Setting Up a Coastal Ocean Acidification Observing Network in New Zealand

NIWA
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and many others

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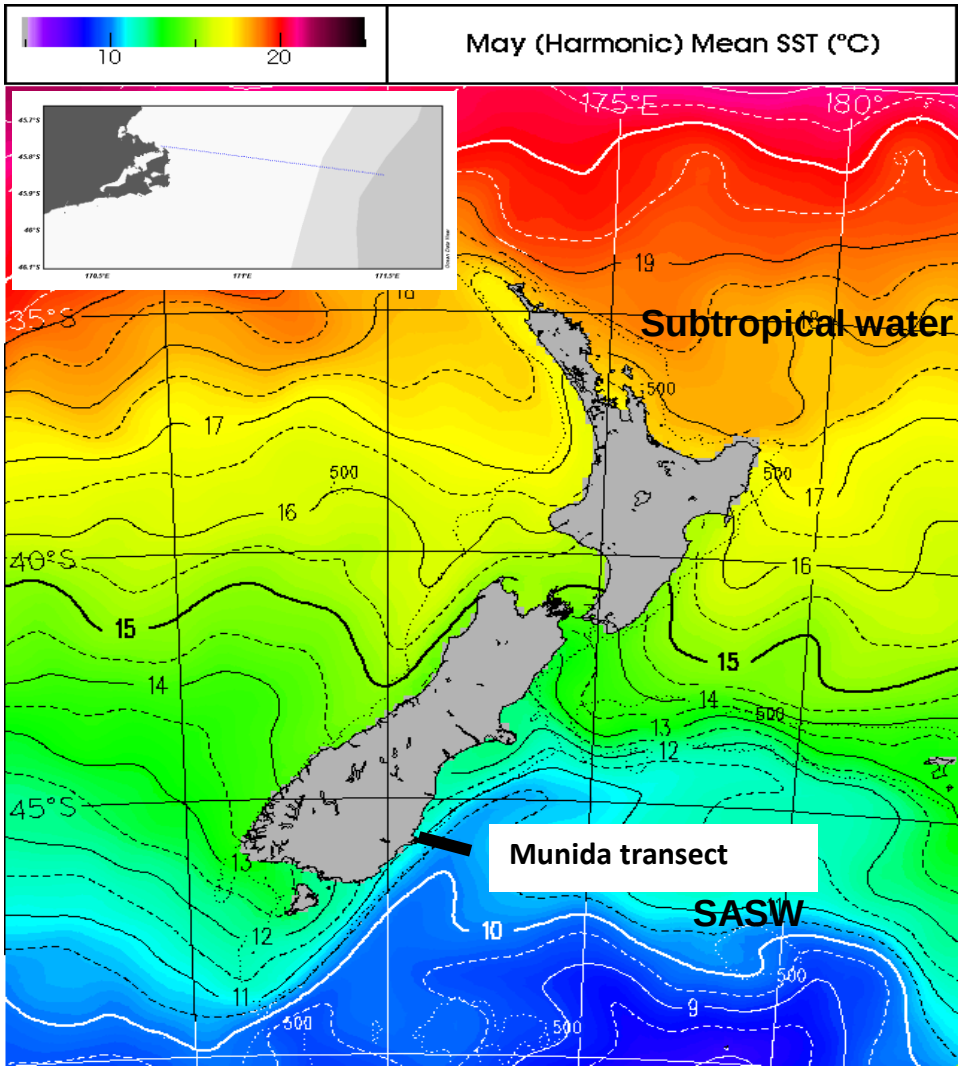
NZOA-ON

New Zealand Ocean Acidification Observing Network

Munida Time Series

- A carbon chemistry time series was established in 1998, off the south east coast of New Zealand – **Munida Time Series**
- Part of research programme looking at uptake of atmospheric carbon dioxide by SW Pacific waters
- Now is longest running carbon time series in the Southern Hemisphere
- Collaboration between NIWA and the University of Otago
- Carbon chemistry ⟶ ocean acidification parameters

Munida Time Series



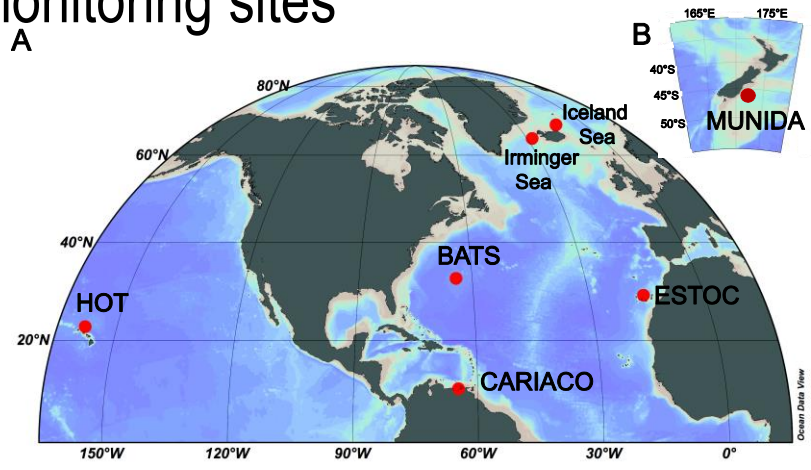
- surface transect
- SASW cast (500m)
- bi-monthly since 1998
- neritic, modified subtropical, SASW

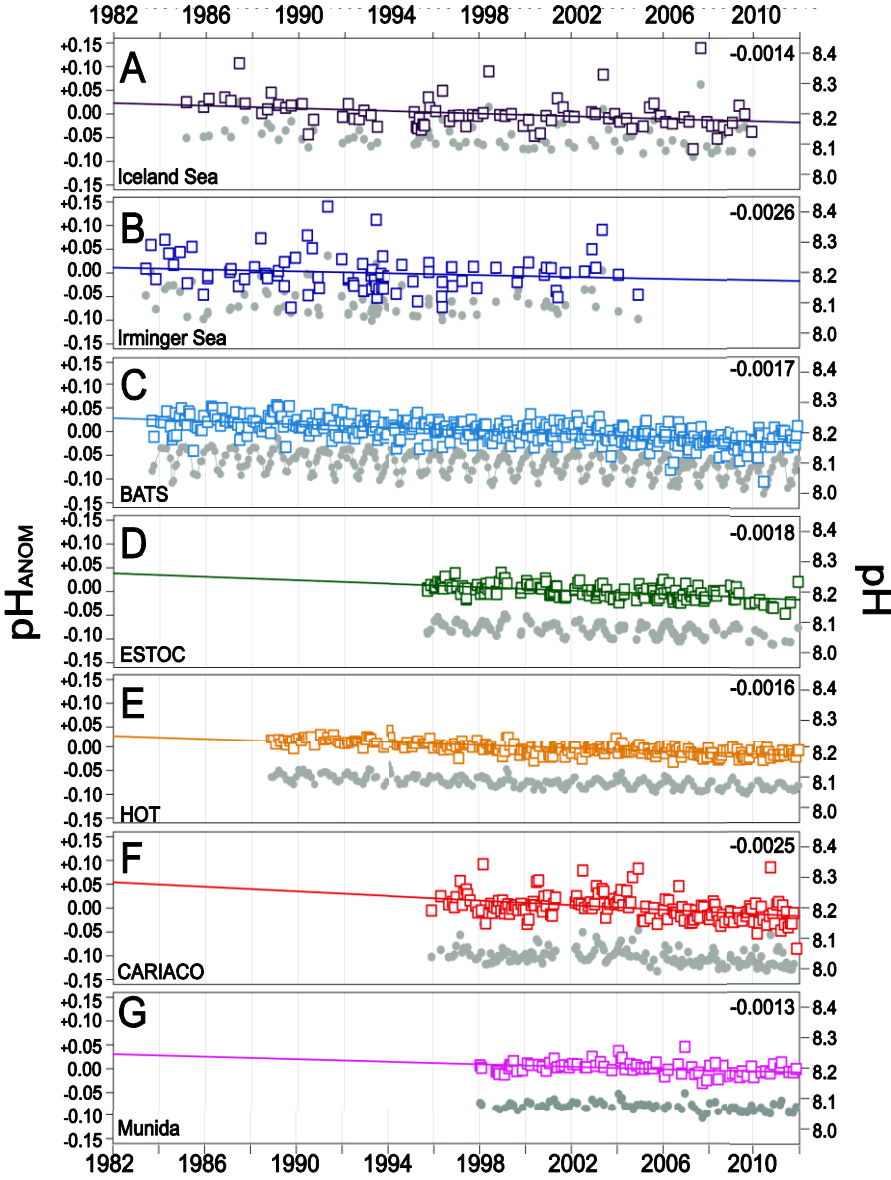
measure:

- temperature
- salinity
- pCO_2
- pH
- alkalinity
- C_T / DIC
- nutrients
- chlorophyll

Results

- Area is a sink for atmospheric carbon dioxide
- Biological activity is main driver of seasonal variability
- Long term pH decrease in sub-antarctic water is similar to that observed at other long-term monitoring sites





Bates, N.R., et al., 2014 A time-series view of ocean uptake of anthropogenic CO_2 and ocean acidification. Oceanography.

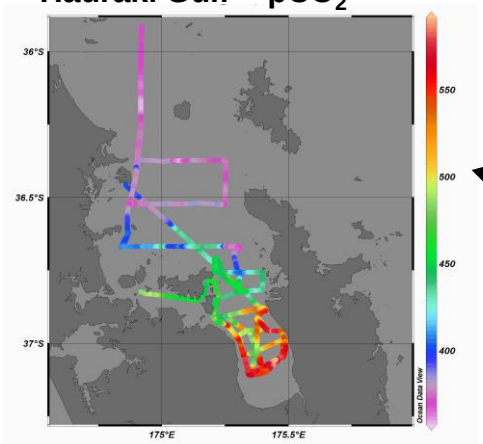
NZOA-ON
New Zealand Ocean Acidification Observing Network

enhancing the benefits of New Zealand's natural resources

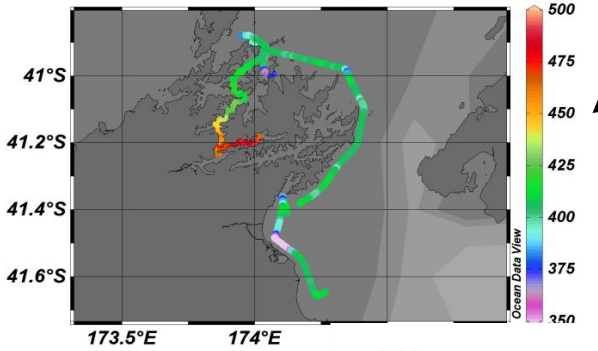
NIWA Taihoro Nukurangi

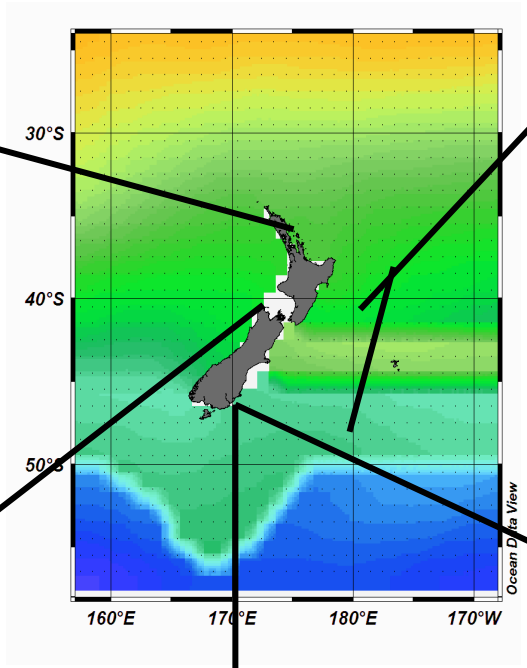
OA data available in NZ

Hauraki Gulf - pCO_2

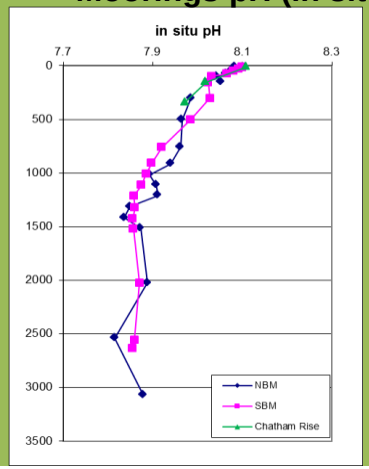


Marlborough Sounds – pCO_2

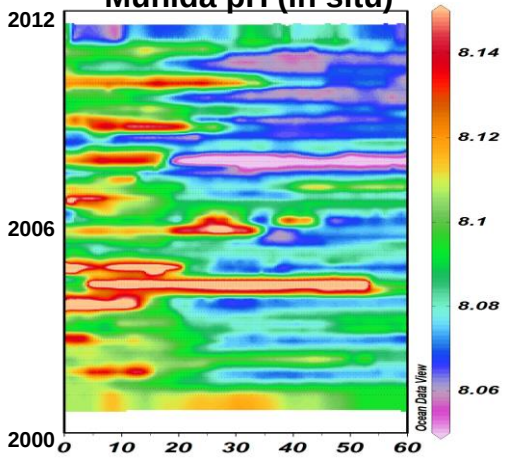




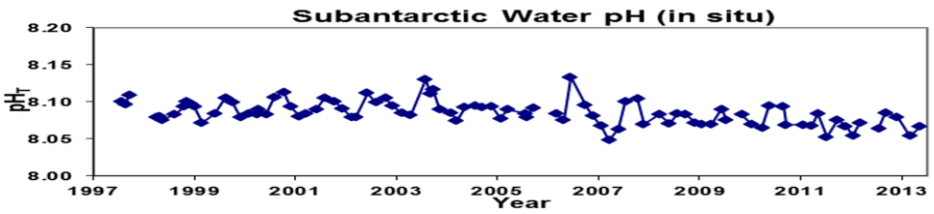
Moorings pH (in situ)



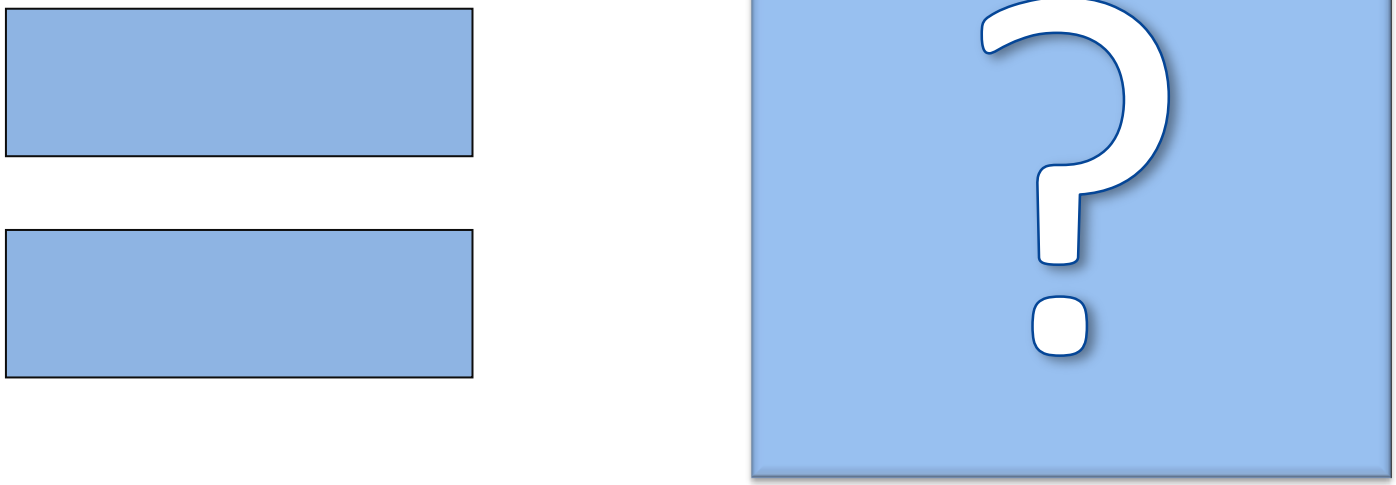
Munida pH (in situ)



Subantarctic Water pH (in situ)



Difficult to assess impact of OA, particularly in coastal areas



Need for more OA data

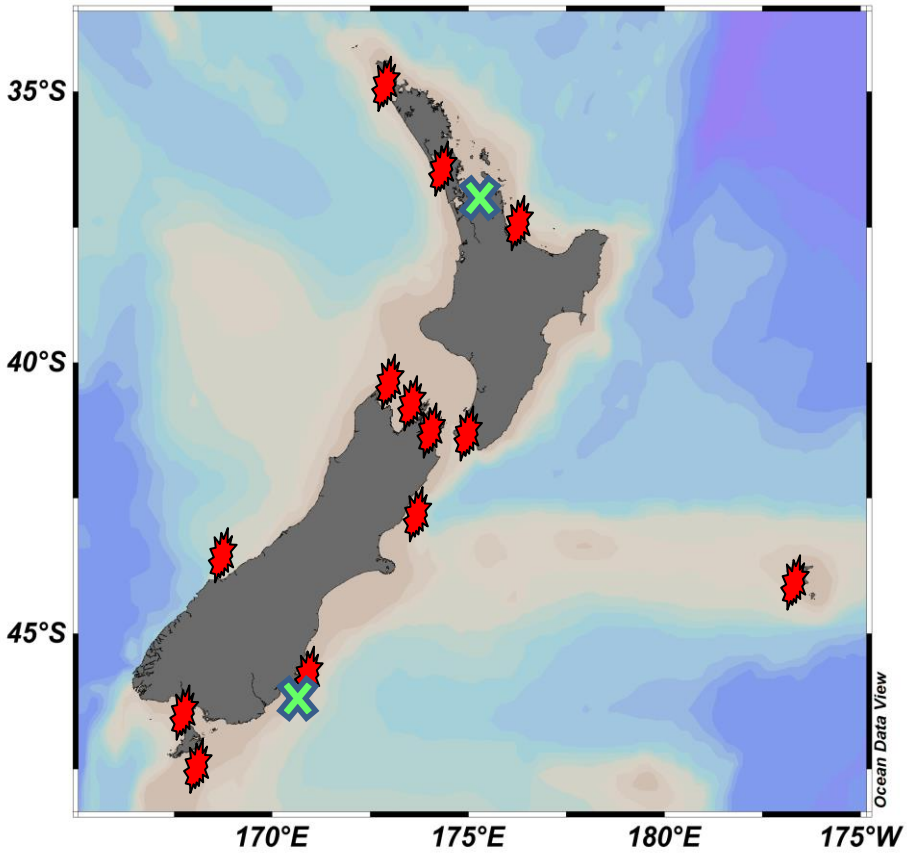
- Clear that waters around NZ are variable
  - spatially, different time scales
- Need a bigger picture of NZ base-line conditions
- Need to get an understanding of the variability
- Identify areas of vulnerability and potential resilience
- OA important for aquaculture, scientific interest and also culturally
- Inform coastal management plans
- International effort to set up observing network
  - GOA-ON

GOA-ON
Global Ocean Acidification Observing Network

NZOA-ON:
New Zealand Ocean Acidification Observing Network

- Establish a network for coastal OA observations
- Fortnightly bottle sampling
- Moored SeaFET pH sensors
- Alkalinity and DIC measurements → pH, Ω, $[CO_3^{2-}]$.....
- Central analytical facility - NIWA/UoO Research Centre for Oceanography
- Sampling Sites
  - 14 sites throughout the country
  - Work with sampling partners to collect bottle samples

The 14 Sites



bottle sampling

GOA-ON FoT mooring Munida time series

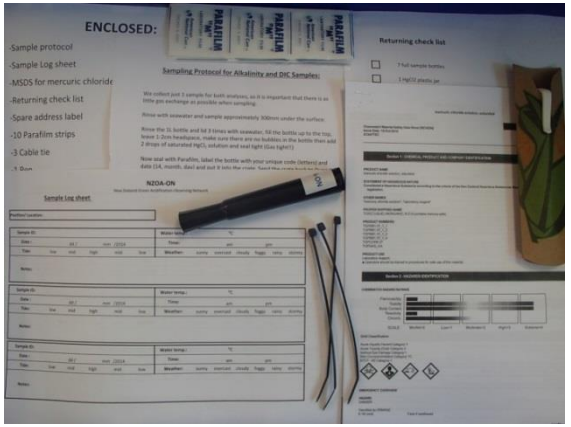
Site	Sampling Partner
Te Oneroa aTōhē / Ninety Mile Beach	Discussion with tangata whenua
Auckland	Auckland Council
Firth of Thames	NIWA
Bay of Plenty	BoP Regional Council
Wellington	NIWA
Marlborough Sounds	Aquaculture New Zealand
Tasman Bay	Cawthron Institute
Golden Bay	Aquaculture New Zealand
Jacksons Bay	Fishing Industry
Kaikoura	Discussion with tangata whenua
Dunedin	NIWA / University of Otago
Southland - South Coast	Discussion underway with Environment Southland
Stewart Island	DoC
Chatham Islands	Paua Industry Council

NIWA/University of Otago Research Centre for Oceanography, Dunedin

- Central analytical facility
- Experience in carbonate chemistry analysis, calculations and interpretation
- Logistics - bottles, freight boxes
- Database management
- International inter-comparisons, demonstrated high quality
- Dedicated marine chemistry technician (2-years)
- Database management
- Commercial analytical service
  - additional samples (industry, councils...)
  - preparation and certification of buffers and dyes

Logistics


NZOA-ON


ENCLOSED:
-Sample protocol
-Sample Log sheet
-MSDS for mercuric chloride
-Returning check list
-Spare address label
-10 Parafilm strips
-3 Cable tie
Sampling Protocol for Alkalinity and DIC Samples:
NZOA-ON
Returning check list


NIWA
Taihoro Nukurangi
Sat. HgCl2
TOXIC SUBSTANCE

pH sensor / SeaFET

- pH sensors (SeaFET™)
  - to establish short term variability (diel, tidal)
- 5 sensors at this time
- Deploy on short-term basis (4-5 months)
- They rove from site to site
- Ideally, each site has a sensor
- Data available via website

NZOA-ON Website

- Website – data available for sampling partners and other users

Overview

- Bottle samples + pH sensors
- Local sampling partners
- Centralised analytical lab
- Can easily add additional sites as resources allow
- Knowledge of present-day conditions, against which to assess future impacts
- Knowledge of spatial and temporal variability in NZ coastal waters
- Identification of vulnerable sites
- Data for aquaculture industry, policy making, coastal management
- Modelling – input to NZ coastal biogeochemical model
- Secure funding to consolidate NZOA-ON

Thank you

- NZ Prime Ministers Science Prize – funding for Marine Technician
- NIWA – Capex for infra-structure
- Many industry, council and institutional partners
- Ministry for Primary Industries
- Ministry for Business, Innovation and Employment
- Department of Conservation
- NZ-US JCM – travel support
- Cliff Law
- Malcolm Reid
- Keith Hunter
- John Zeldis
- John Wells
- Workshop guys
- Store guys
- Anna Crosbie
- Mary Livingston
- Debbie Freeman
- Norman Ragg
- Colin Johnston
- Julie Hills
- Steve Urlich
- Jeremy Cooper
- Mike Hudson
- Kate Richardson
- Barry Horne
- Robert Win
- Stephen Park