
Changing diets for the Adelie penguins

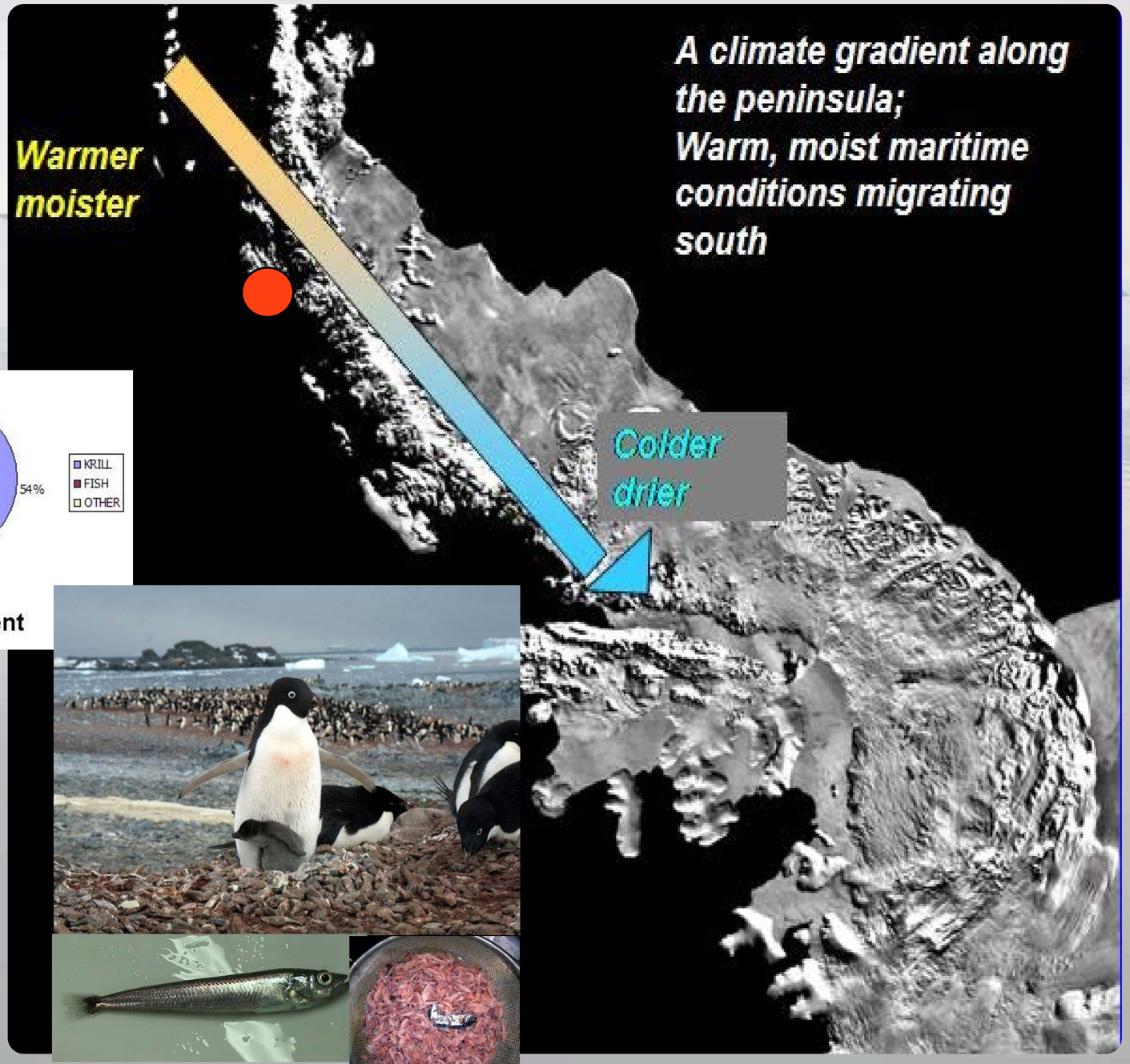


Changing diets for the Adelie penguins

1994-present

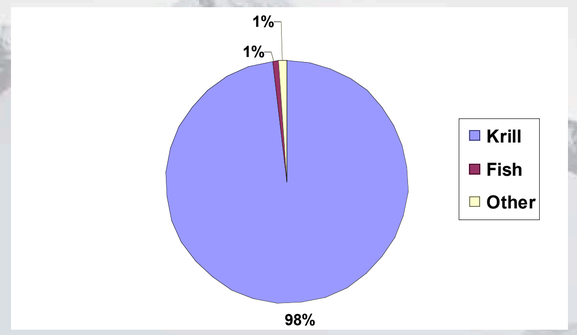


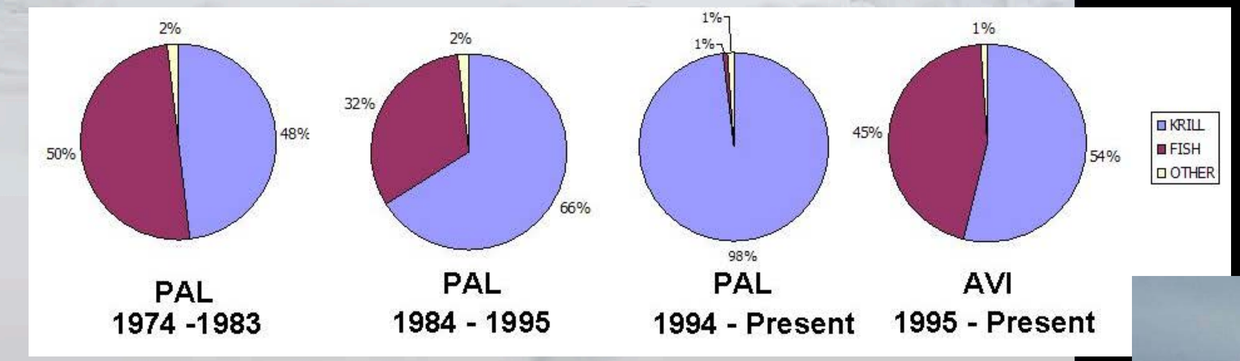




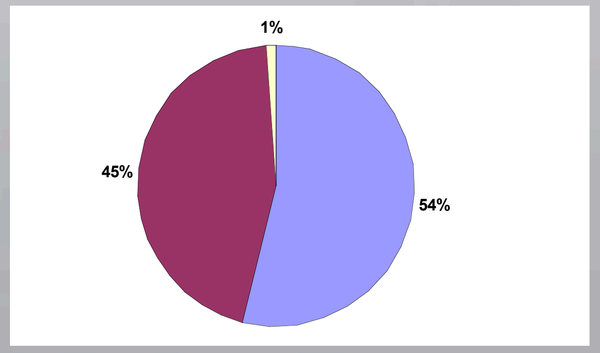
Changing diets for the Adelie penguins

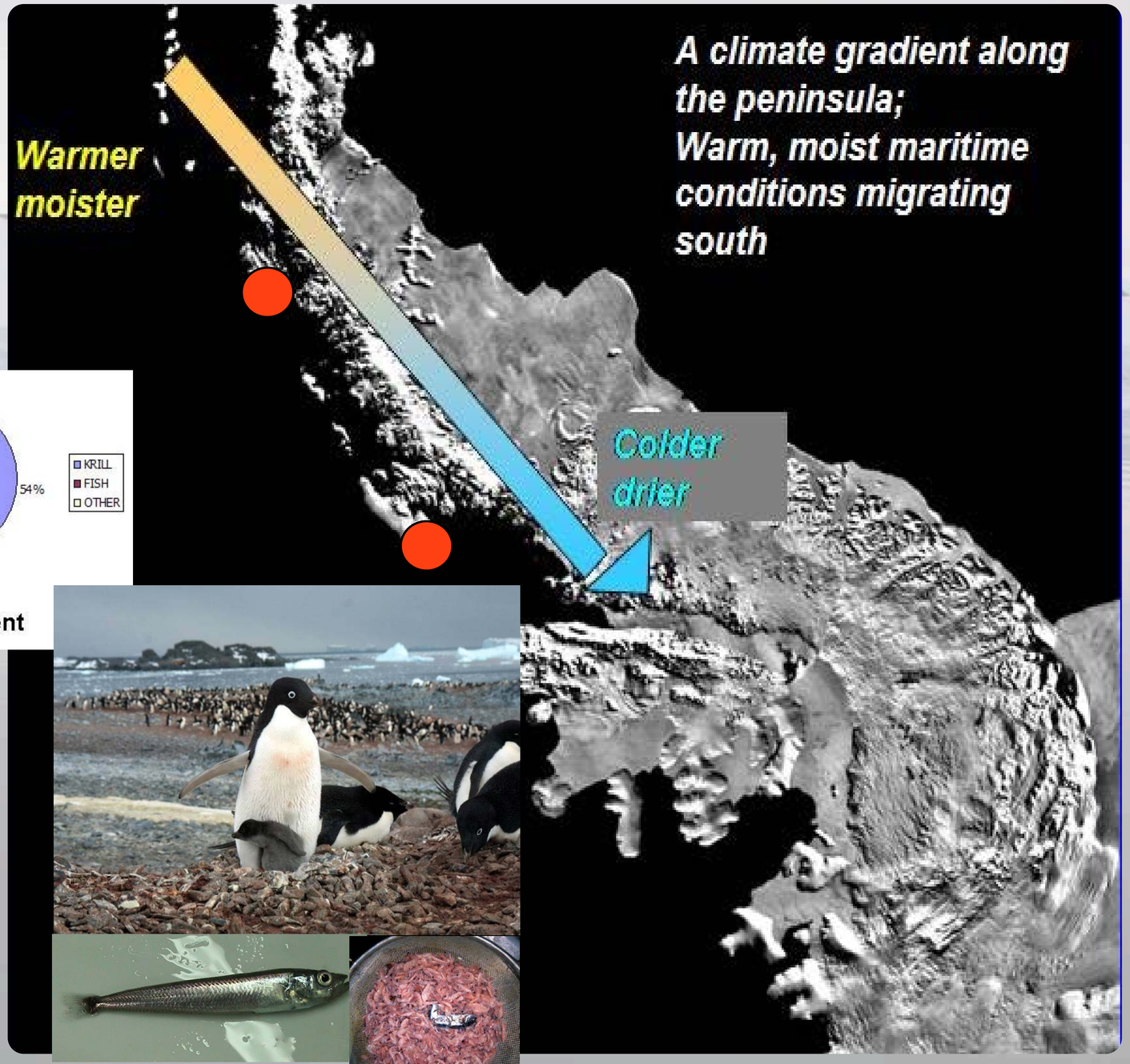
1994-present

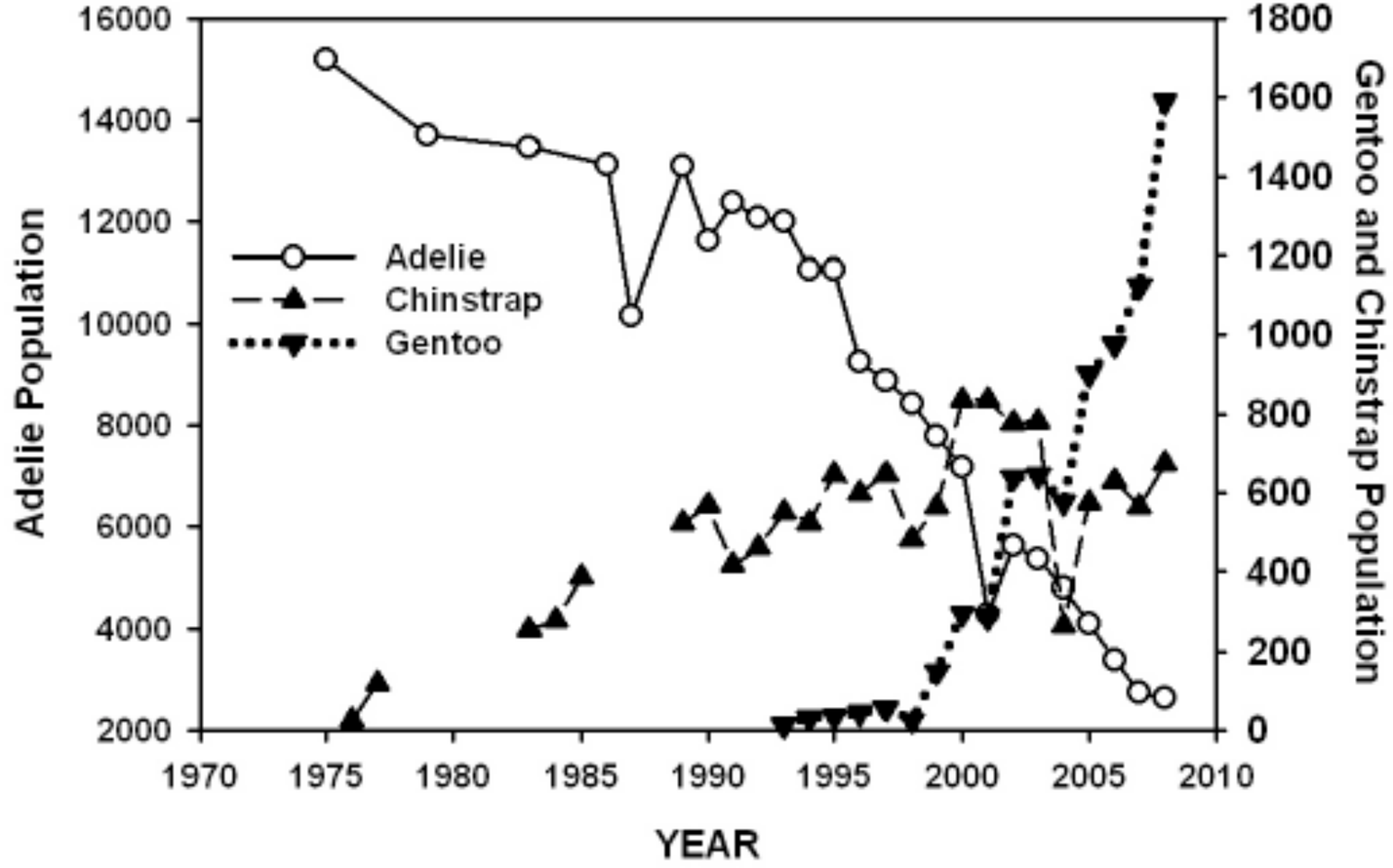




1995-present






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

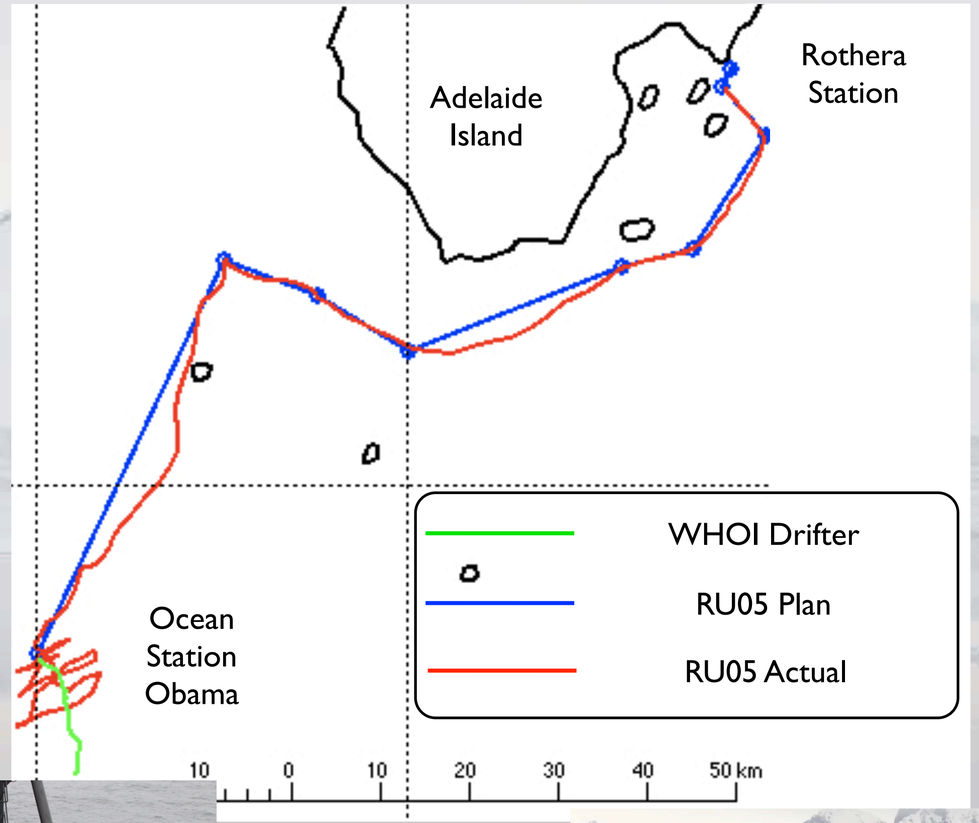
In Situ Research- 'The Early Years'

Thursday, May 31, 12

Old Day Communication

HAM Operator Coms Palmer Station 1988

Brave New Day



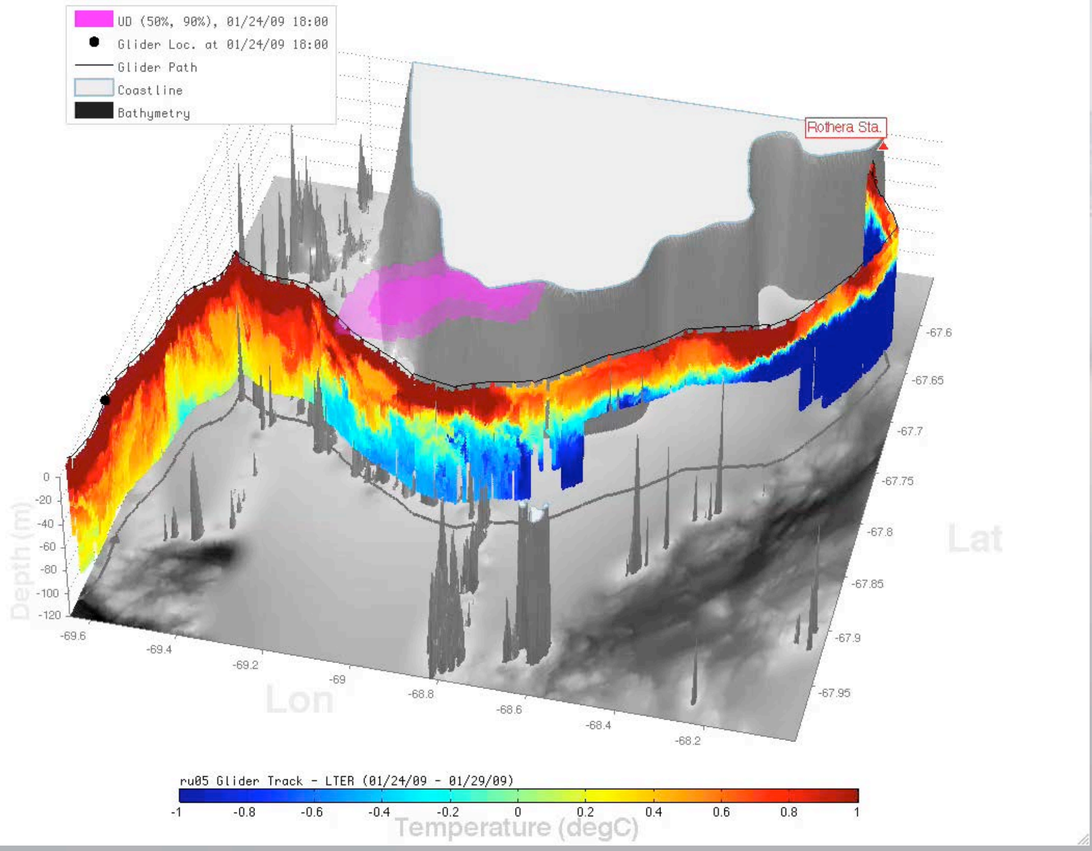
RV Gould

Rothera Base

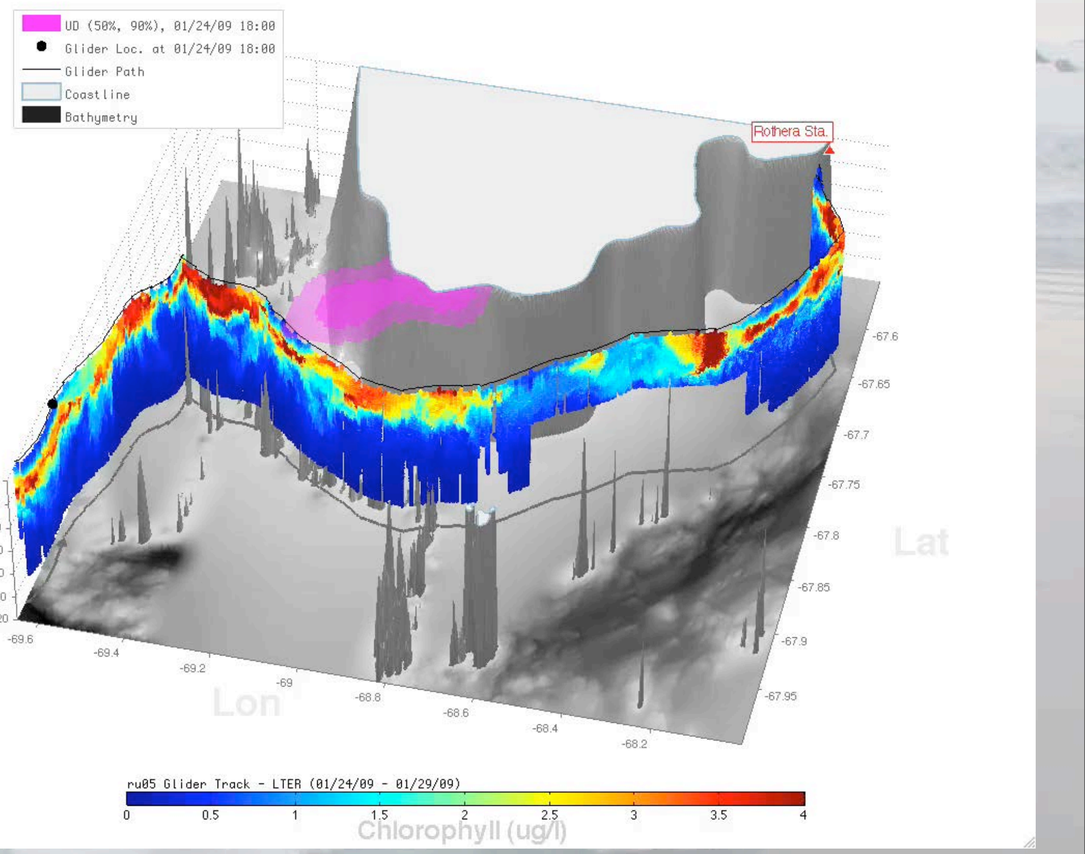
Real time comms

Rutgers COOLroom

Temperature from ru05's 01/24/09 - 01/29/09 deployment with overlay of 2009 penguin UD shown at 50% and 90% confidence intervals



Chlorophyll from ru05's 01/24/09 - 01/29/09 deployment with overlay of 2009 penguin UD shown at 50% and 90% confidence intervals



Conclusions:

The oceans are changing in our lifetimes.

A changing ocean will impact human society

It will be your generation that will meet the challenges, you will be at the front lines of exploration, discovery, and the leaders of living on changing power.