

PALMER, ANTARCTICA
Long
Term
Ecological
Research



Annual Meeting
Big Trout Ranch, MT
18-22 August, 2003

Outline of my talk:

Purposes of this meeting
Personnel & Introductions
PAL science background
Summary & Challenges



Purposes of this meeting

1. Science Meeting for PAL PI's, students, techs, guests – only opportunity to meet as a full group

2. Meet with Steering Committee (program guidance)

3. Planning meeting: field season, new initiatives

4. Complain, provoke praise...



Our hosts:

Donna Patterson

Bill Fraser

PORGYS



PAL Principal Investigators:

Hugh Ducklow*

Doug Martinson

Ray Smith+

Maria Vernet +

Robin Ross +

Langdon Quetin

Bill Fraser

Karen Baker

Andy Clarke

****Lead PI***

+ Executive Committee

microbes & biogeochemistry

phys oceanography & modeling

remote sensing and sea ice

phytoplankton & optics

zooplankton & nekton

"

"

seabirds

information management &

outreach

benthic & water column ecology



PAL Steering Committee:

John Hobbie*

Bruce Hayden*

Jim Reichman⁺

Tom Fisher *

Andy Clarke

David Ainley

MBL Woods Hole, ARC

Univ VA, VCR

NCEAS, UCSB

Horn Point Lab, MD

BAS & Rothera

HT Harvey; Ross Sea

**** Sent regrets***

+ no response



Students, Techs and Guests:

Chris Carillo, (S), G
Heidi Geisz, T(S)
Rich Iannuzzi, T
Wendy Kozlowski, T
Dan Martin, T
Tim Newberger, T
Stephanie Oakes, S
Sharon Stammerjohn, S
Colm Sweeny, G

UCSB, (Smith)
Polar Res Group (Fraser)
" " "
SIO (Vernet)
UCSB, (Ross/Quetin)
" (Sweeny)
" " "
LDEO (Martinson)
Princeton



*The central tenet of PAL is that the **annual advance and retreat of sea ice is a major physical determinant of spatial and temporal changes in the structure and function of the Antarctic marine ecosystem...** We now recognize the west Antarctic Peninsula (WAP) as a premier example of a climate-sensitive region experiencing major changes in species abundance and composition due to changes in range and distribution that are occurring in response to regional climate change manifested here primarily as a southern migration of principal climate characteristics (climate migration). In effect, the maritime system of the northern WAP is replacing the continental, polar system of the southern WAP along the peninsular climate gradient. This change is driven by regional warming, which is modulated by regional hydrography, sea ice processes and global teleconnections to lower latitude atmospheric variability...we seek to understand the full ecological implications of climate migration in the WAP, and uncover the mechanisms linking them through teleconnections to global climate variability.*

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What we know:

Regional warming (+5C in winter; +2C annual) over past 5 decades

Sea ice extent, duration declining

These two highly correlated; mechanisms are beginning to be understood.

Interannual variability in sea ice behavior

Penguins declining locally (70% since 1975): but mechanisms and links to climate not clear...some factors may be terrestrial (e.g., snow).

What we think:

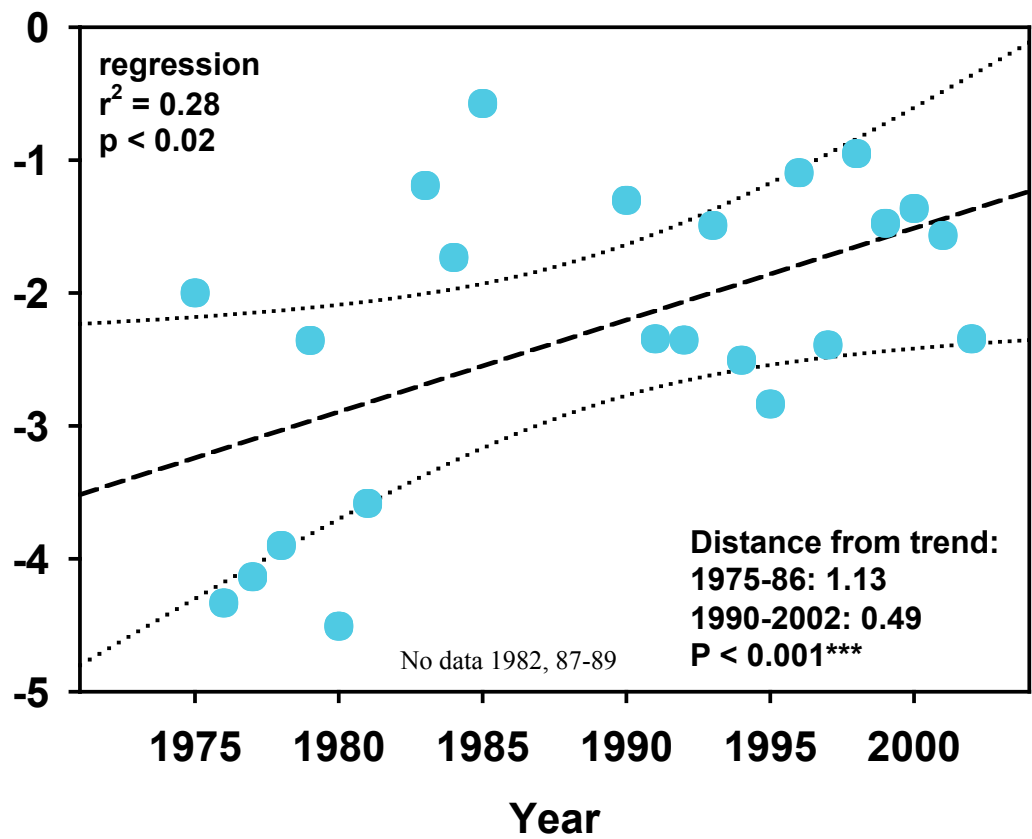
Some relationship between sea ice variability and plankton dynamics:

High ice years → High PP (eg, 1996) Low ice → low PP (eg, 1999)

But krill optimize on 'average ice years' ??? And no real highs, lows in the 1990s...

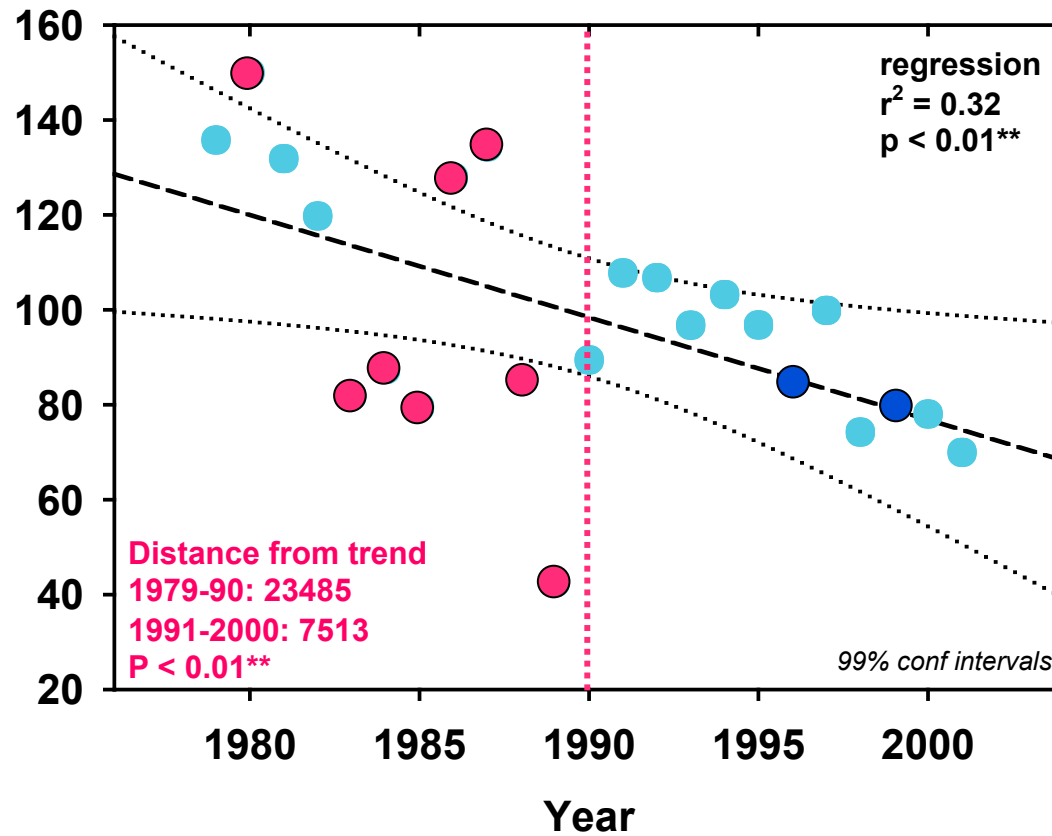
Links between lower trophic levels and penguins also unclear

Palmer temperature, 1975 - 2002 !

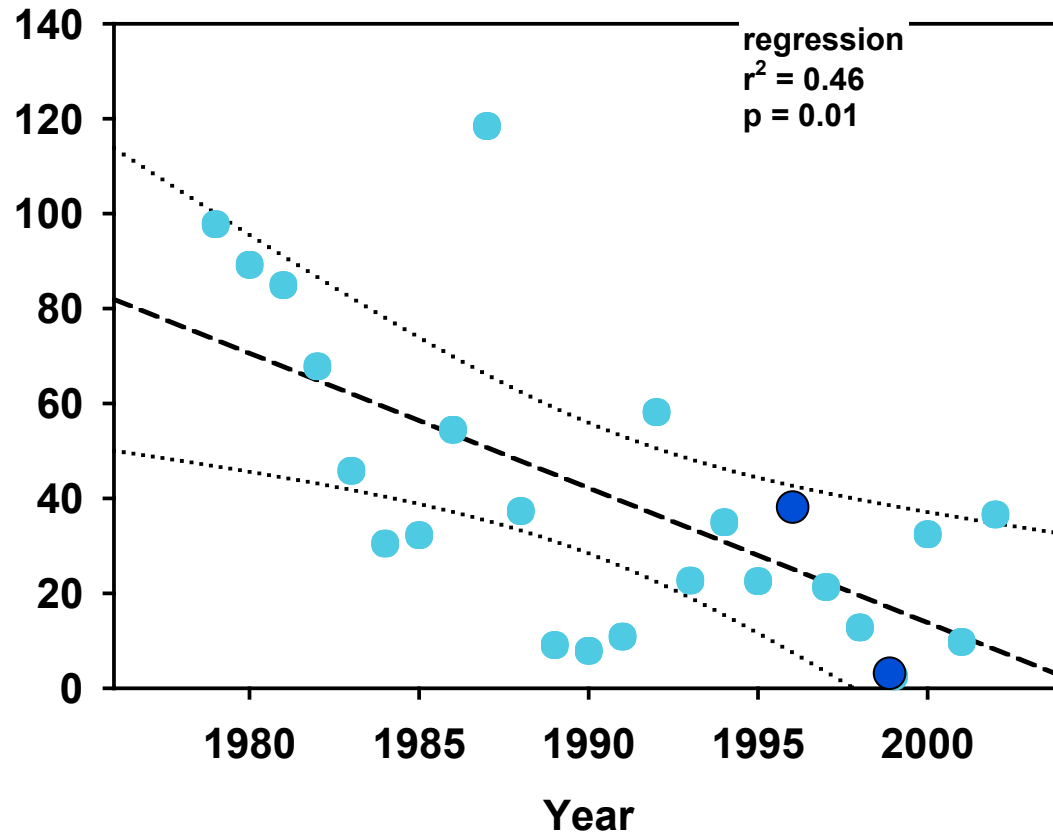


1980s: Hi/Lo temps
1990s: Not

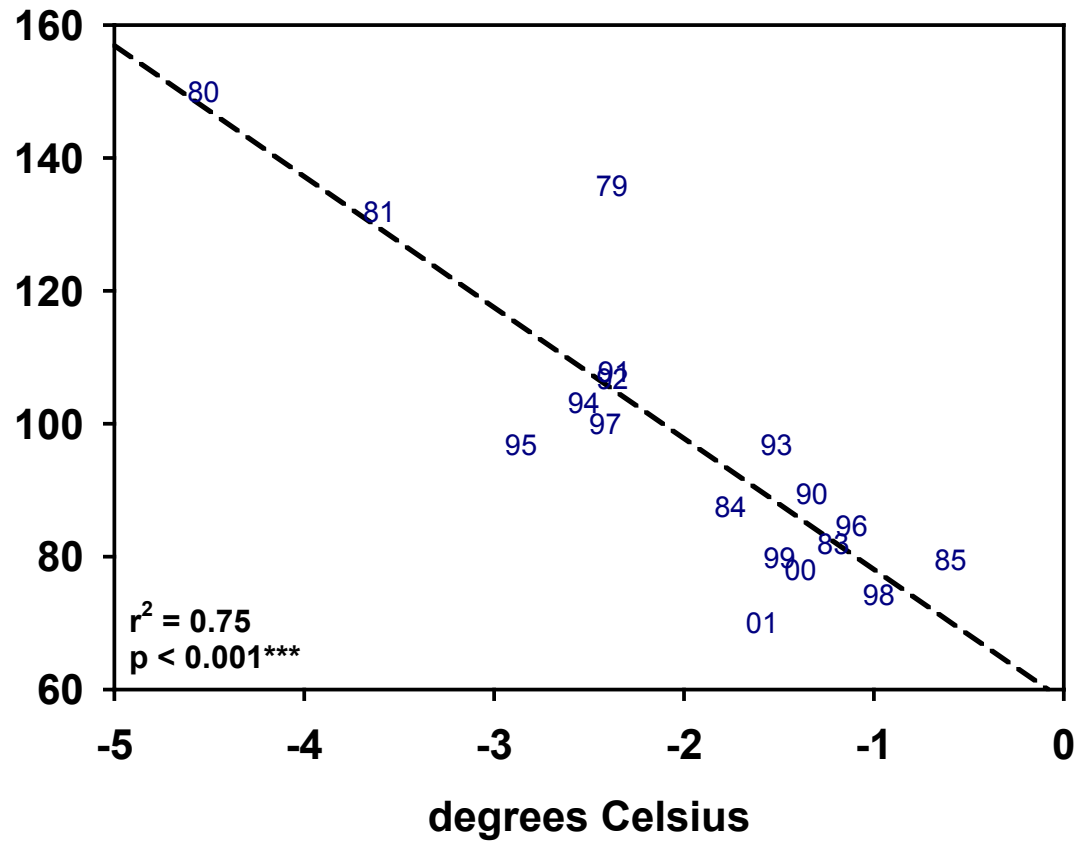
Palmer annual mean ice extent, 1979 - 2000



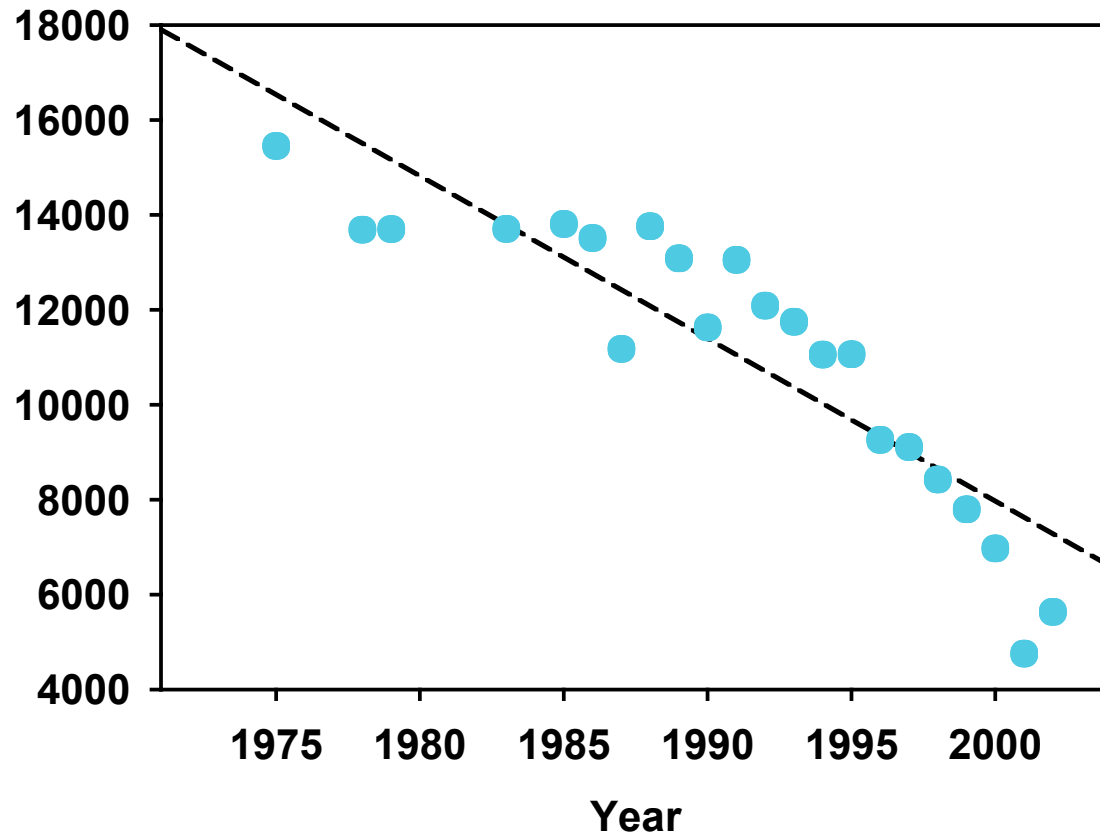
Palmer January sea ice, 1979 - 2001



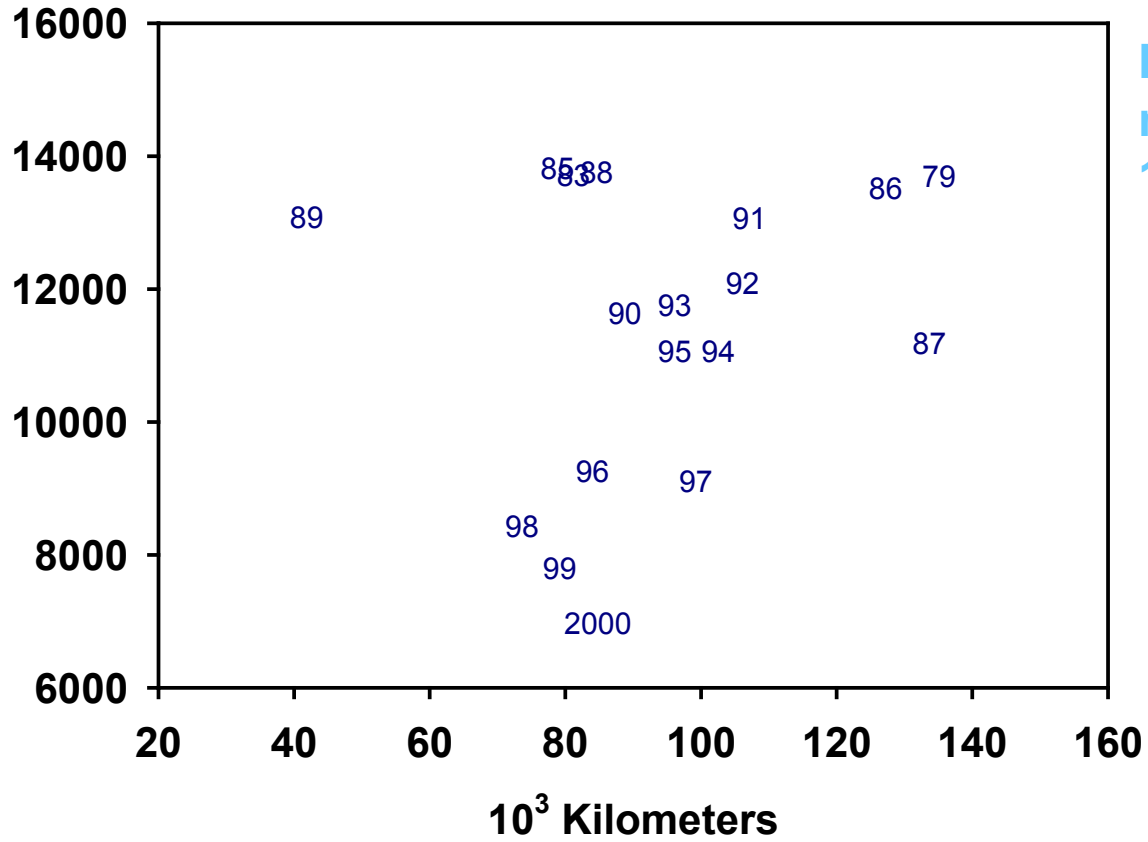
Palmer sea ice & temperature, 1979 - 2001



Palmer Adelie population, 1973 - 2002

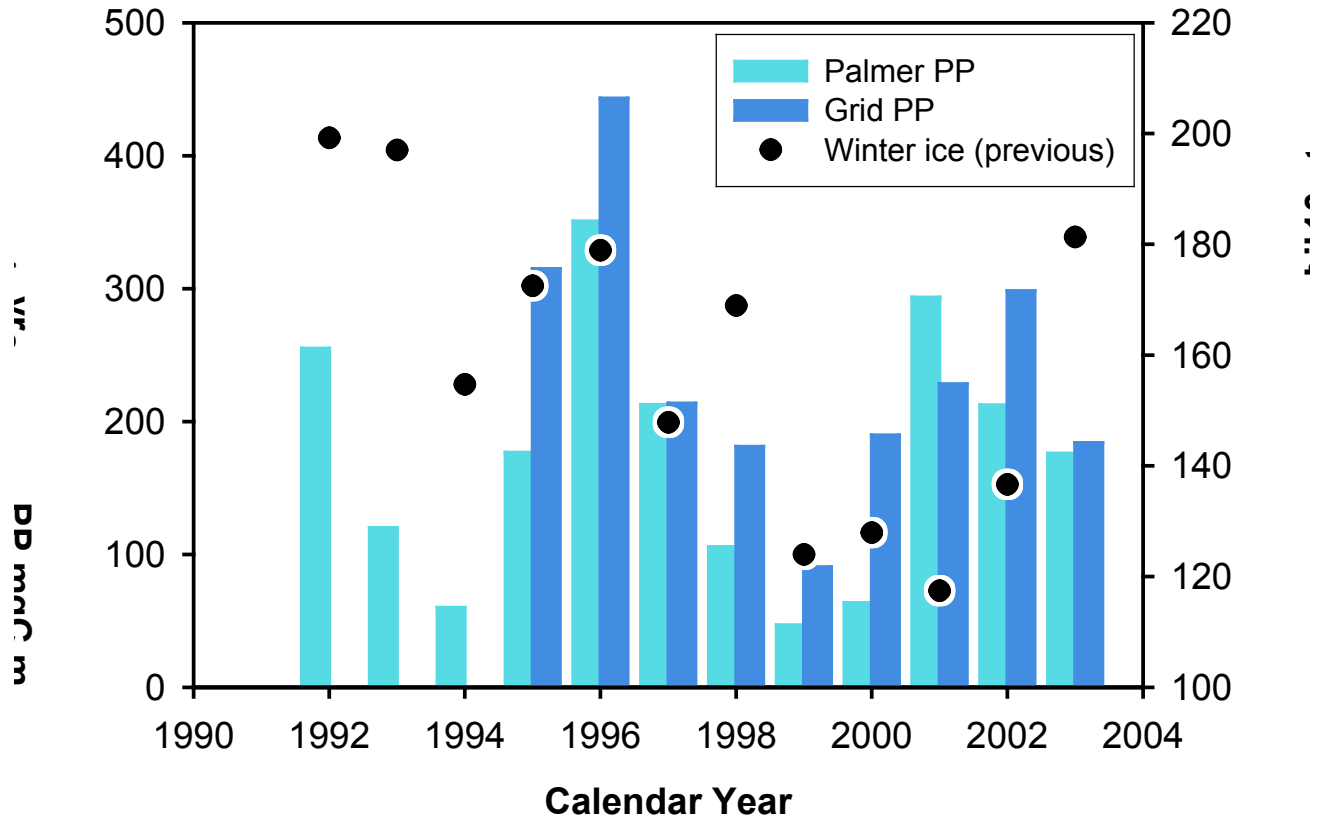


Penguins and sea ice, 1979 - 2000

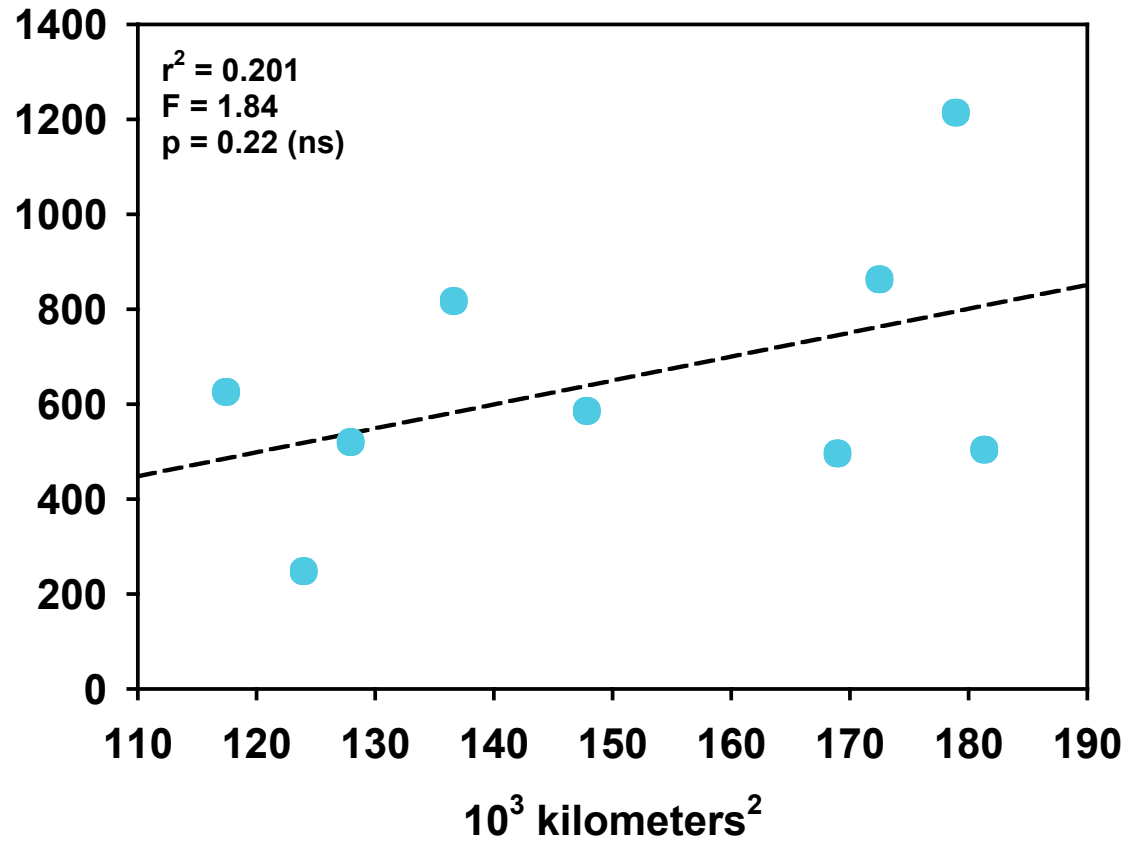


Relationship
not improved with
1-5 year lags

Primary Production and Ice extent



Grid PP (Jan) vs Winter Ice



Krill recruitment: maximizing in average ice years

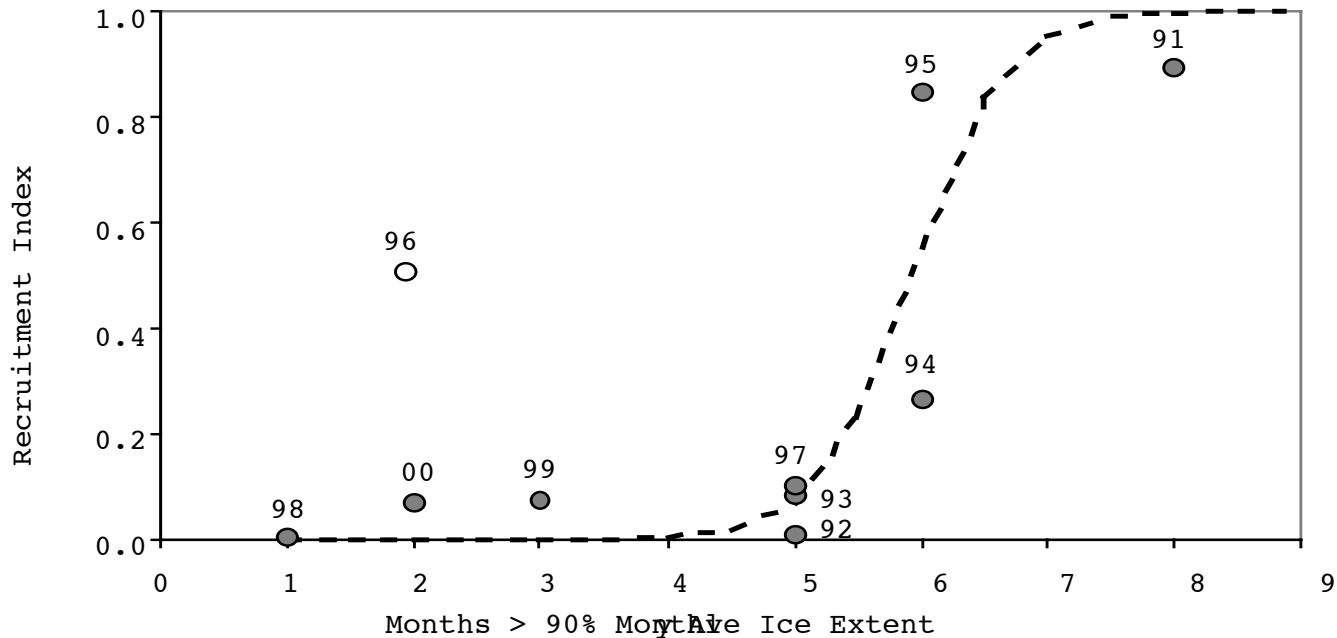
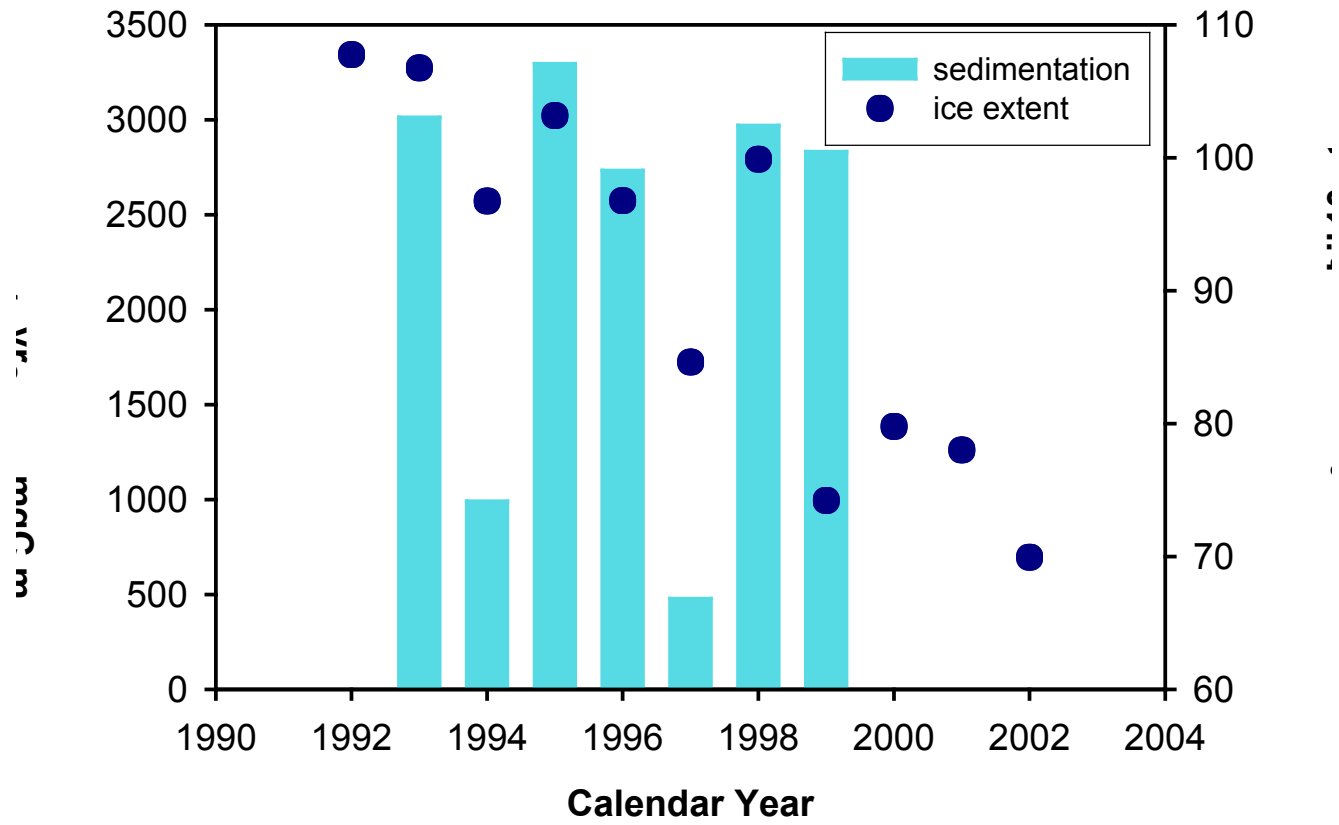


Figure 2 The krill recruitment index plotted against the number of months between Apr and Dec when the sea ice extent for each month is greater than the 22-yr mean for that month. Symbols show year class. A sigmoidal response curve, $r^2 = 0.88$. The strong '96 year is a consequence of a high % females reproducing.

Sedimentation and ice extent



Summary and Challenges

Science Issues:

What is the relationship between sea ice variability and plankton dynamics?

What is the relationship between plankton response to climate change and penguin breeding success?

Infrastructure Issues:

How do we move toward a strategy embracing advanced instrumentation – moorings, AUV's, next generation GIS, remote obs etc?

What about NEON?

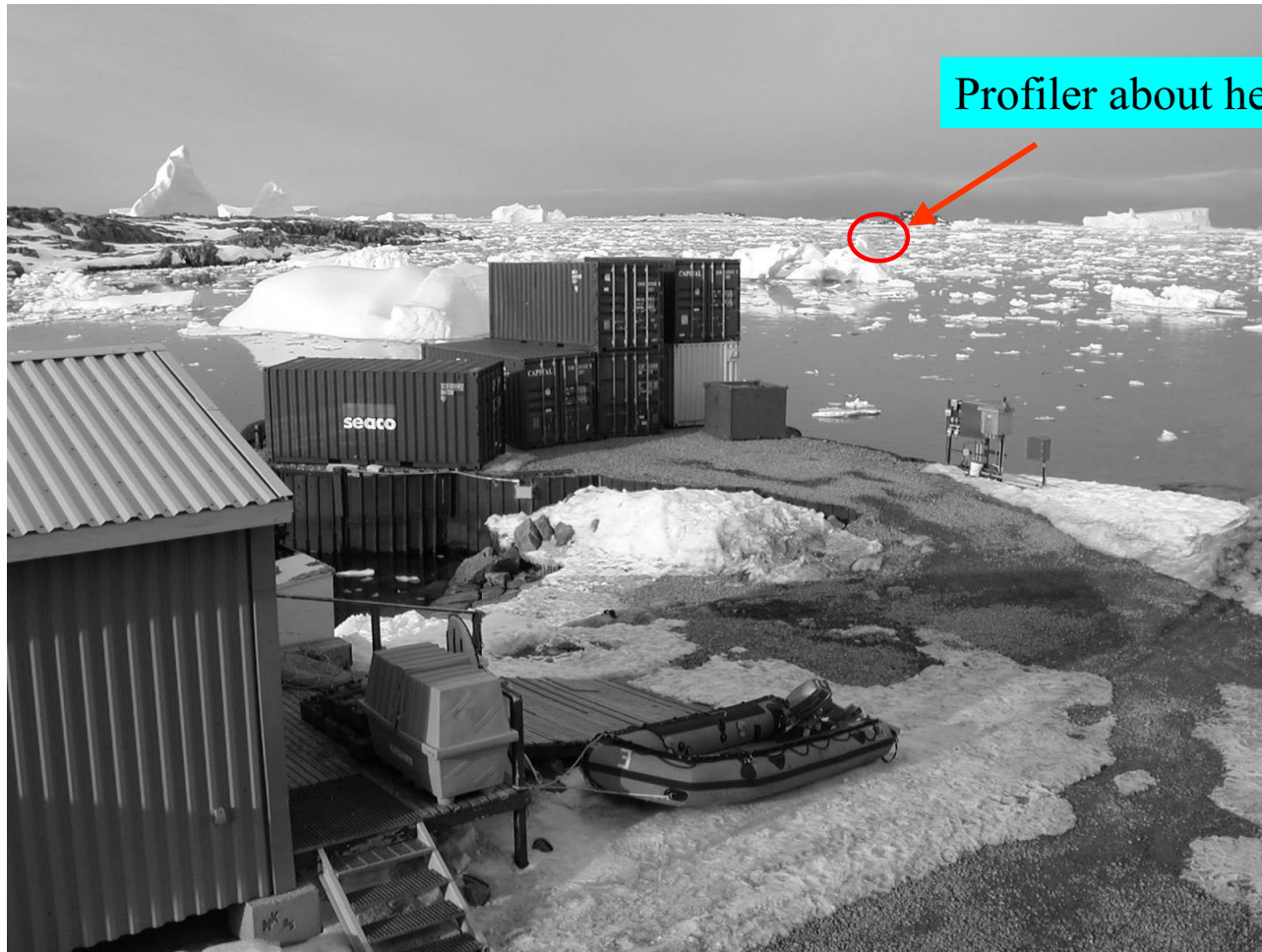
How do we maintain productivity and observations in the current limited funding structure?

How do we enhance our profile in LTERNet?

How do we replace (succeed) Ray?

A database to support and enhance synthesis & outreach

The APV at Palmer Station



And moving right along...



Palmer January temperature, 1975 - 2003

