What is driving interannual variability in lower trophic levels near Explorer Seamount (Canada)?

Tetjana Ross[1], Moira Galbraith[1], Tammy Norgard[2] and Marie Robert[1]

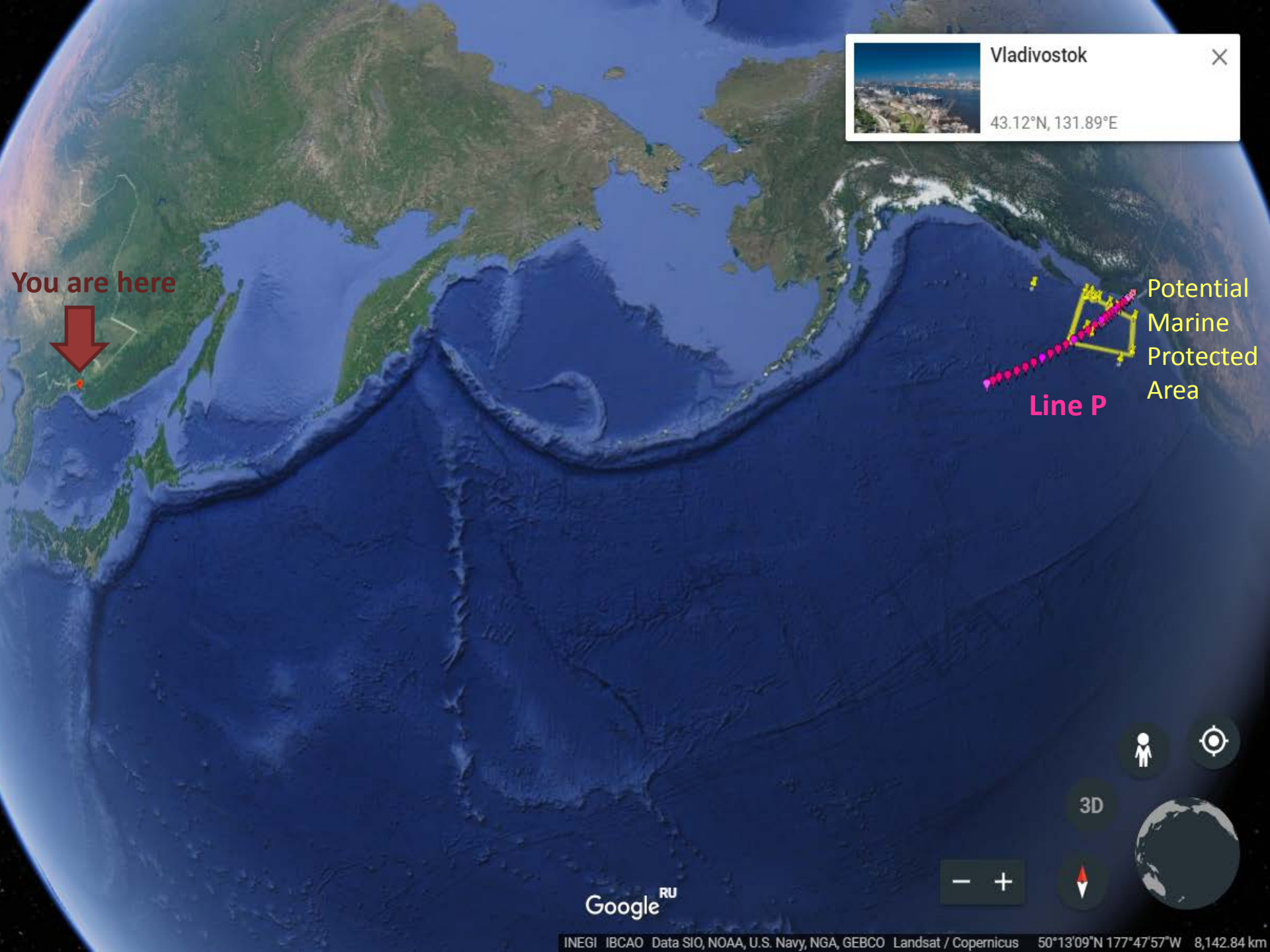
[1]Institute of Ocean Sciences

[2]Pacific Biological Station

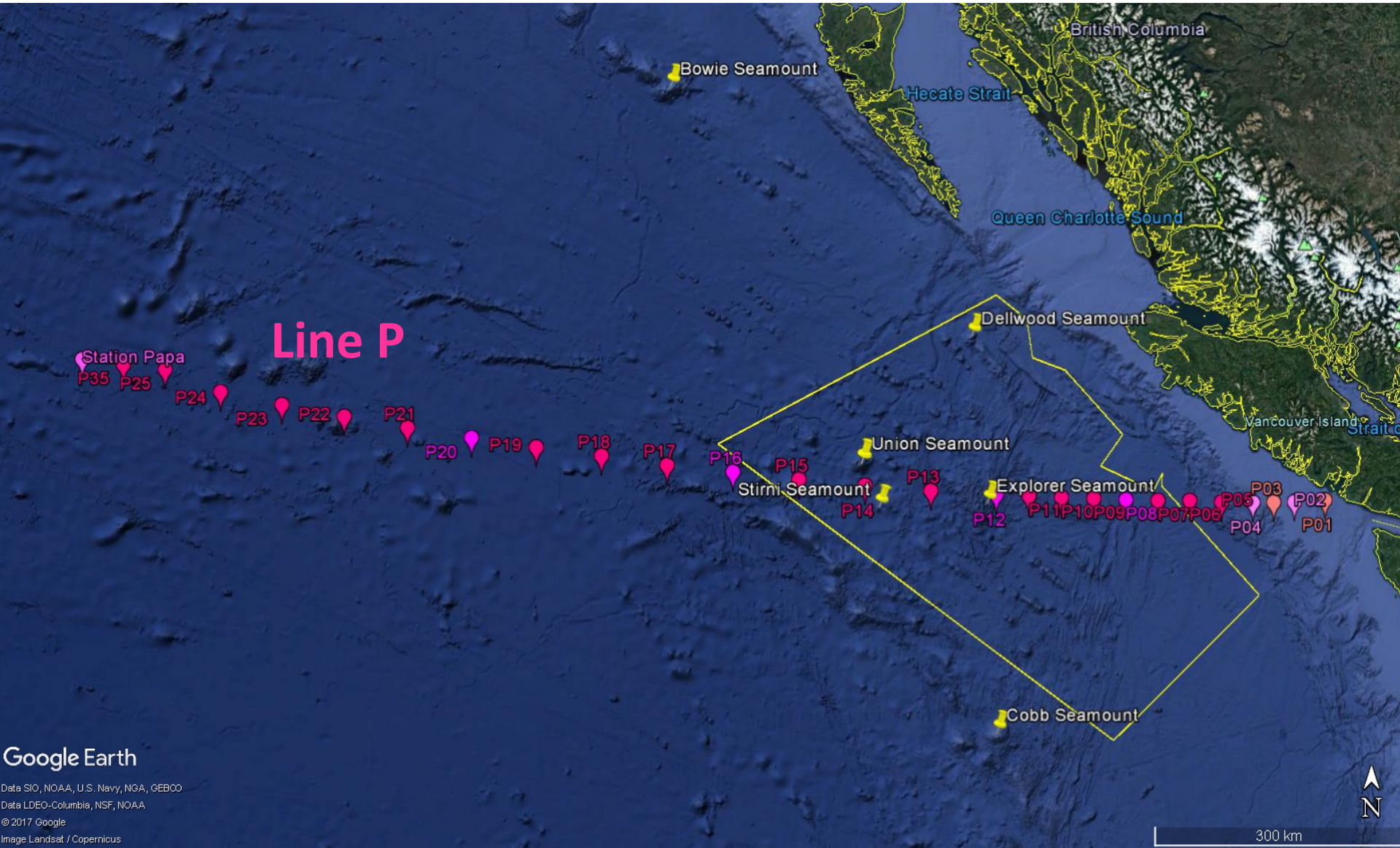
Fisheries and Oceans Canada | Pêches et Océans Canada

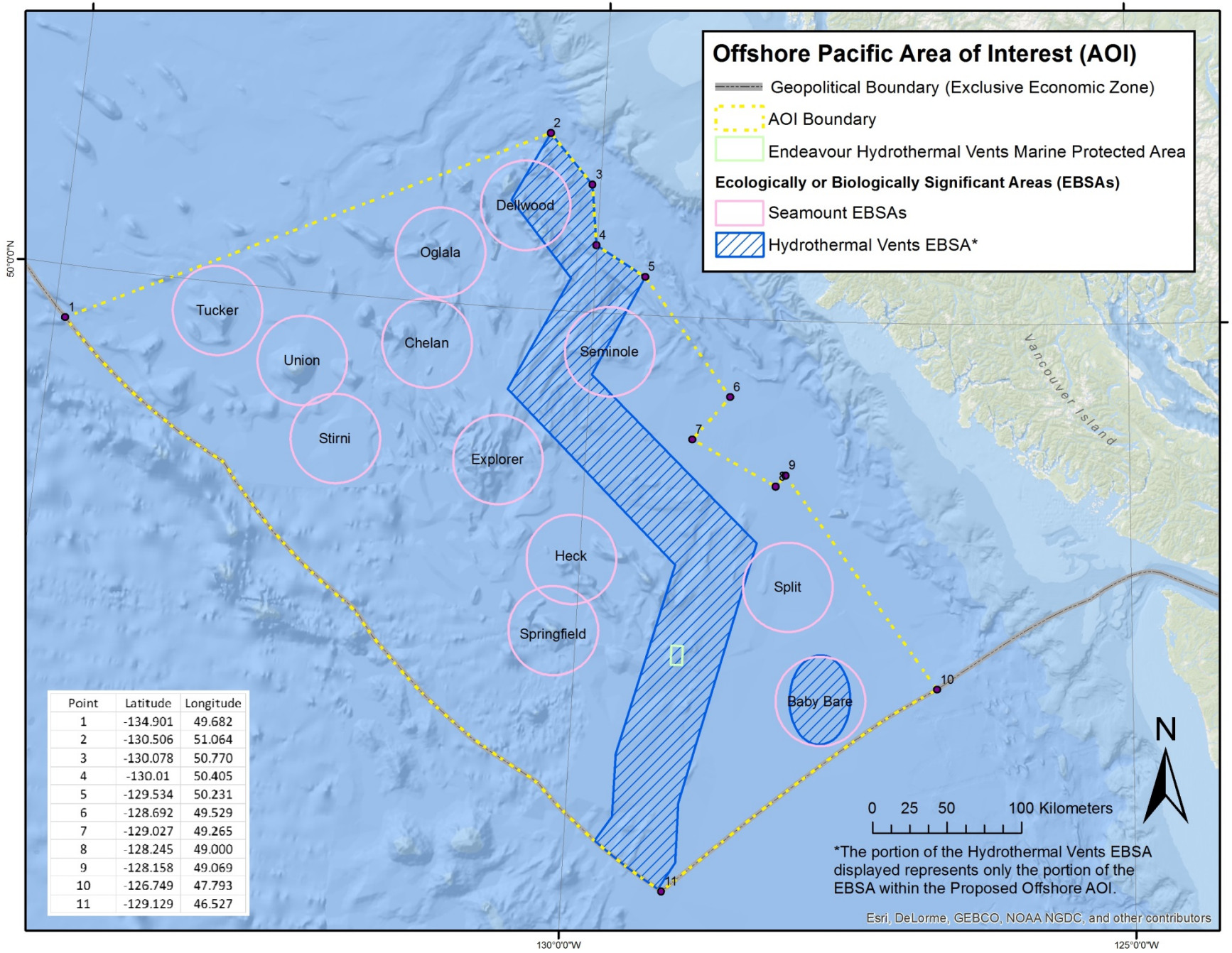
Motivation

- Canada is considering a number of sites for new Marine Protected Areas
  - a step towards meeting national and international biodiversity conservation targets (conservation of 10% of coastal and marine areas by 2020)
- Increased observational effort is being put into potential sites
- Need to understand longer-term variability (interannual and longer) to put these new observations in context


Vladivostok
43.12°N, 131.89°E
You are here
Potential Marine Protected Area
Line P
3D
Google RU
INEGI IBCAO Data SIO, NOAA, U.S. Navy, NGA, GEBCO Landsat / Copernicus 50°13'09"N 177°47'57"W 8,142.84 km

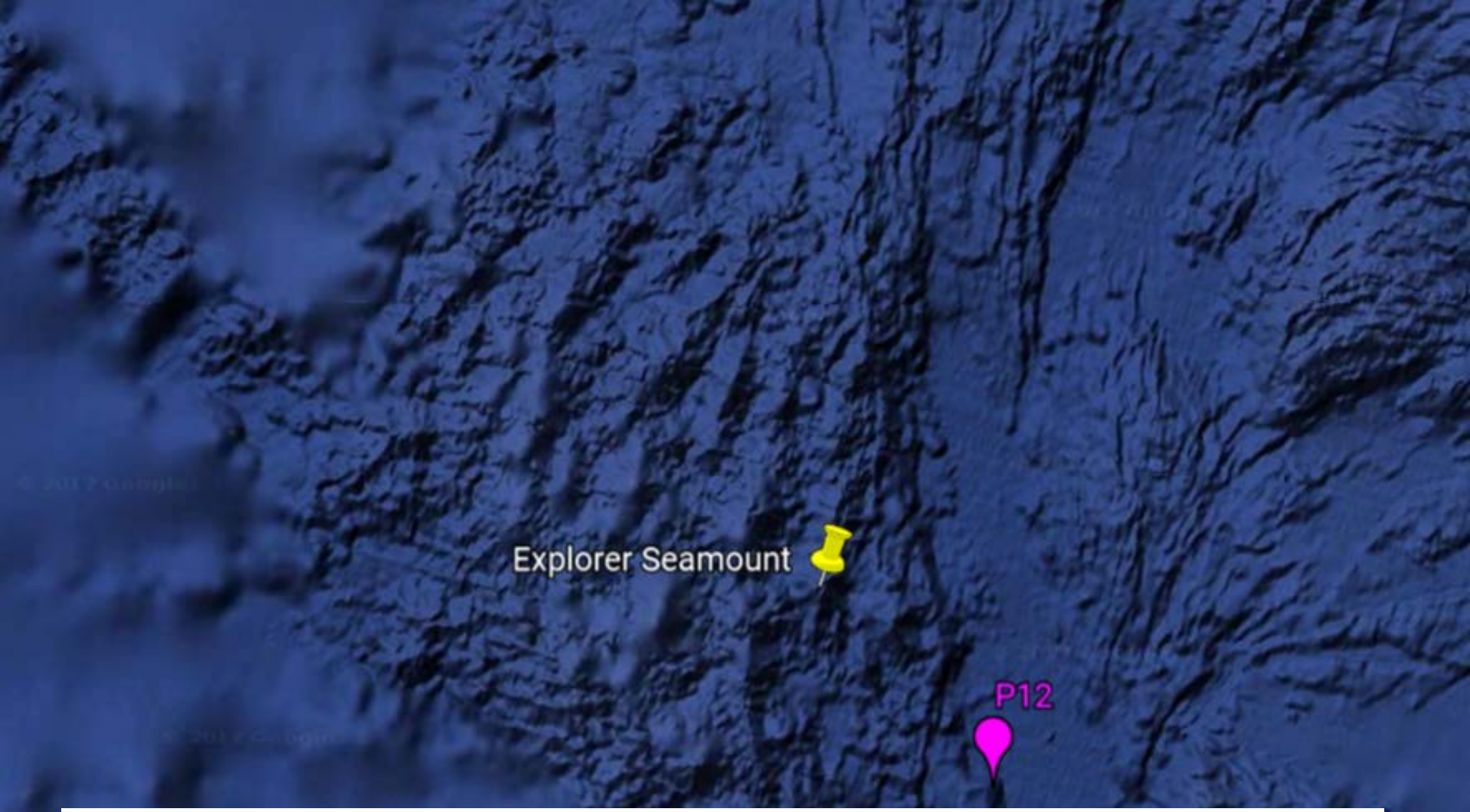
Pacific Offshore Area of Interest (i.e. Potential Marine Protected Area)





Point	Latitude	Longitude
1	-134.901	49.682
2	-130.506	51.064
3	-130.078	50.770
4	-130.01	50.405
5	-129.534	50.231
6	-128.692	49.529
7	-129.027	49.265
8	-128.245	49.000
9	-128.158	49.069
10	-126.749	47.793
11	-129.129	46.527

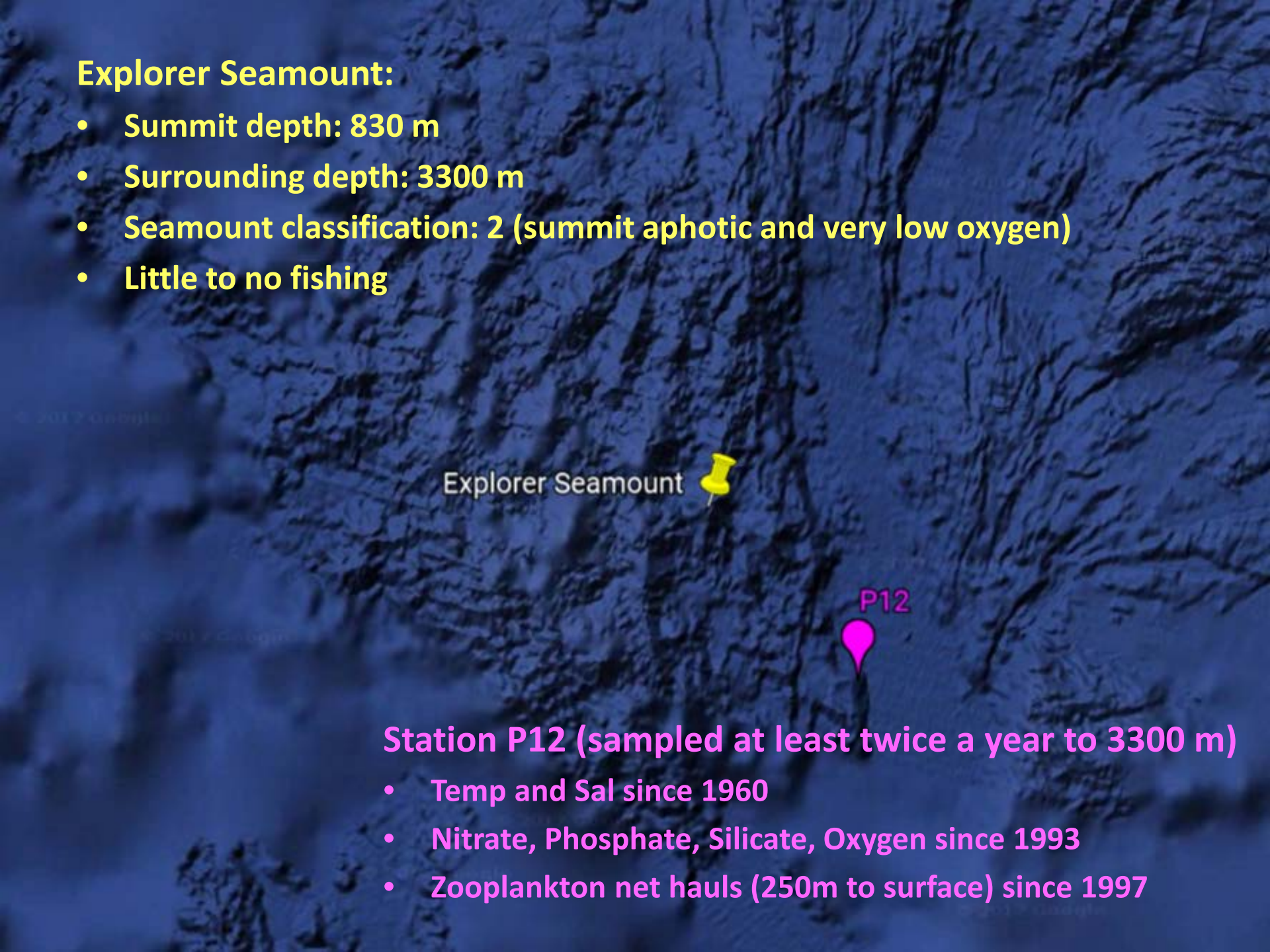

Explorer Seamount
P12



- Station P12 is just east of Explorer Seamount, we chose to examine the interannual variability at this site not so much because of its proximity to the seamount, but because there are long term bottle and net tow data there.

Explorer Seamount:

- Summit depth: 830 m
- Surrounding depth: 3300 m
- Seamount classification: 2 (summit aphotic and very low oxygen)
- Little to no fishing



Station P12 (sampled at least twice a year to 3300 m)

- Temp and Sal since 1960
- Nitrate, Phosphate, Silicate, Oxygen since 1993
- Zooplankton net hauls (250m to surface) since 1997

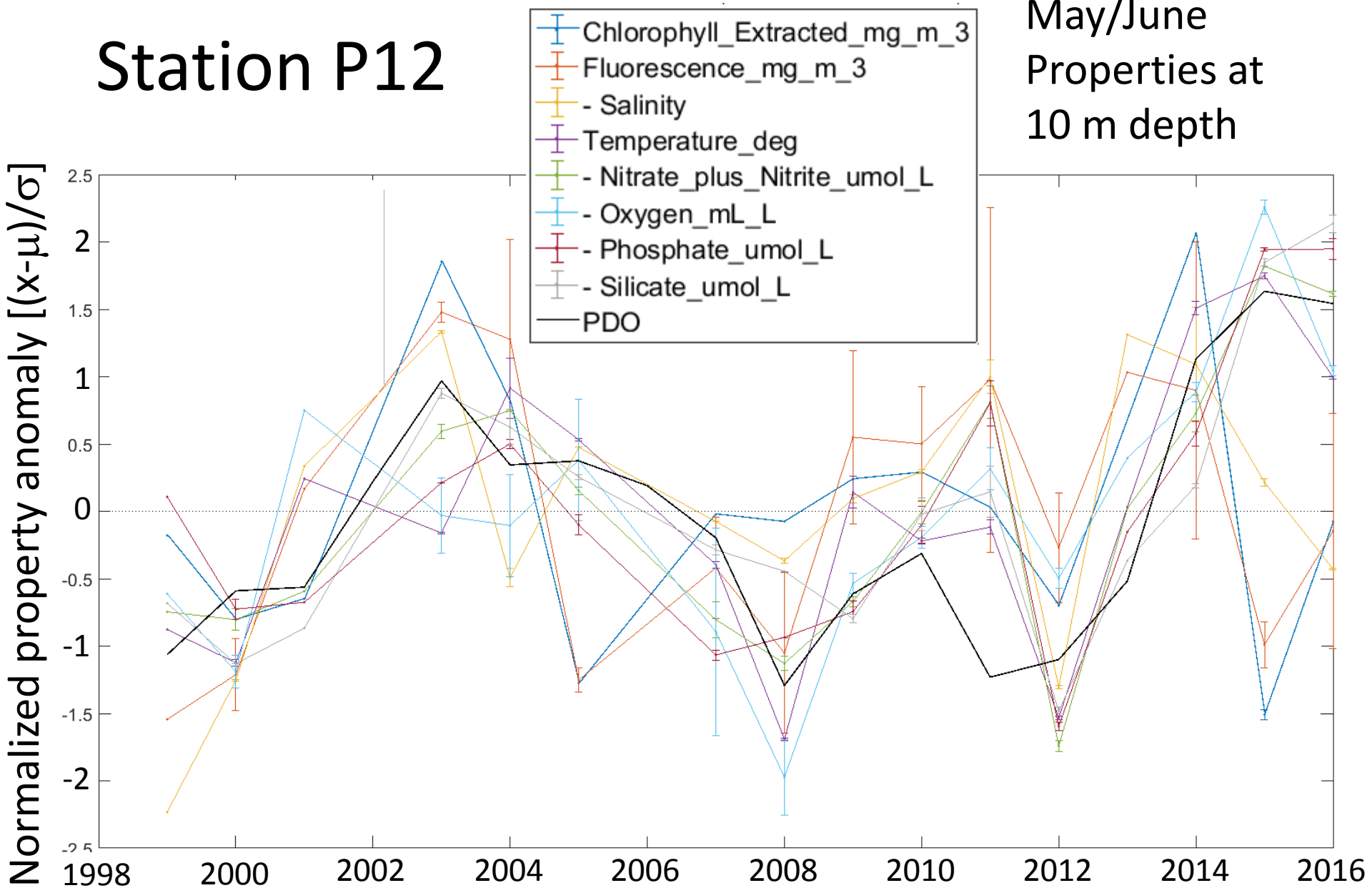
Station P12 data likely represent pelagic rather than seamount environment

Station P12 (sampled at least twice a year to 3300 m)

- **Temp and Sal since 1960**
- **Nitrate, Phosphate, Silicate, Oxygen since 1993**
- **Zooplankton net hauls (250m to surface) since 1997**

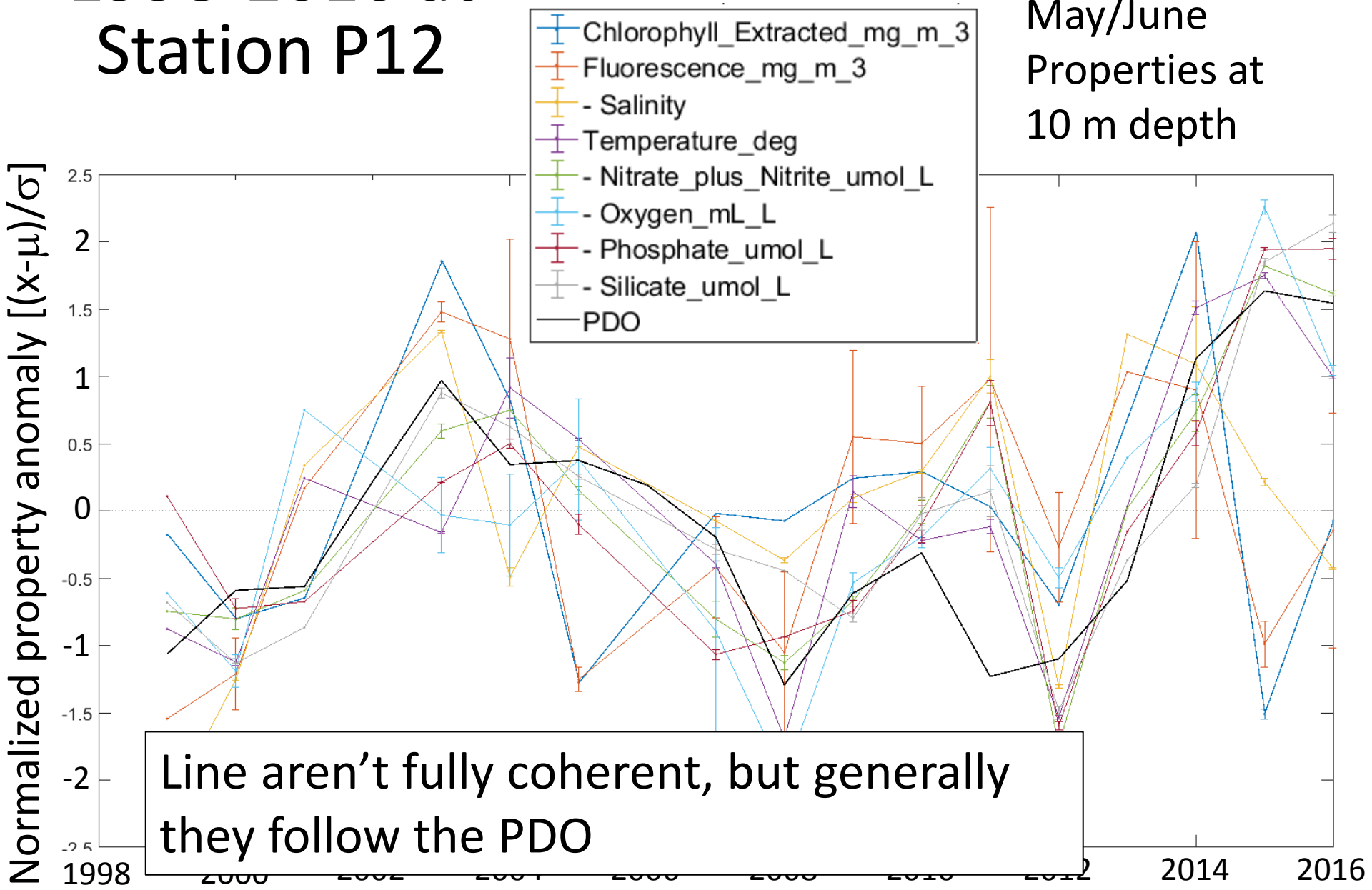
1998-2016 at Station P12

May/June Properties at 10 m depth



1998-2016 at Station P12

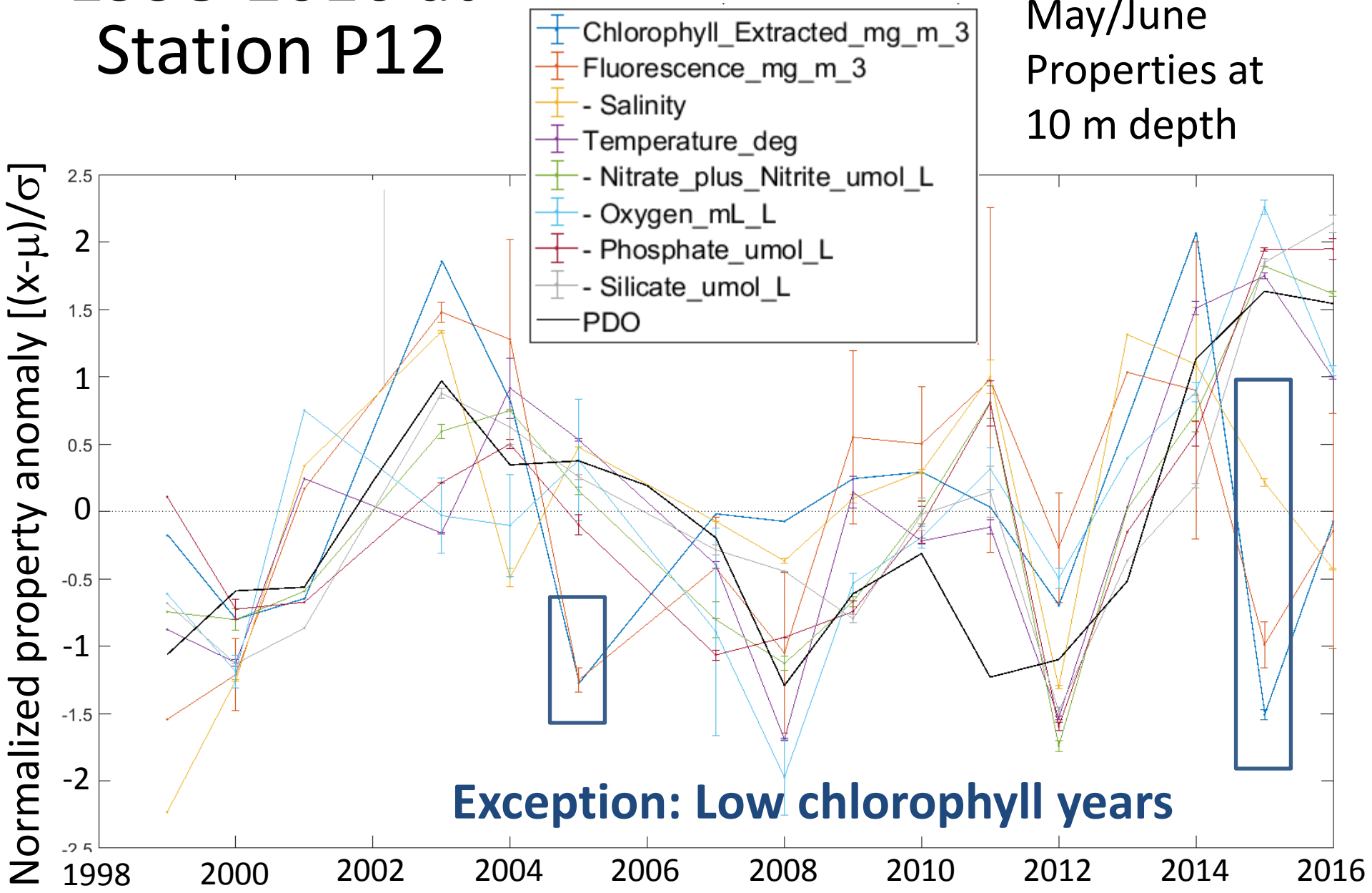
May/June Properties at 10 m depth



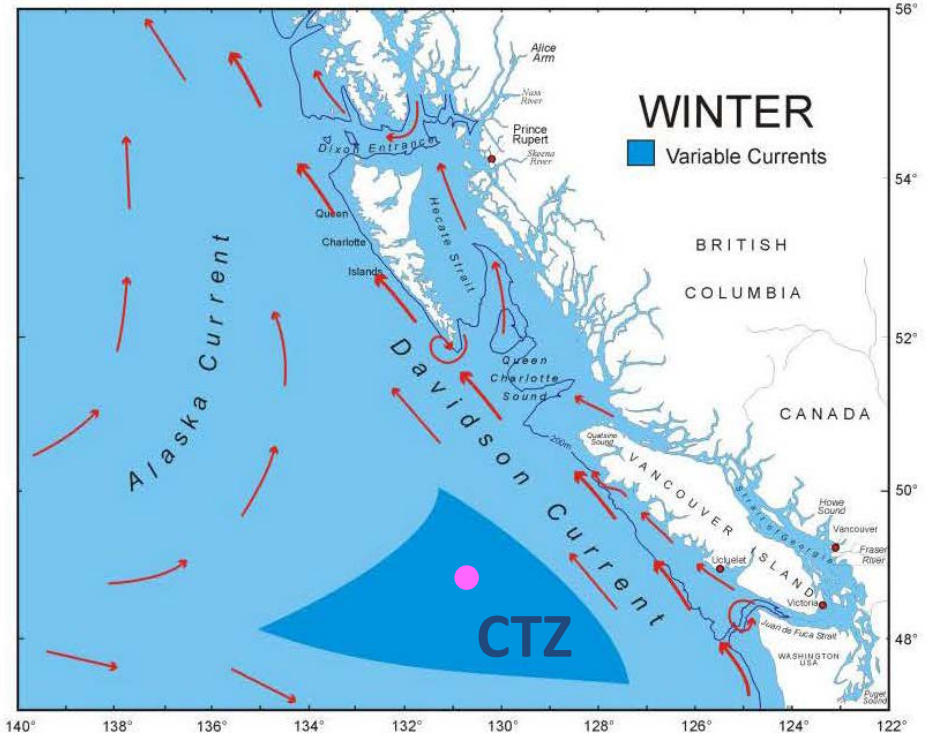
Line aren't fully coherent, but generally they follow the PDO

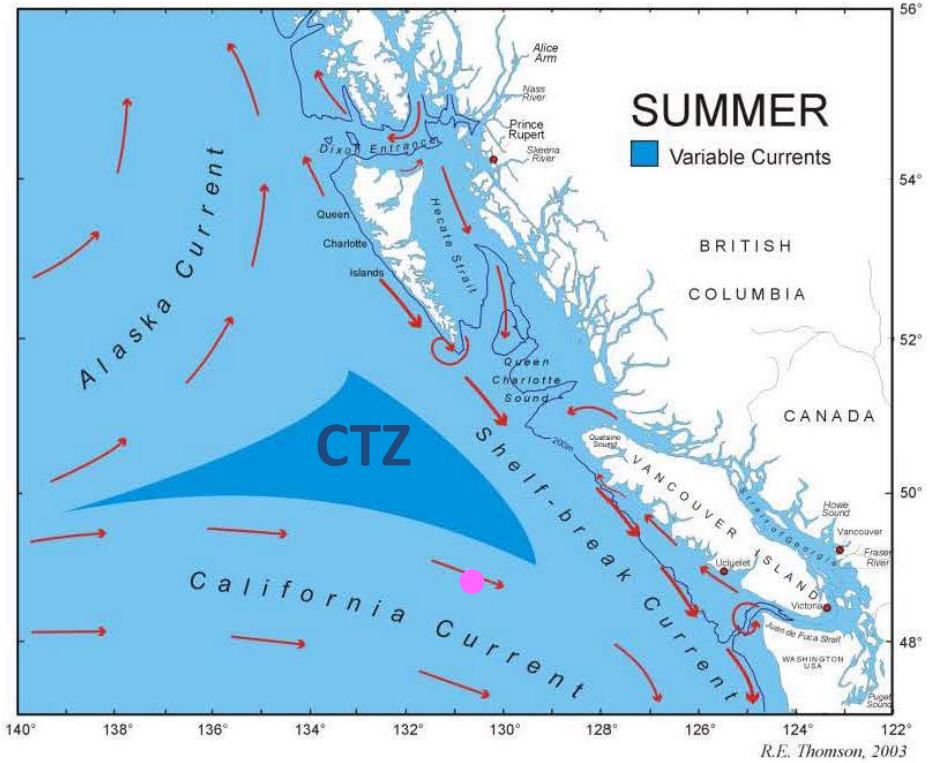
1998-2016 at Station P12

May/June Properties at 10 m depth



Hypothesis





- What's really important for the May/June data is the interannual variability in the movement of the Coastal Transition Zone (CTZ)

Hypothesis

- What's really important for the May/June data is the interannual variability in the movement of the Coastal Transition Zone (CTZ)

PDO positive Salinity low Temperature high Nutrients low CHL high (sometimes low)	Less subarctic influence
PDO negative Salinity high Temperature low Nutrients high CHL low	More subarctic influence

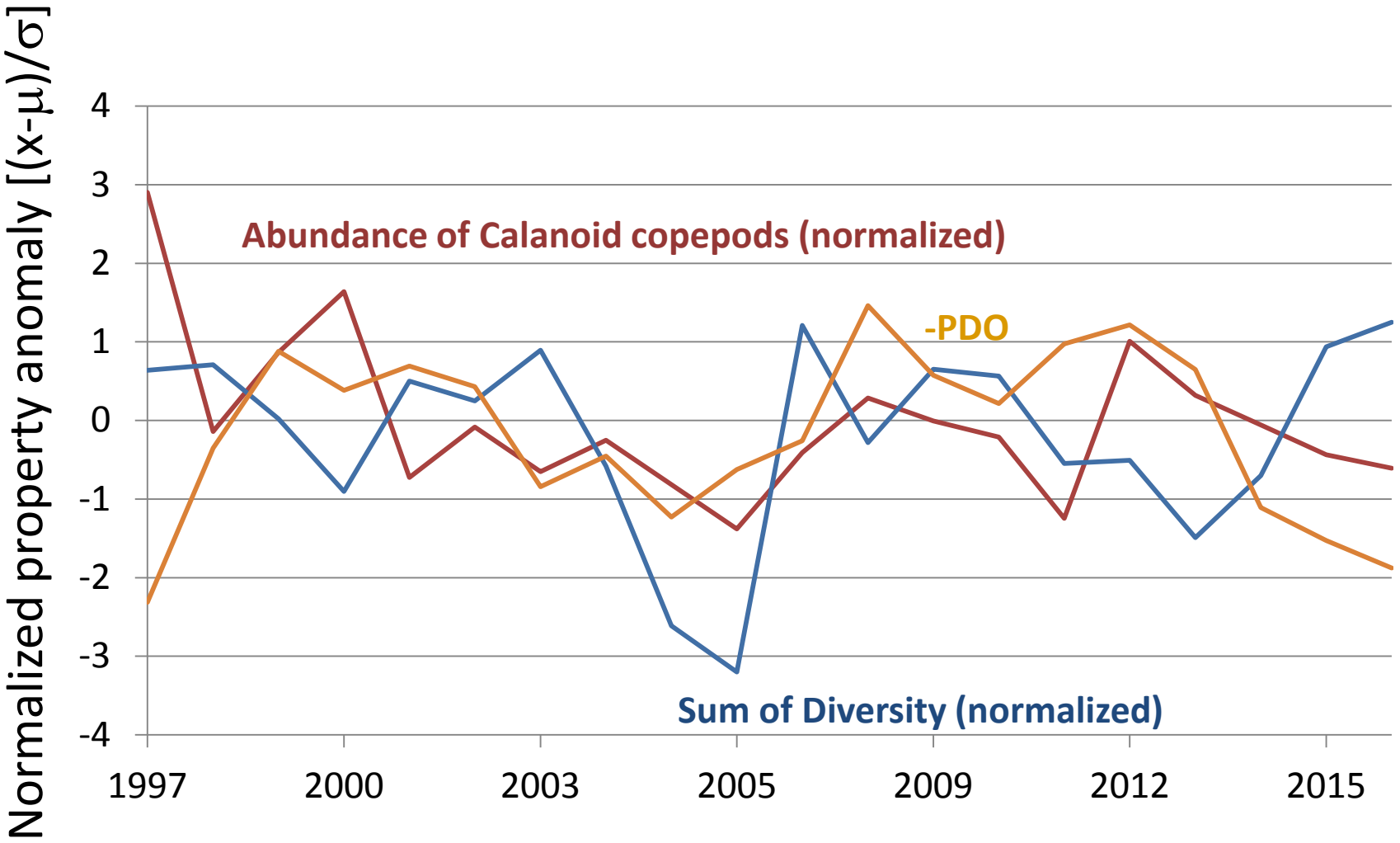
Hypothesis

- What's really important for the May/June data is the interannual variability in the movement of the Coastal Transition Zone (CTZ)

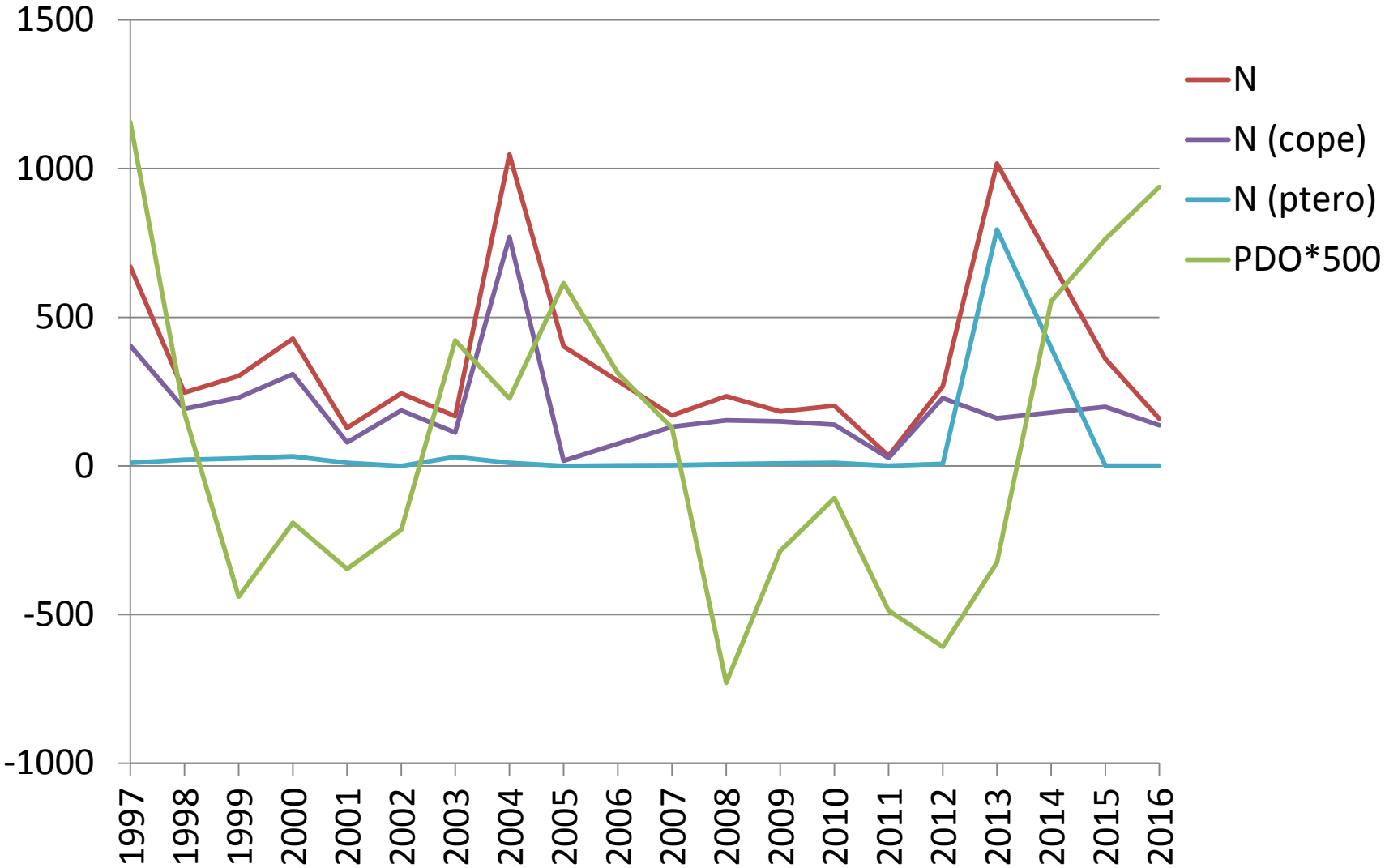
PDO positive Salinity low Temperature high Nutrients low CHL high (sometimes low)	Less subarctic influence
PDO negative Salinity high Temperature low Nutrients high CHL low	More subarctic influence

- This should influence zooplankton populations observed at P12 (CTZ present = more diversity, higher concentrations of subarctic species)

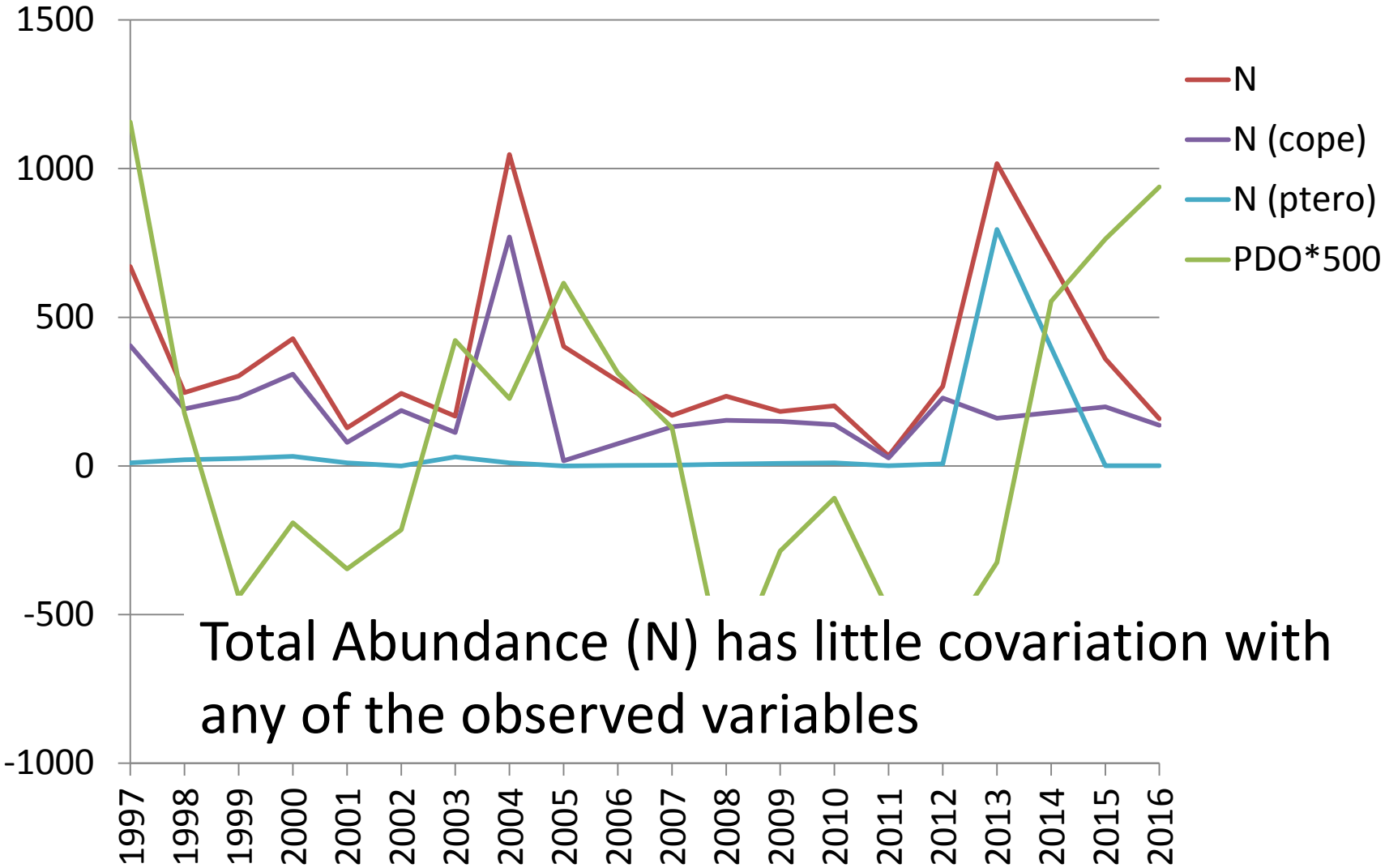
Zooplankton observations



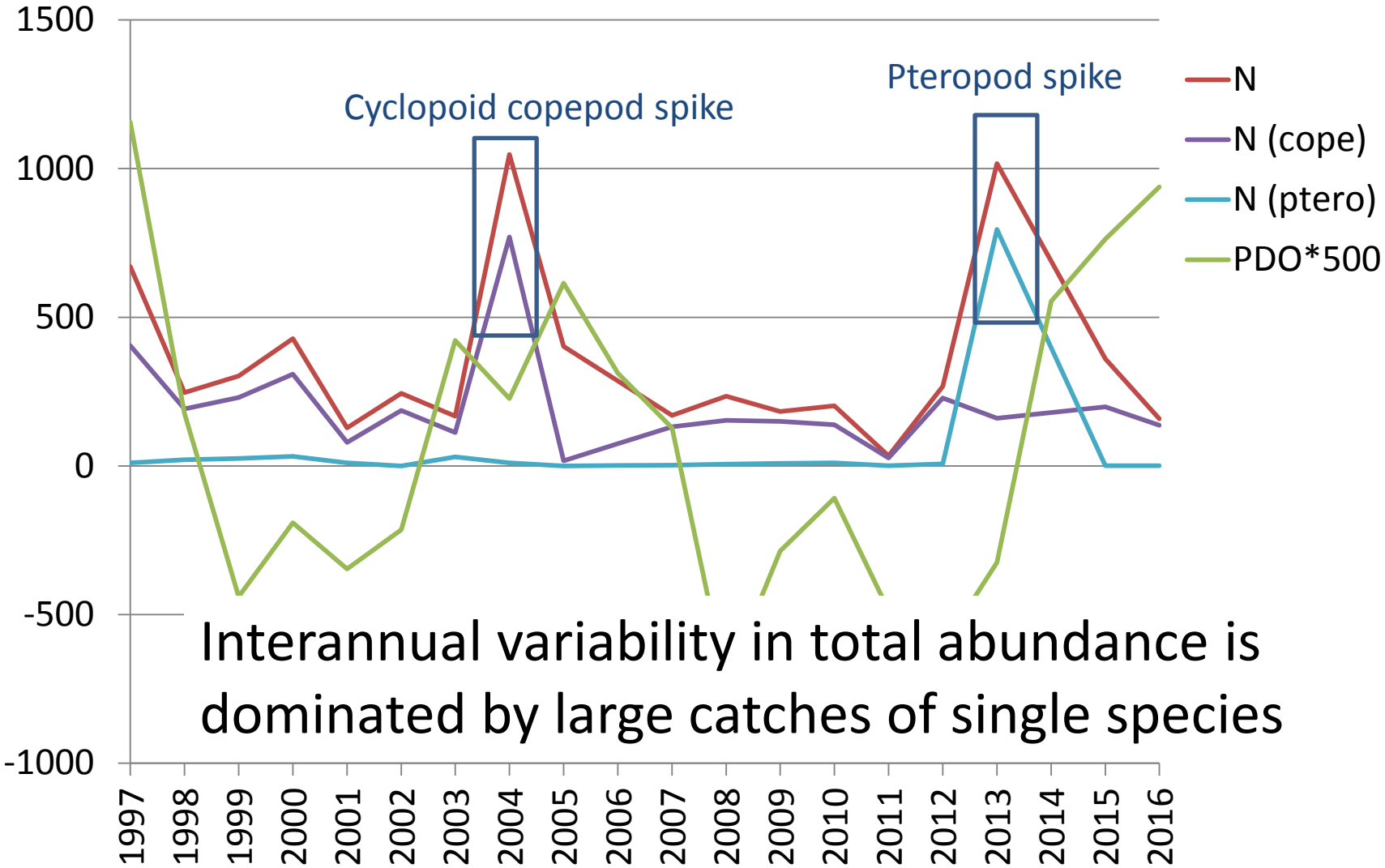
Zooplankton observations



Zooplankton observations



Zooplankton observations



Summary

- Variability in May/June water properties (hydrography, nutrients and to some extent chlorophyll) covary with each other and the PDO index
- While this is consistent with the hypothesis that there is interannual variability in the movement of the Coastal Transition zone, the zooplankton data do not support this
- The variability in the zooplankton (i.e. lower trophic levels) is complicated and hard to predict based on the historical set of variables