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Carbonate chemistry covariation with temperature and oxygen in the Salish Sea and California Current Ecosystems: implications for the design of ocean acidification experiments

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Carbonate chemistry covariation with temperature and oxygen in the Salish Sea: implications for the design of ocean acidification experiments

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Ocean acidification experiments

Scenario IS92a

\[ p\text{CO}_2 \] (µatm)

Year

- Preind.
- Today
- 2100
Ocean acidification experiments

body growth

280 PreInd
400 Today
800 Future
How does $p\text{CO}_2$ change with temperature and oxygen?

What does covariation mean for OA experimental design and interpretation?
Seattle Temperature (°C)
Vertical distribution
Vertical distribution

Winter

Summer

Nighttime

Daytime

Depth (m)

Temperature (°C)
Mooring Puget Sound discrete West coast discrete Surface underway CO2 data OA experiments

Reum et al. In Review
Reum et al. In Review
Temperature (°C)

$\text{pCO}_2$ (μatm)

OA treatment

control
Equilibration with air CO$_2$ at formation

$\text{DIC}_{\text{Air}}$ $800 \ \mu$atm $- \ \text{DIC}_{\text{formation}} = \Delta \text{DIC}$

$\Delta \text{DIC} + \text{DIC}_{\text{Respiration}} + \text{formation}$

Puget Sound

Upwelling

$\text{DIC}_{\text{formation}}$

$+ \ \text{DIC}_{\text{Respiration}}$
ΔDIC = 90 umol kg⁻¹
$\uparrow \text{CO}_2$

Direct Effects

Upwelled/deep
- Low Oxygen
- Low Temp
- High $\text{pCO}_2$

Oceanic/shallow
- High Oxygen
- High Temp
- Low $\text{pCO}_2$

Carbonate chemistry niche
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