



Palmer Antarctica Long Term Ecological Research Project 1993-2015

Planned operations in 2015-16 and connections to ORCAS



**Local-scale science
near Palmer Station
Daily-weekly
sampling Oct to April**

**Water column hydrography
and plankton ecology...
and sometimes whales**

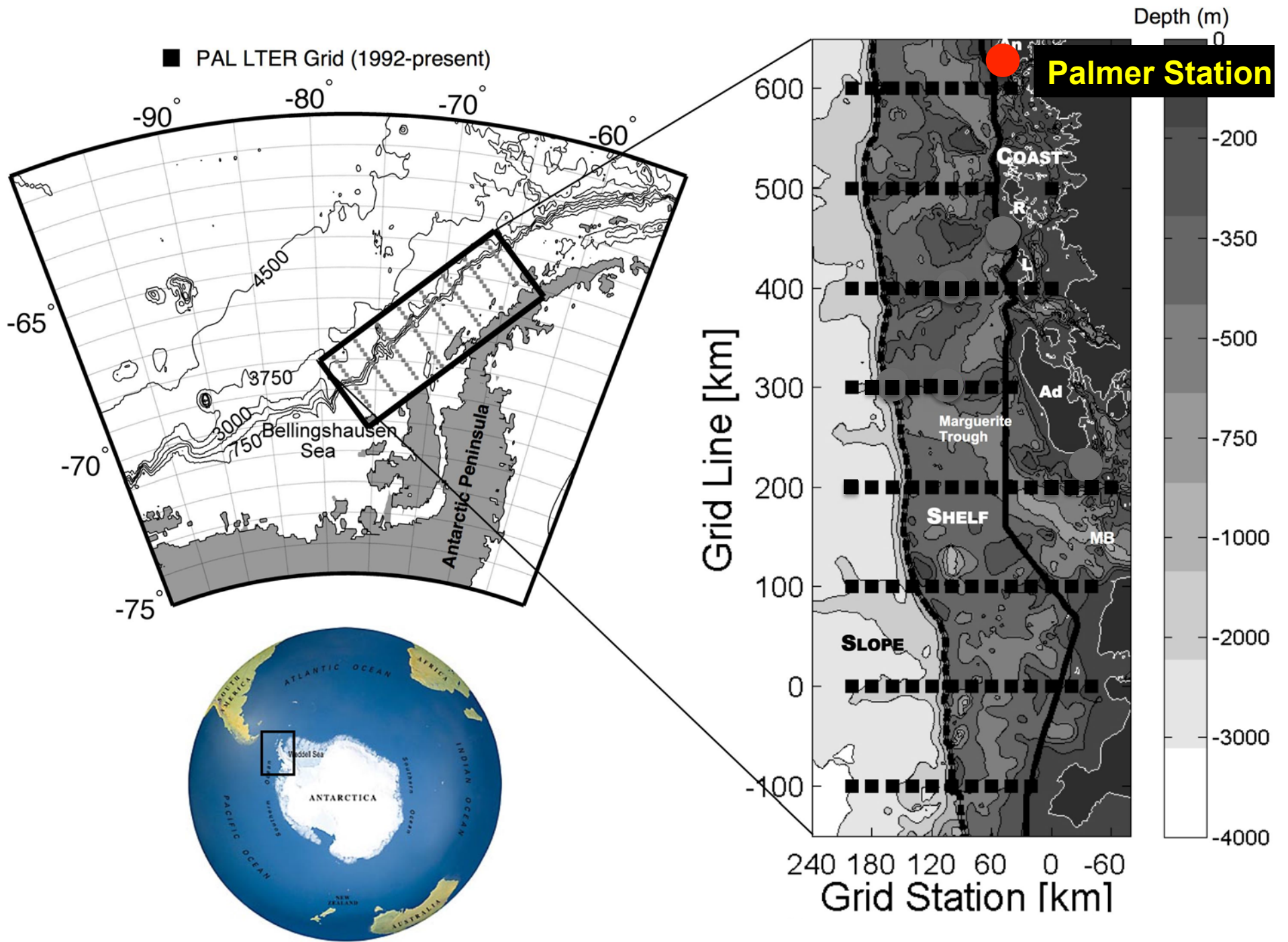
**Seabird ecology
and demography**

Bill Fraser and Gentoo Penguins



**Regional-scale oceanography
along the Peninsula every
January aboard LM GOULD**





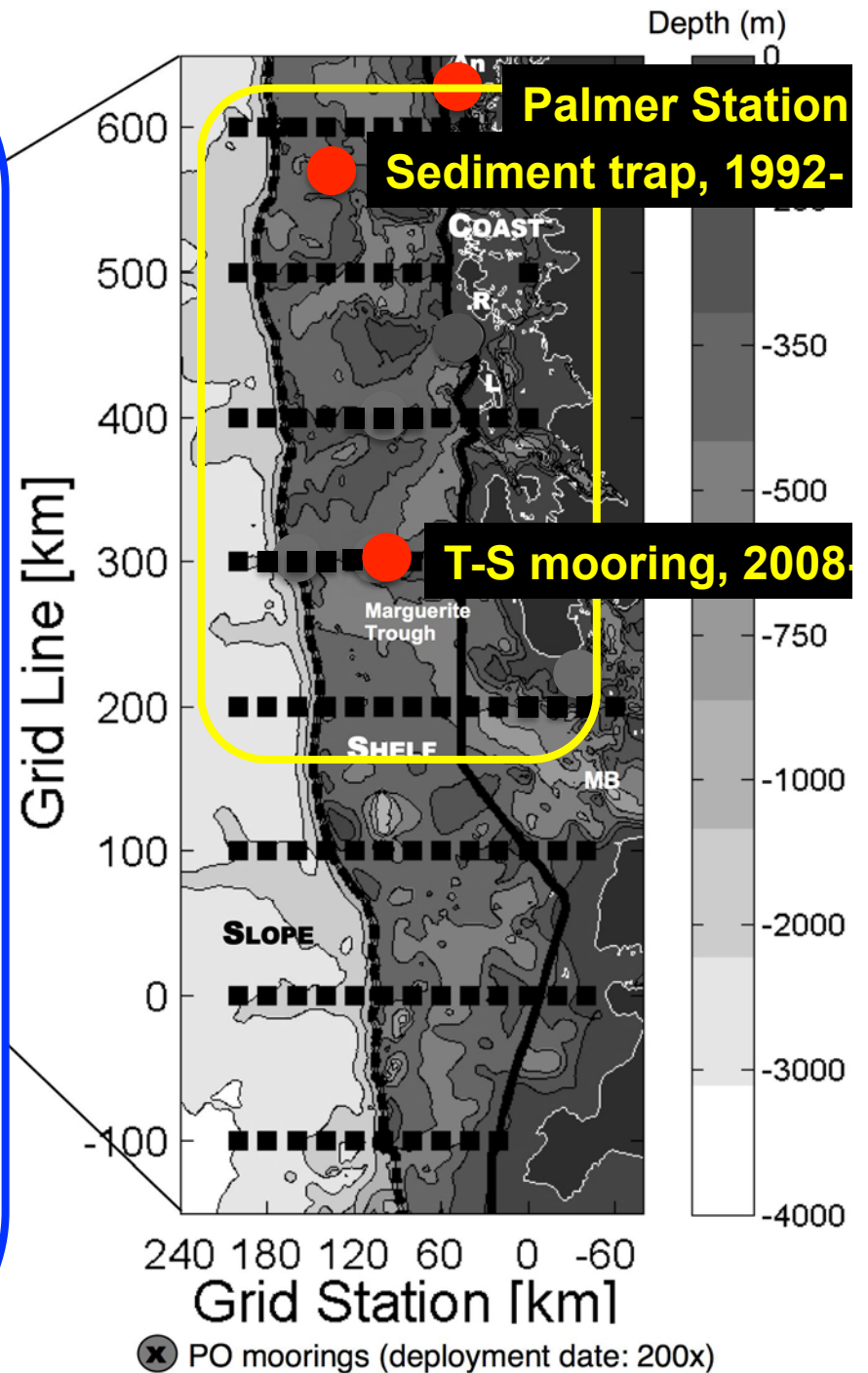
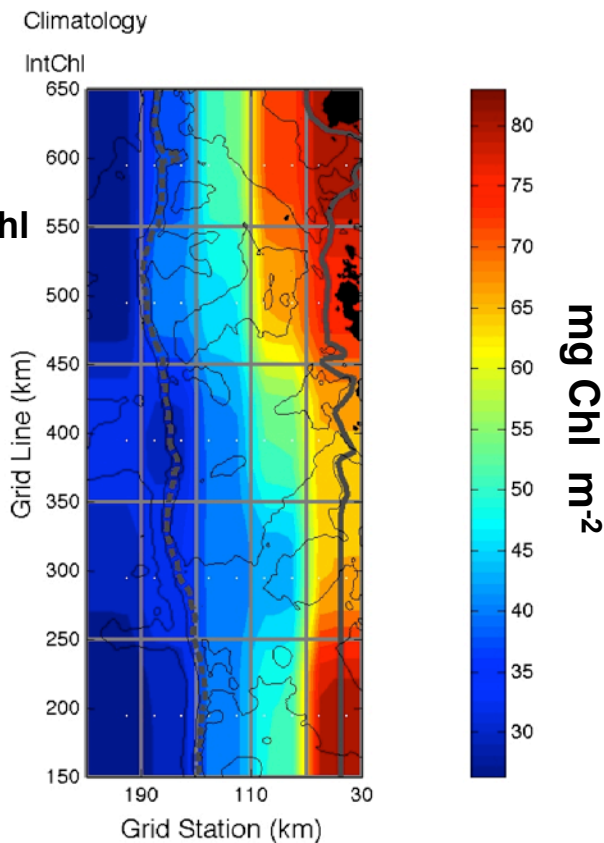
LTER Grid Coordinate System:

Cross-shelf lines, 100 km spacing

55 Stations on lines, 20 km spacing.

1993-2008: CTD/Rosette & Zooplankton nets at each station on the 200 – 600 lines.

LTER grid Chl
1993-2012



LTER Grid Coordinate System:

2009-15: **Extended grid** south to -100 line (70S, Charcot Island), to sample in region influenced by persistent summer sea ice.

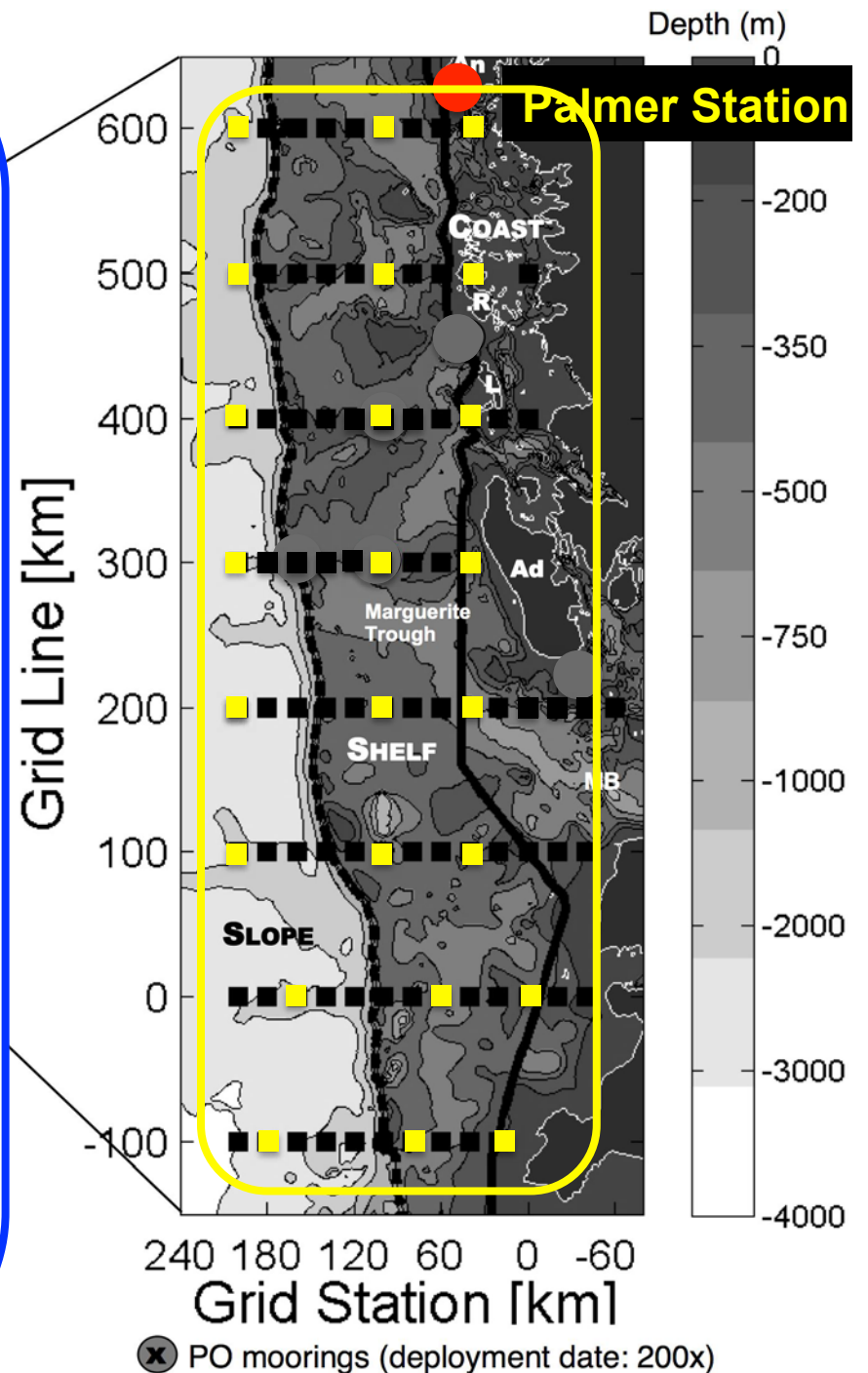
Extra distance and shiptime necessitated lowering spatial resolution on grid

3 stations on each cross-shelf line: coastal, midshelf, slope (>3000 m)

Currently, the northern grid (200-600 lines) takes about 2 weeks (~Jan 7-21)

Southern grid takes another week (Jan 21-28, when ice allows access)

Final week is return leg and mooring operations, glider recovery, etc



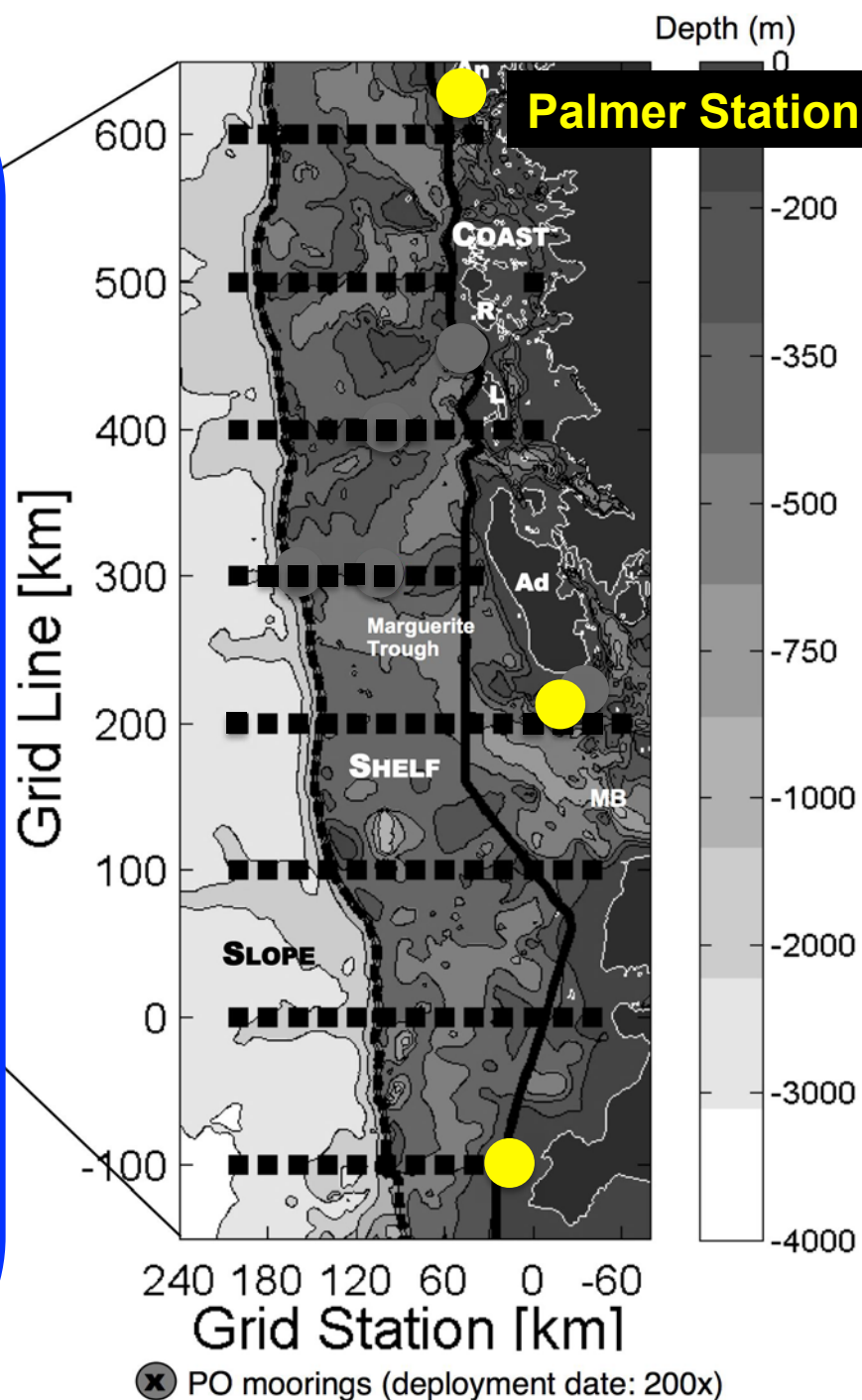
Process Studies:

We also conduct 3, ~3-day **process studies** at 3 locations in study area.

An extended period allowing more intensive, repeated sampling, and other operations in a single area.

Process themes selected each year, sometimes determined by events and observed conditions (e.g., ice-edge blooms, canyon upwelling).

We could locate one or more process studies to **optimize links to ORCAS** (small-scale surveys under aircraft, etc)



LTER sampling and measurements, 2016 cruise:

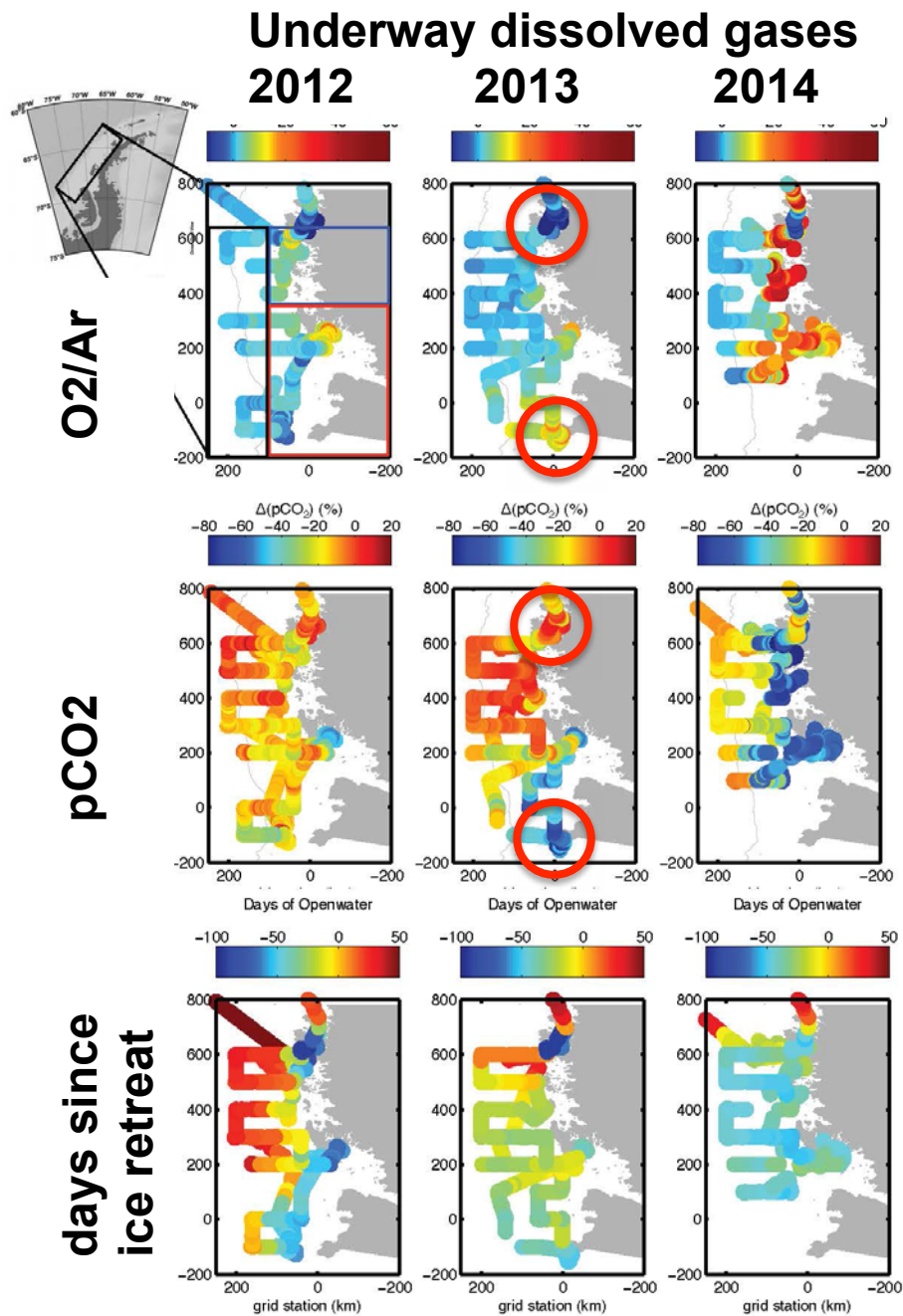
CTD to bottom at 25 grid stations and 10-20 process stations

Bottles 12-24 depths per CTD cast / Zooplankton net tows to 500 meters

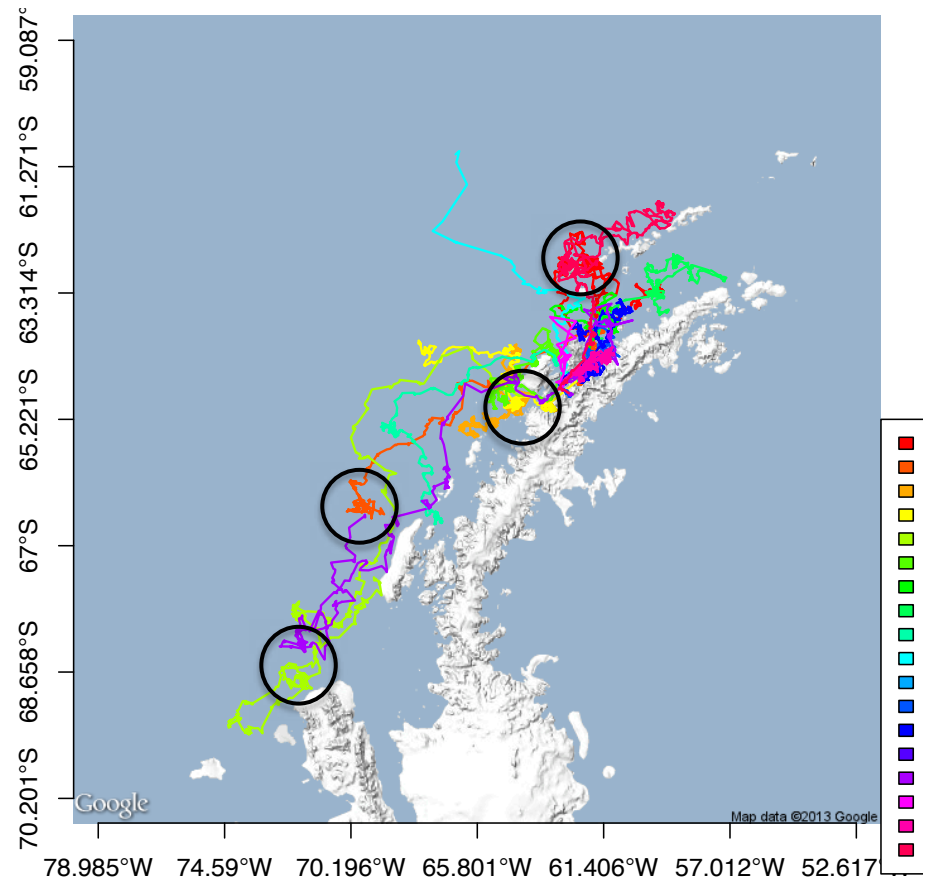
Underway, continuous sampling along track

Discrete surface samples along track

| <u>Grid stations</u> | <u>Underway continuous</u> | <u>Underway discrete</u> |
|---------------------------|----------------------------|--------------------------|
| In-water optics | pCO ₂ | nutrients |
| Chlorophyll | O ₂ | DIC, TALK |
| POC, PN | T,S | Chl |
| C14-Prim Prod | Fluorescence | Seabird abundance |
| HPLC pigments | Fv/Fm | Marine mammals |
| Diss. nutrients | O ₂ /Ar (NCP) | |
| DIC, TALK, DOC | | |
| Bacterial Prod | | |
| Microbe abundance | | |
| Microbe DNA, RNA | | |
| Thorium 234 export | | |
| Trace metals (R Sherrell) | | |
| Macro, mesozooplankton | | |
| Whale tagging & biopsy | | |
| Oxygen-18 | | |



courtesy R. Eveleth, N. Cassar, Duke Univ

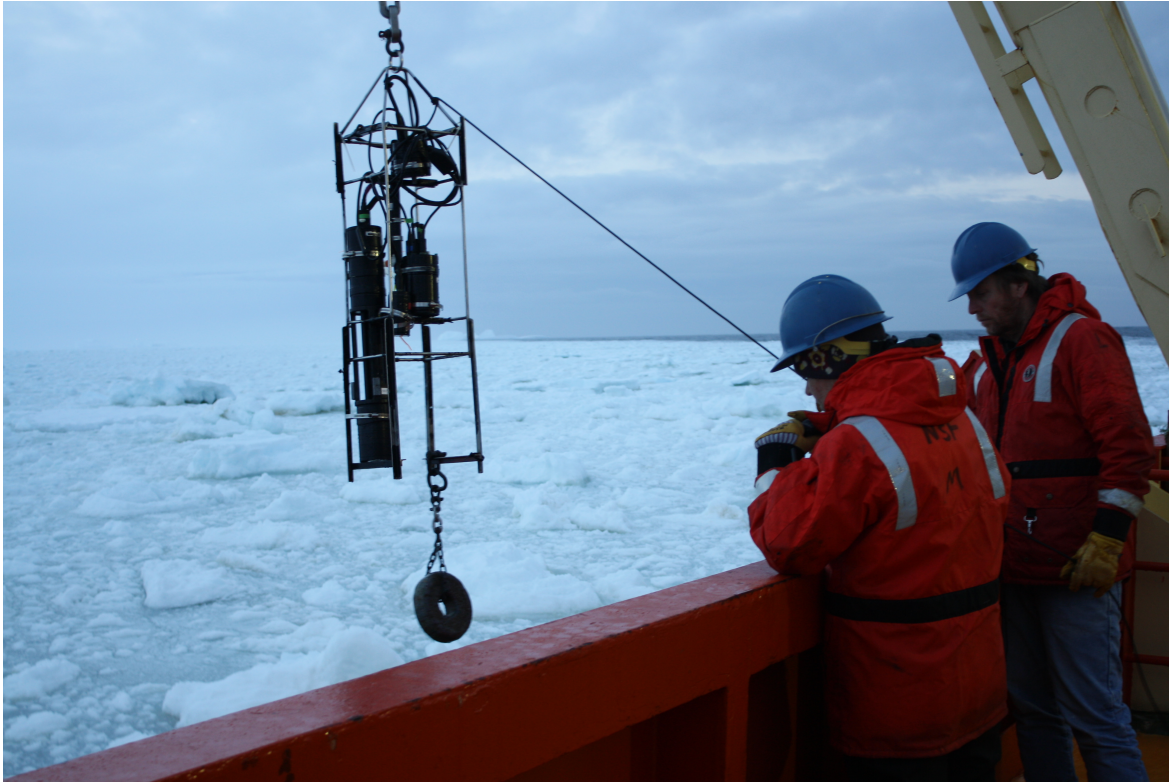


Humpback whale movements, Feb-April 2013. Whales tagged in Gerlache Strait in Feb. Note gas hotspots – whales forage in metabolically active regions.

(each track is one whale; stop-and-eat areas circled)

courtesy A. Friedlaender, Oregon State

Other Relevant Ship Operations to ORCAS



-At each master station:
Profiles of AC-9, Ecopuck
to complement the Ship
CTD (beam-c, oxygen,
chlorophyll fluorescence.
PAR)

-Selected stations spectral
downwelling irradiance
and upwelling radiance



LTER Glider Operations

Two classes of glider (Slocum) operations

1) Coastal gliders operations (200 meter class) (42 missions since 2006).

Research focus on:

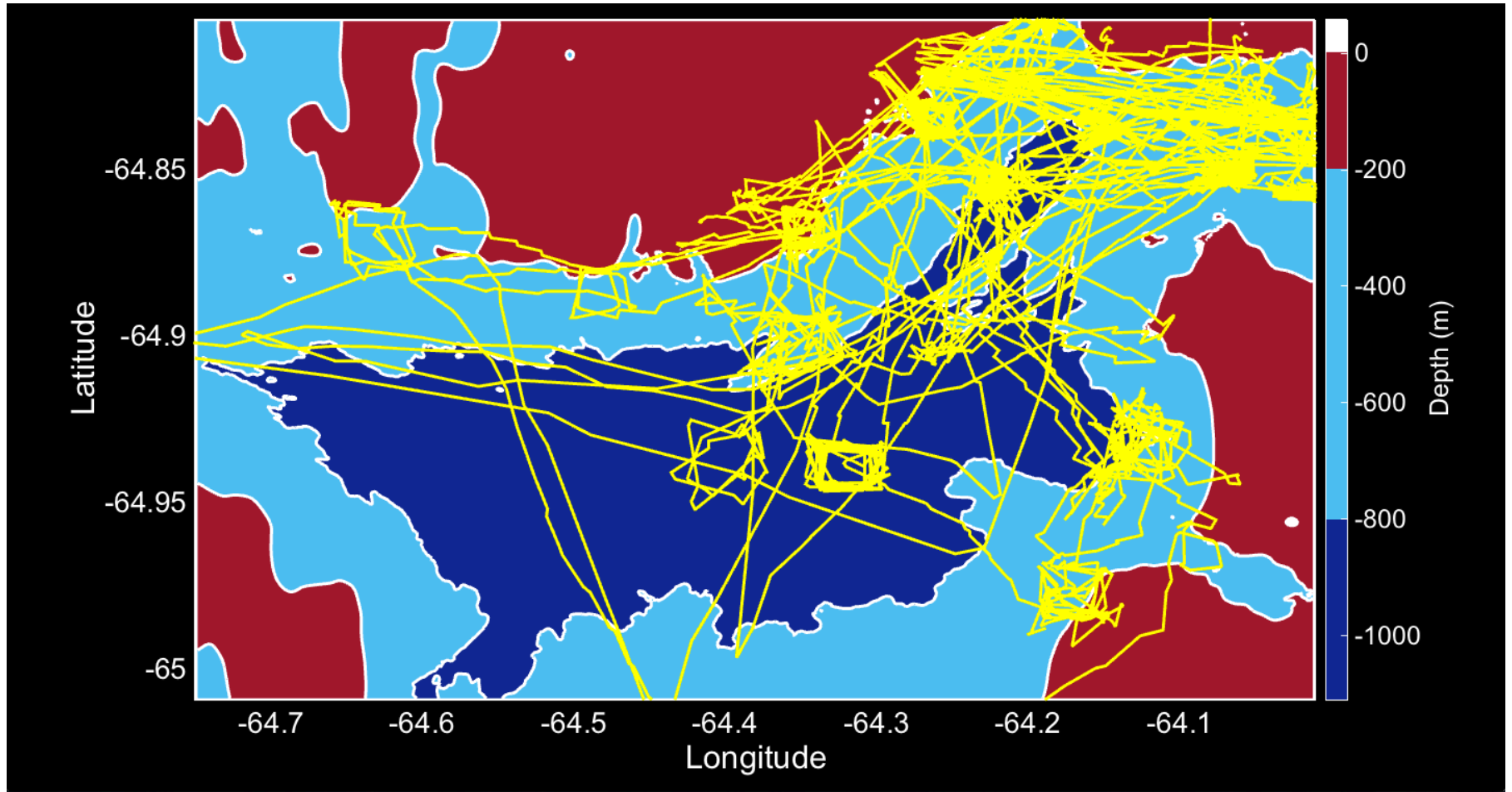
- physical regulation of the nearshore phytoplankton blooms
- photophysiology of phytoplankton
- processes regulating penguin foraging

2) Deep gliders operations (2000 meter class) (6missions since 2009).

Research focus on:

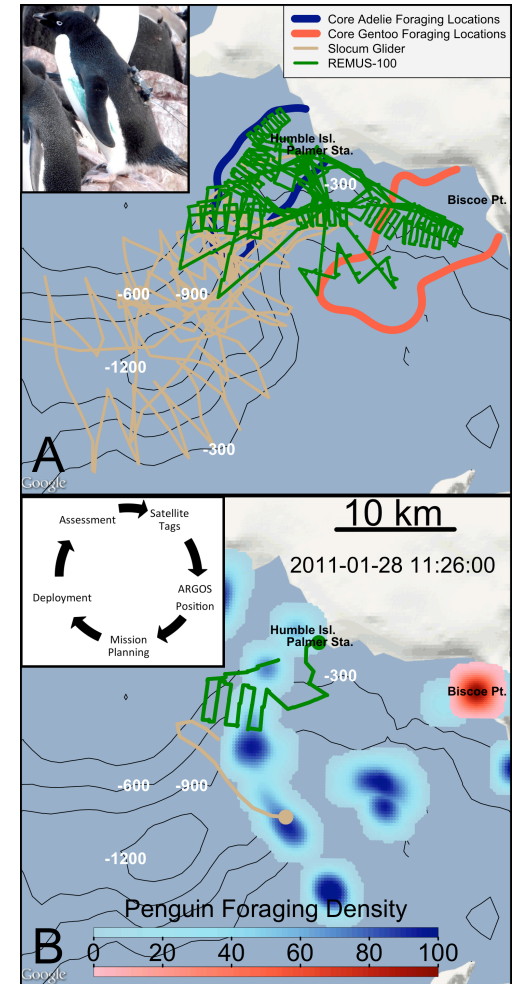
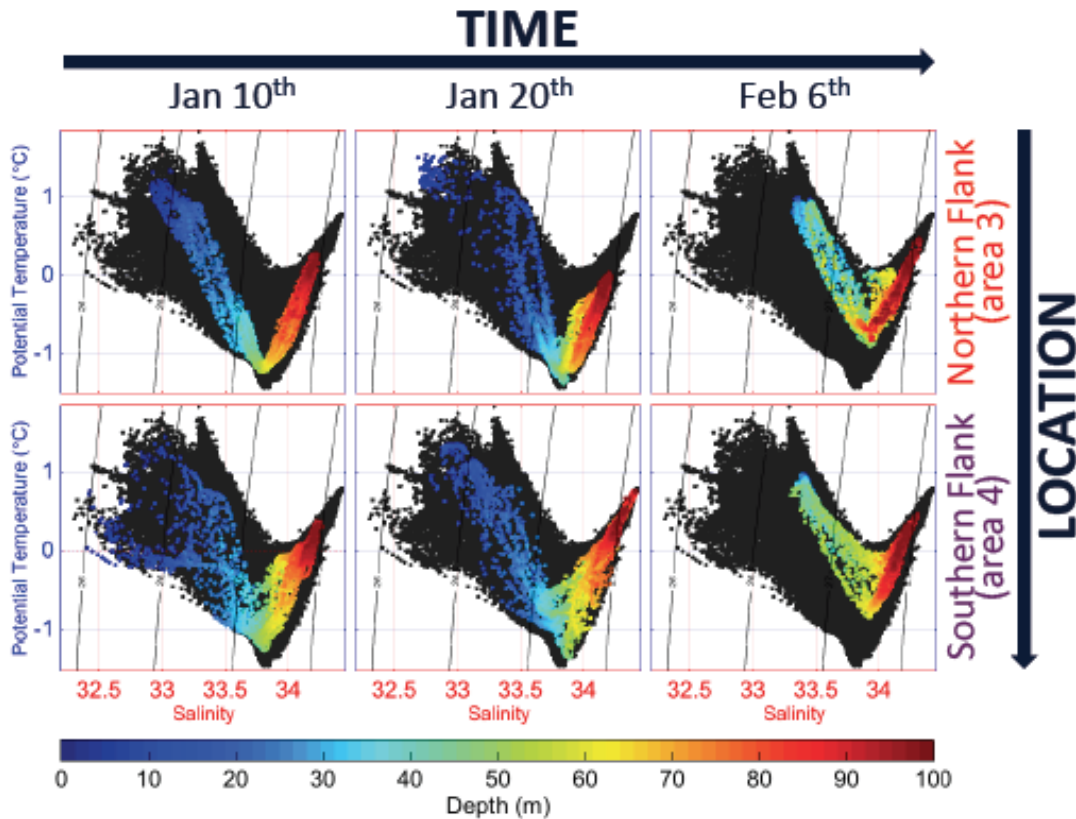
- shelf-wide transport of the circumpolar current across the WAP shelf
- subsurface eddy dynamics

Glider Operations in the Palmer Deep Canyon



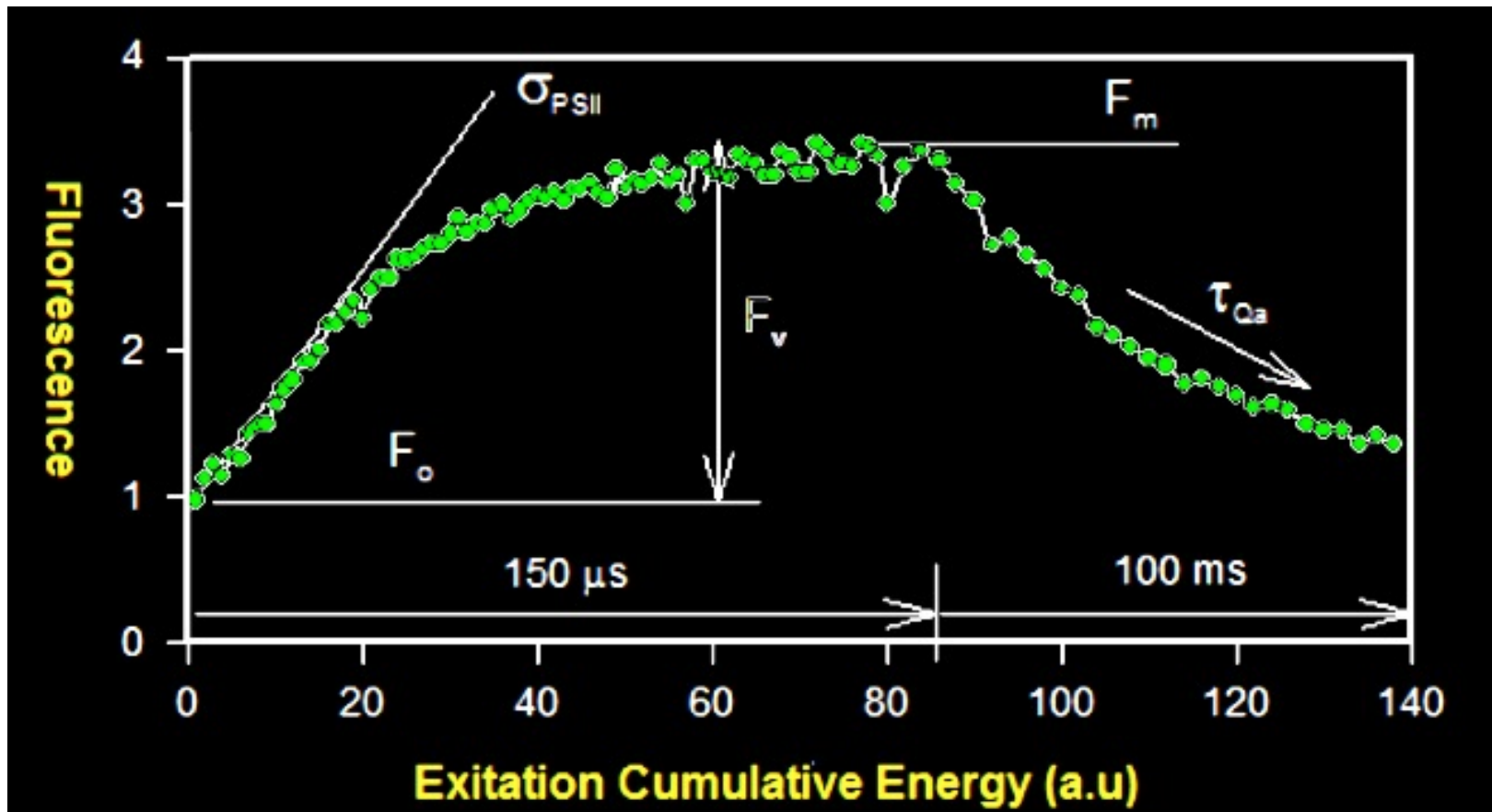
Standard package include CTD, WetLabs Ecopuck. Anderra Optode

Coastal Research Applications

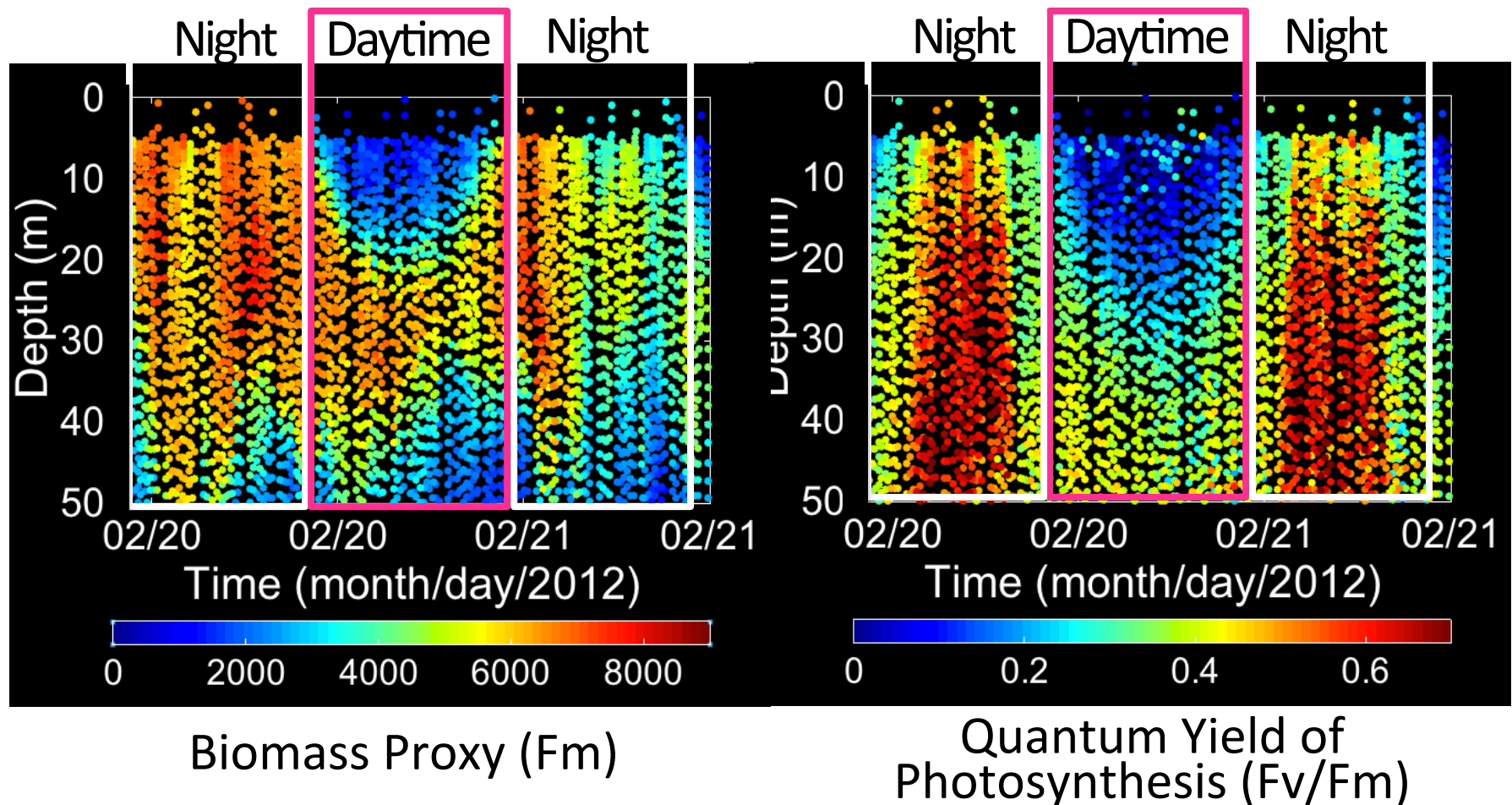




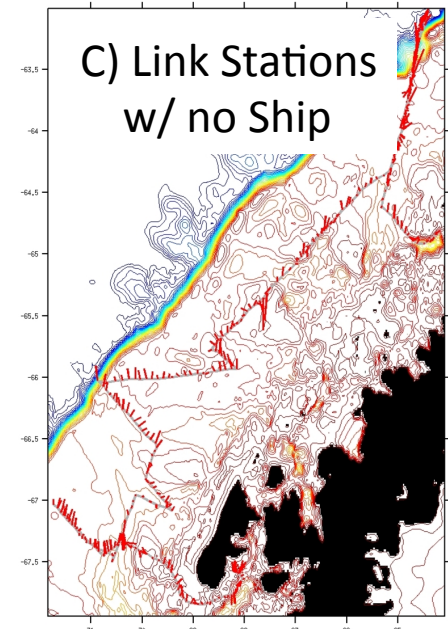
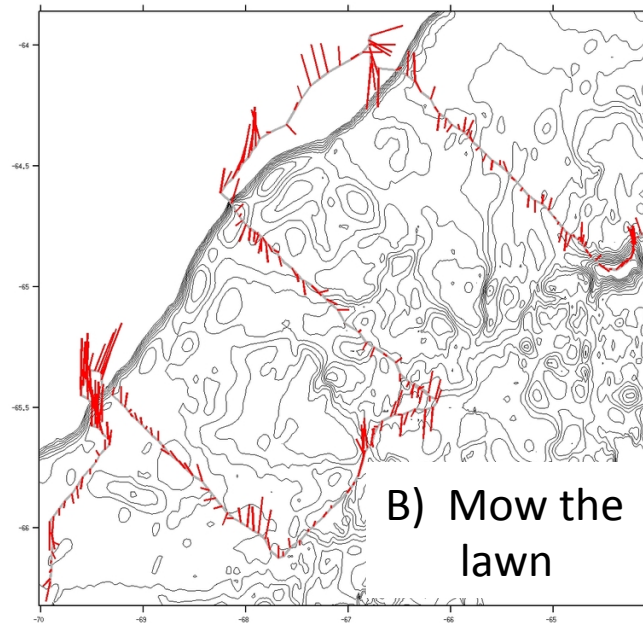
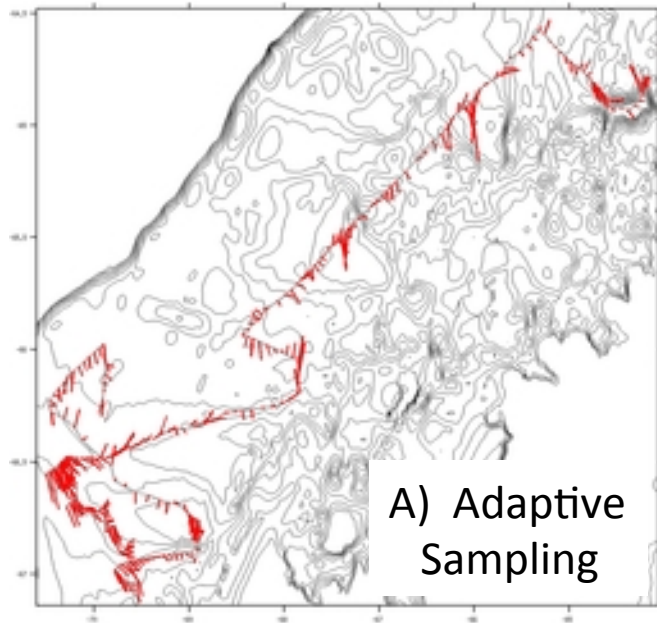
Fluorescence Induction and Relaxation Sensor



Daytime decreases Photosynthetic Efficiency (non-Photochemical quenching)



Glider Operations on the WAP



Standard package include CTD, WetLabs Ecopuck. Anderra Optode, NORTEK ADCP