OCEAN ACIDIFICATION

CLIMATE THRESHOLDS WEBINAR

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Alaska Ocean Acidification Network

Resources at risk from OA

- Fish and shellfish species
- Their prey- Zooplankton
- And shelter (corals)

What are the thresholds for Ocean Acidification?

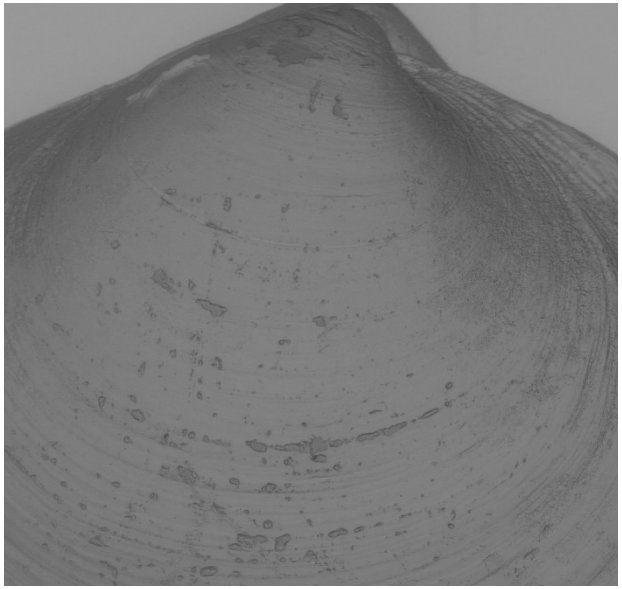
~~pH~~ (not always a reliable indicator)

pCO_2

Aragonite saturation state: amount of free calcium carbonate in the water column

- $\Omega < 1$ or $\Omega > 1$?
- ***Researchers learning this does not always hold true***

→Better metric: Departure from natural range of variability



Challenges using OA thresholds

Aragonite saturation has a high range of natural variability

- Seasonality
- Local drivers (i.e. freshwater run-off, sea ice melt, wind-driven upwelling, primary production)
- Positive or negative feedback cycles

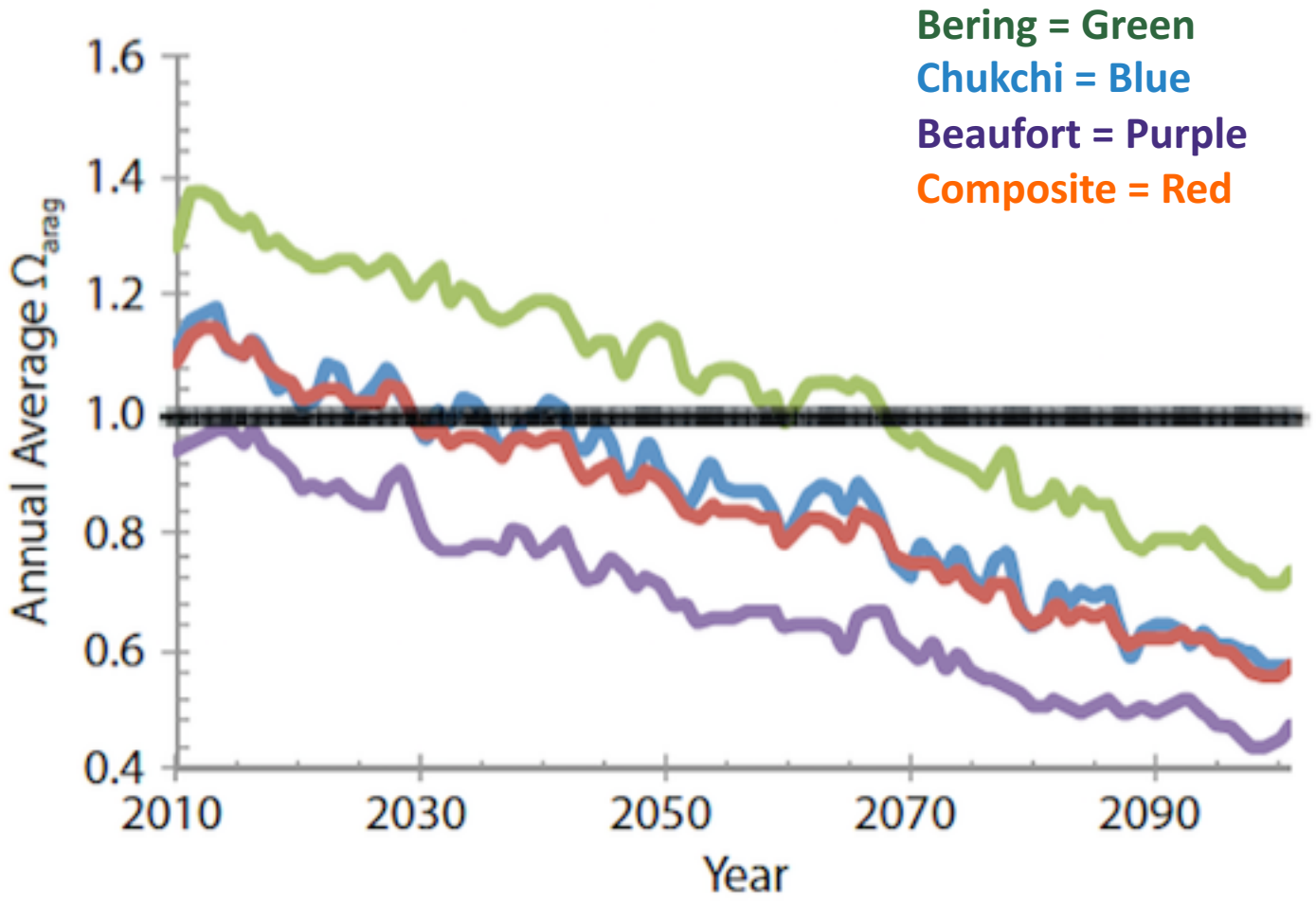
Species are affected by cumulative impacts

- May still have tough time above OA threshold if also hit by other climate related stressors, like warming ocean

Most forecasts are based on models with limited data, but are a good effort towards this threshold product goal

Sample Product:

Model projection of aragonite saturation temporal trends

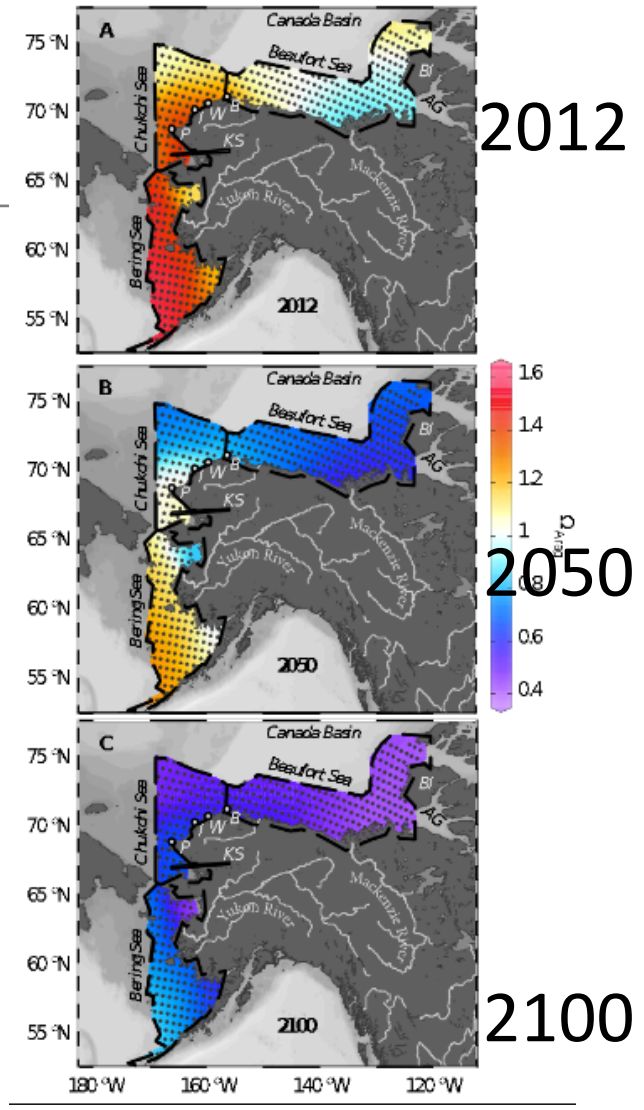


Sample Product

Model-projections of spatial aragonite saturation state for three periods:

Yellow to Reds > threshold (GOOD)

Blues to Purples < threshold (BAD)



Possible Tools

OA Variability assessments by Regions:

Identify physical, biological and chemical drivers

OA Index for the state by region

- i.e. Aragonite saturation scaled with salinity
- Could be generated for regions with historical data to provide a proxy measure.

Identify indicator species in locations where OA measurements are being made and add these to the sample parameter list (i.e. good example is work done with pteropod shell state conditions relative to aragonite saturation state of resident waters)

Long-term observing efforts are required for developing reliable tools

Long-Term Observing Efforts In Alaska

Burke-O-Lators in near shore: Seward, Ketchikan, soon Sitka

Seward Line transect: 2x/year since 2008 (8 years)

Moorings: 1 each in Bering Sea, Gulf, and Chukchi

Glider transects: Gulf and Chukchi

Quarterly water sampling: Lower Cook Inlet/Kachemak Bay NERRS

Planned 2017:

- Sitka: Mooring and regional water sampling
- Repeat twice weekly OA transect from WA to AK onboard passenger ferry
- *In situ* pH sensors- SeaFETS to track near-shore variability

Biological impacts of Ocean Acidification

Use *in situ* measurements to frame OA experiments- include variability

Use data from these laboratory experiments to:

- provide “ecologically relevant” bio data
- identify “biological thresholds”
- inform resource managers

Alaska OA Network

http://www.aoos.org/alaska-ocean-acidification-network/