

Climate Change and the Lower Coquille Watershed



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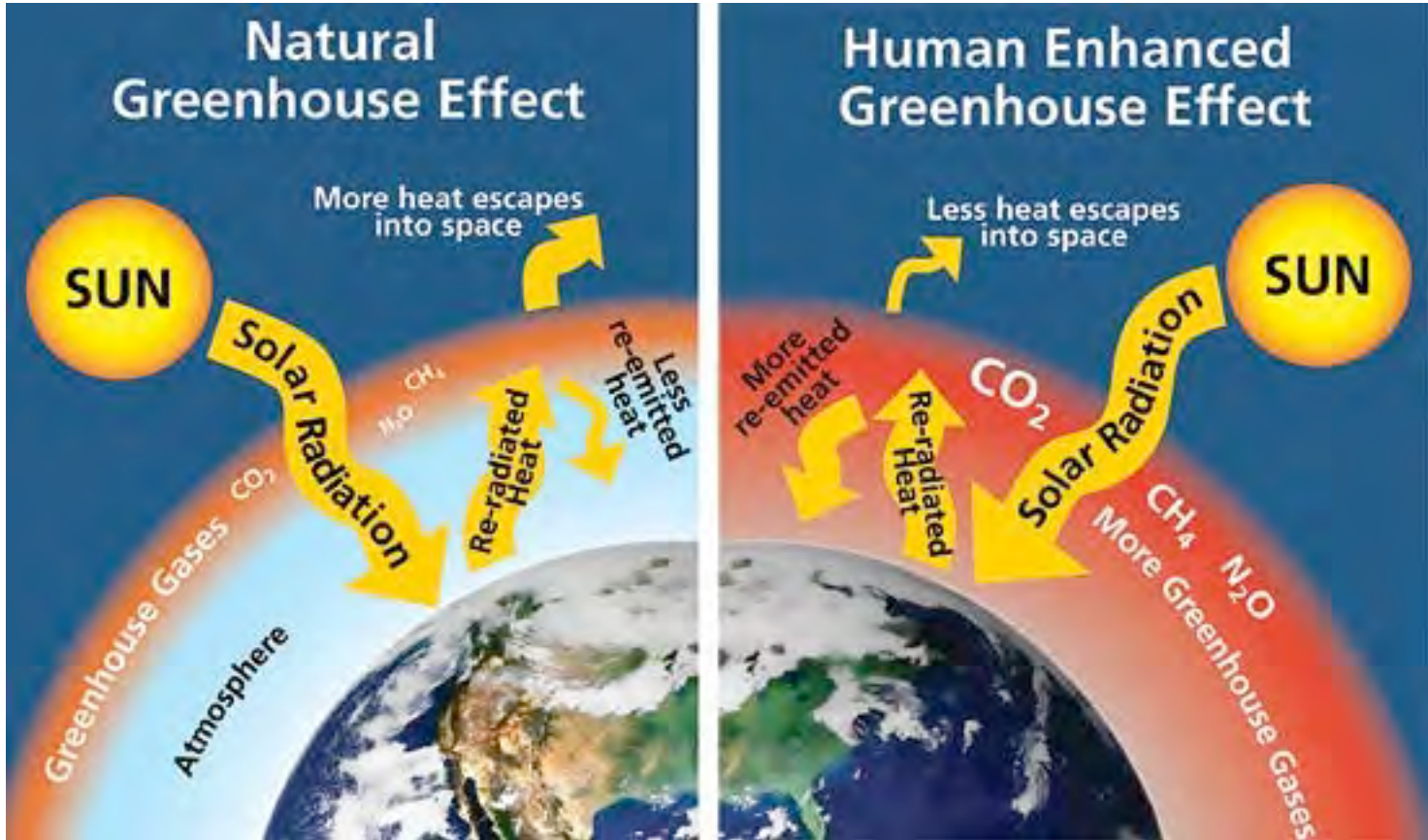
April 18, 2012

Bandon, Oregon

Outline

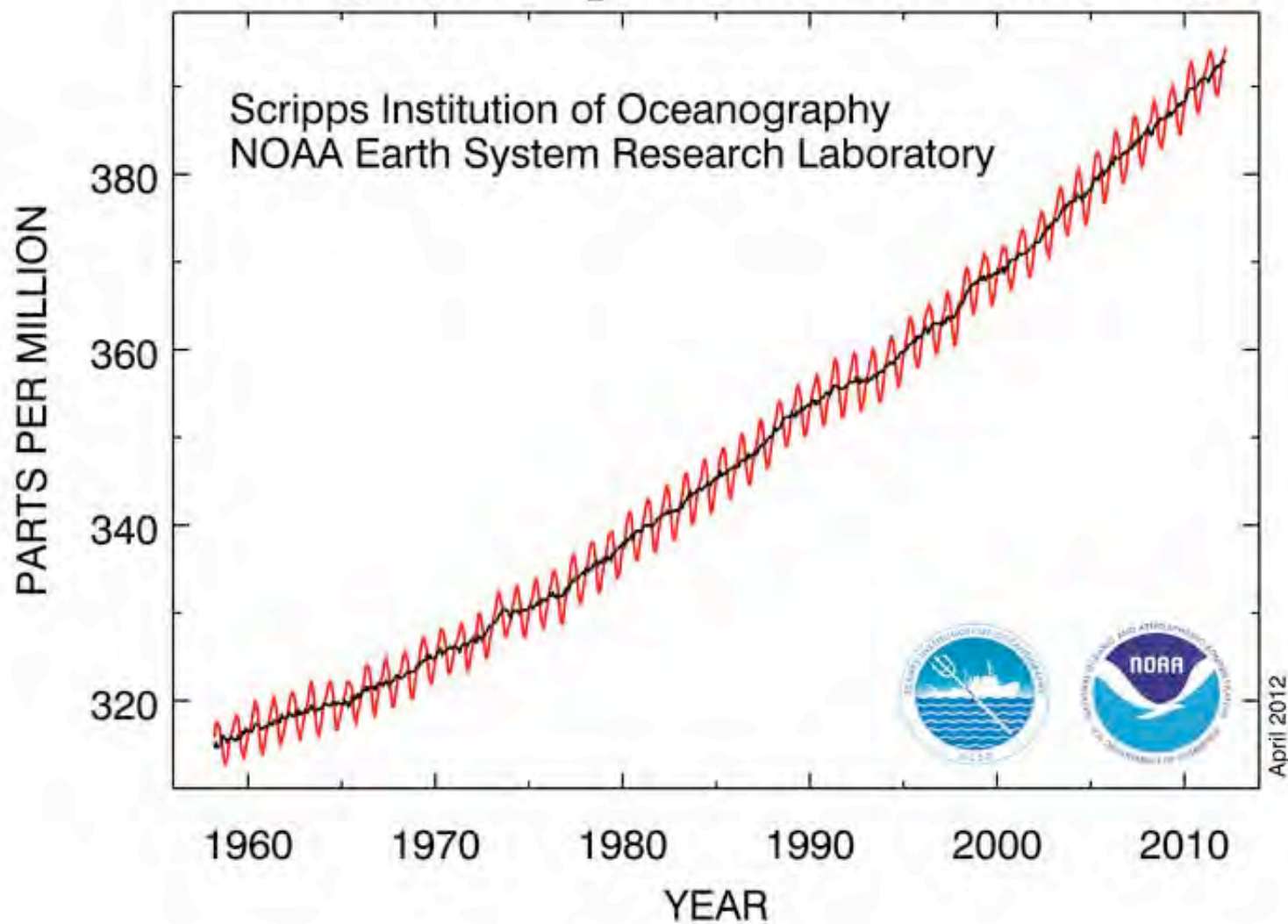
- Climate Primer
- Uncertainty (Range)
- Processes/Historical Data/Future Projections
 - Temperature and Precipitation
 - Ocean Acidification (OA)
 - Sea Level Rise (SLR)
 - Hydrology/Stream Flow
 - Upwelling
 - Waves/Storms
- Extremes
- Wrap Up/Take Home

Climate Primer



Will Elder, NPS

Atmospheric CO₂ at Mauna Loa Observatory



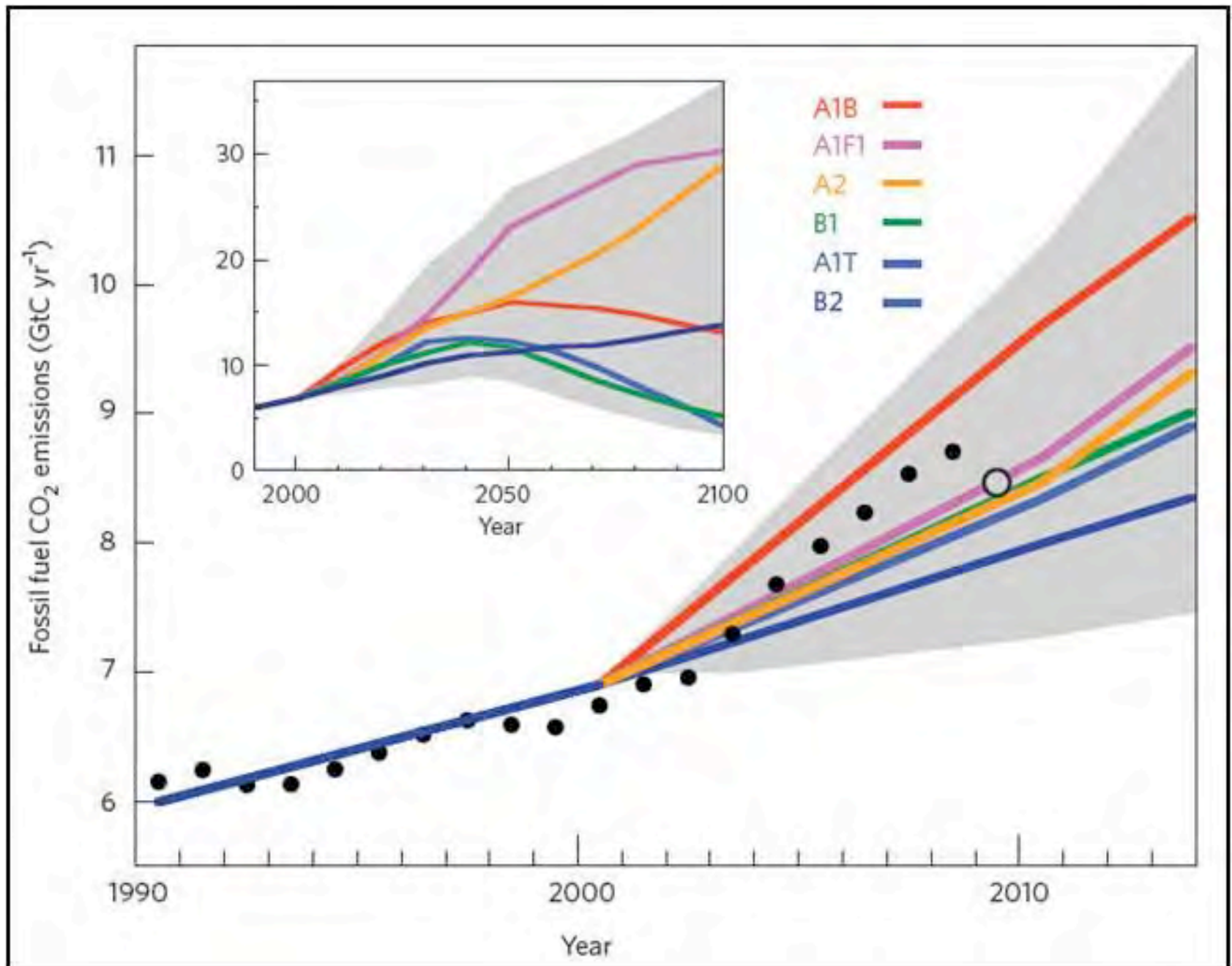
Uncertainty (Range)

Three Components

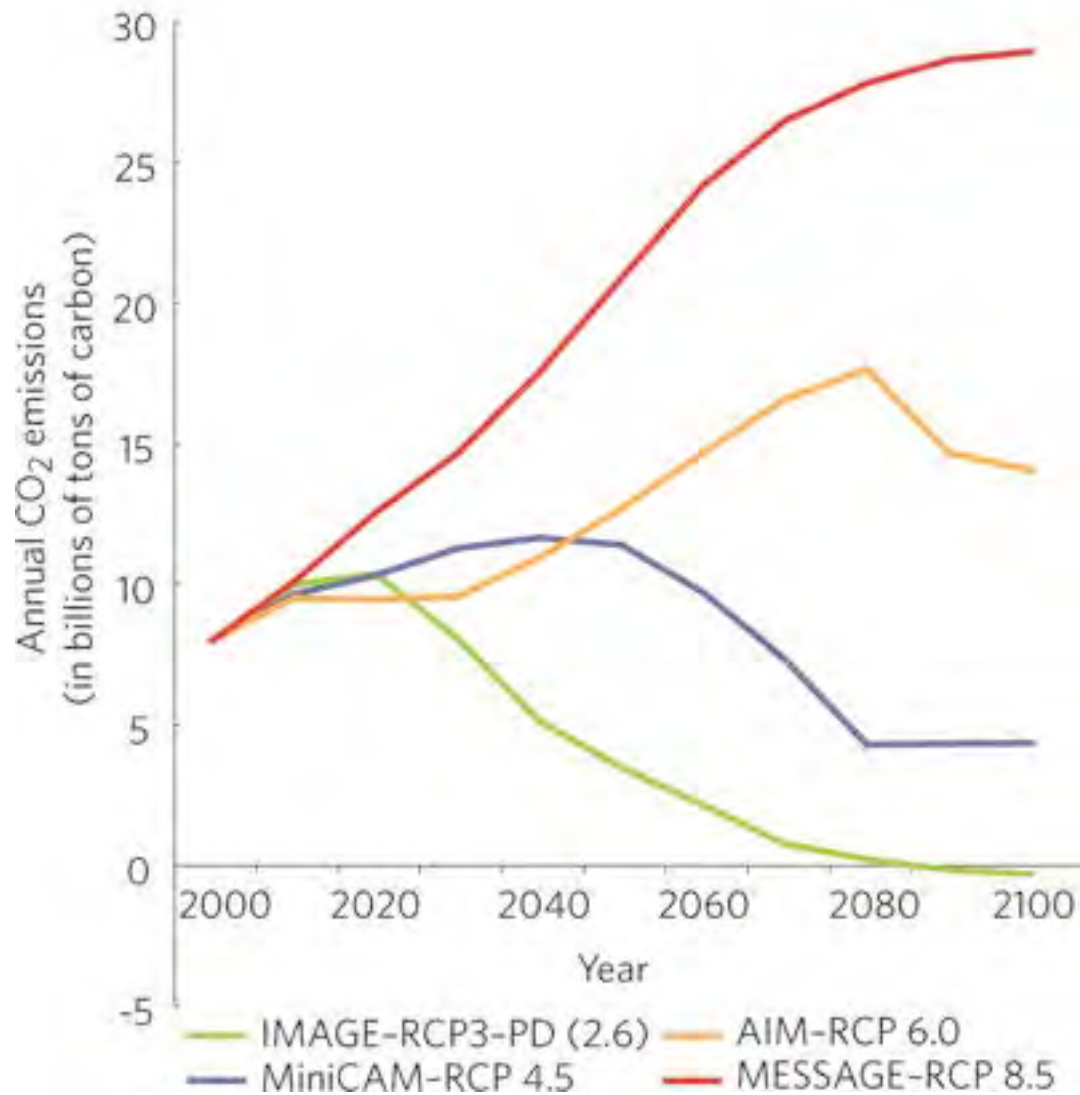
Greenhouse Gas Emissions

Natural Climate Variability

Climate Sensitivity

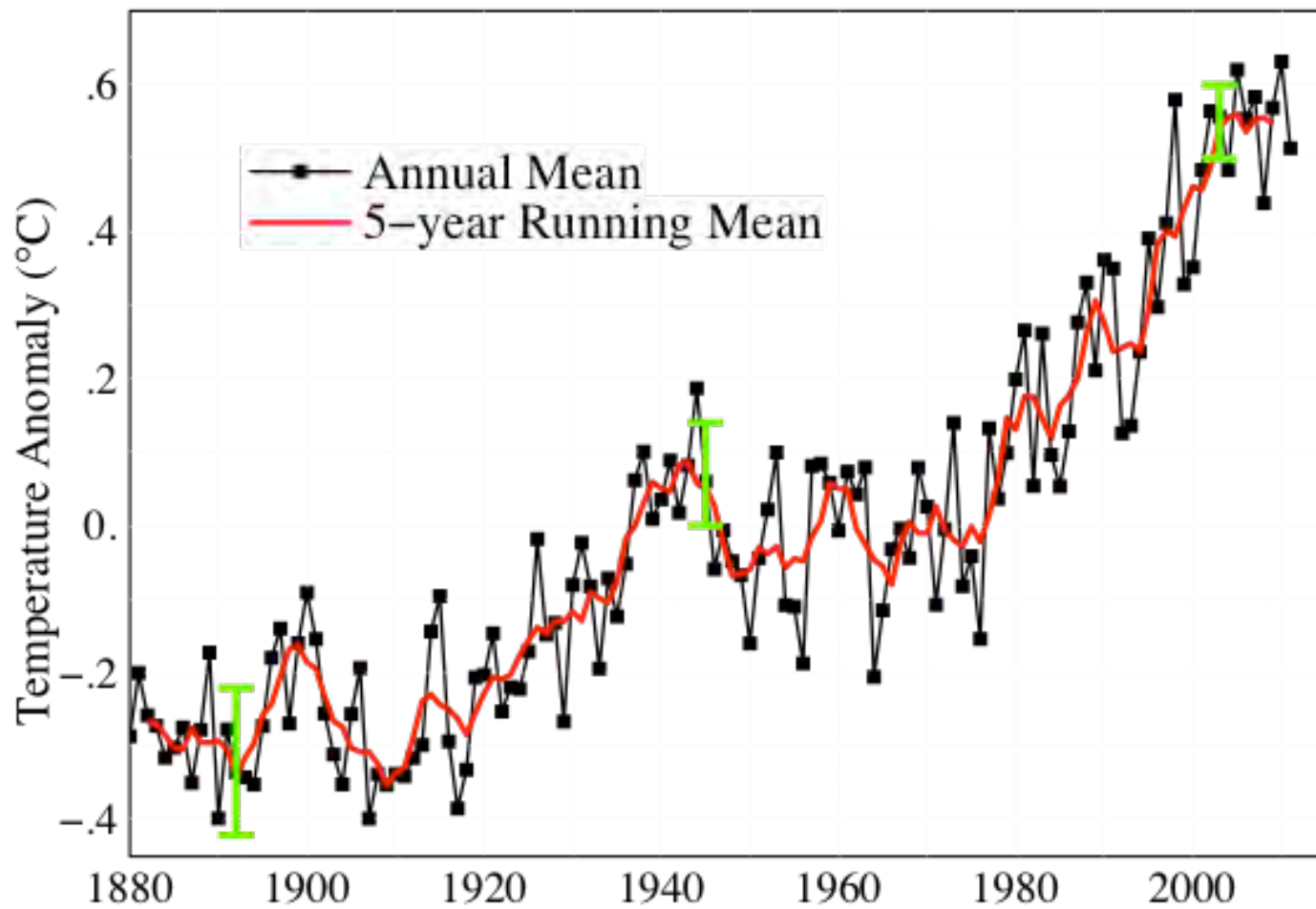


Representative Concentration Pathways (RCPs)



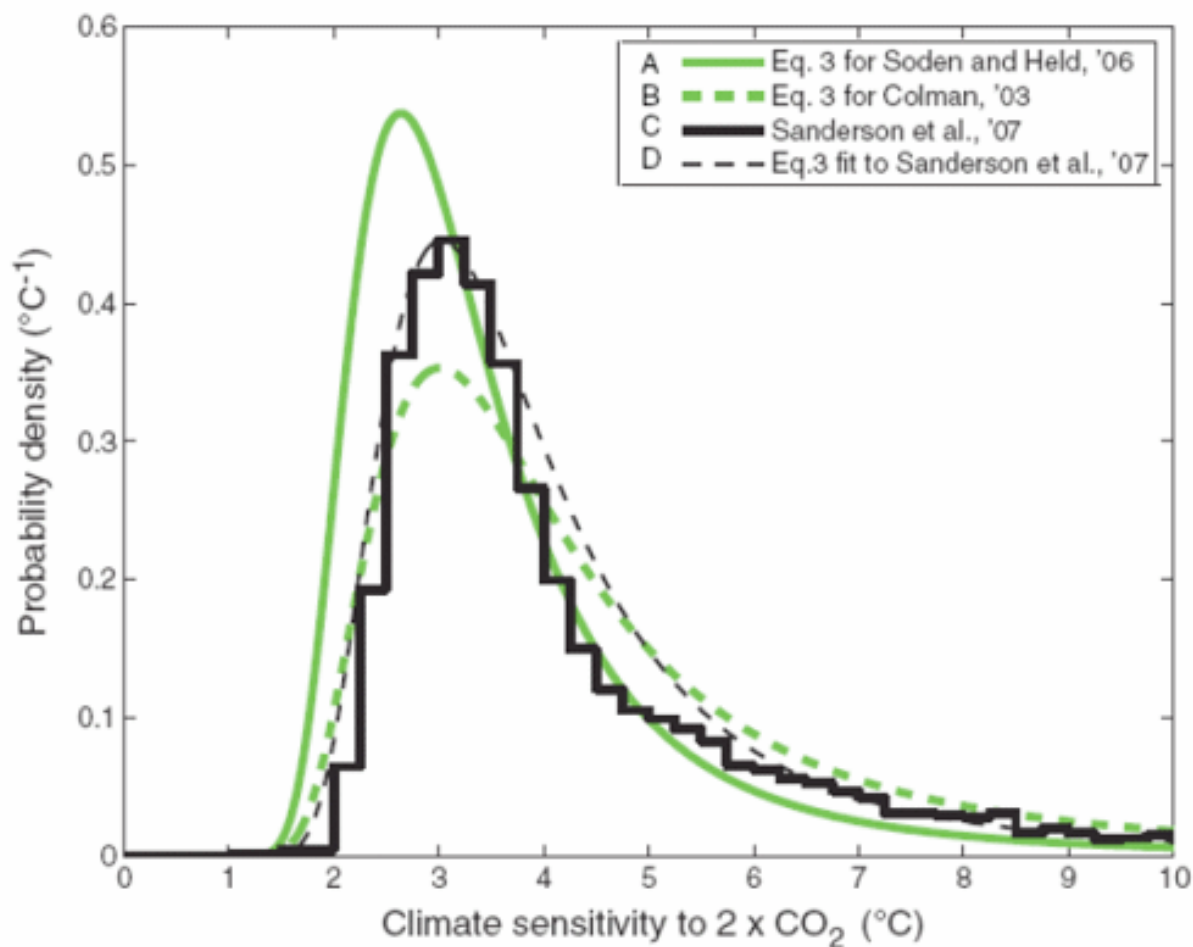


Global Land–Ocean Temperature Index



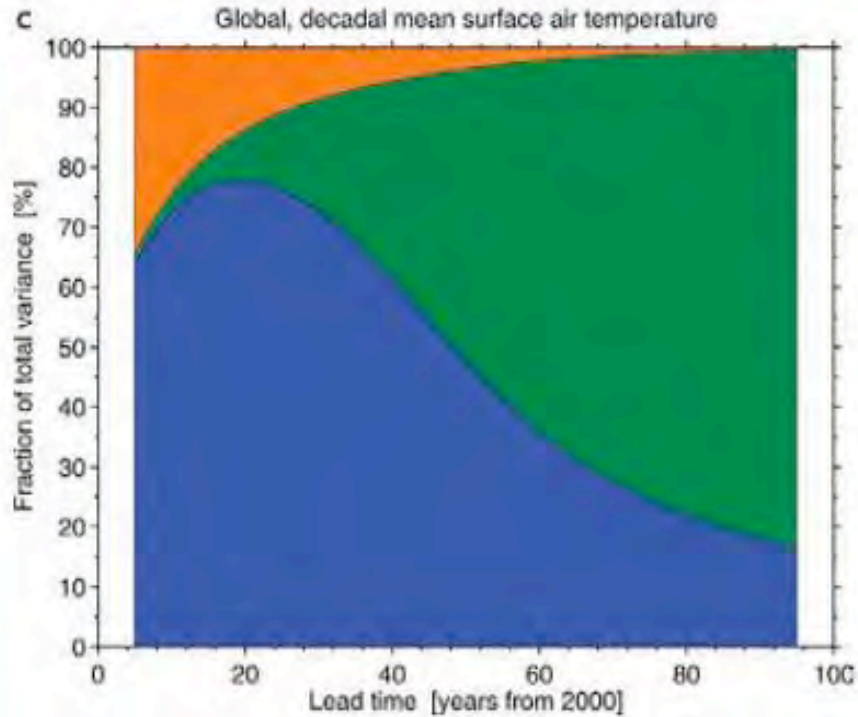
Anomaly Relative to 1951-1980

Intrinsic uncertainty in climate sensitivity

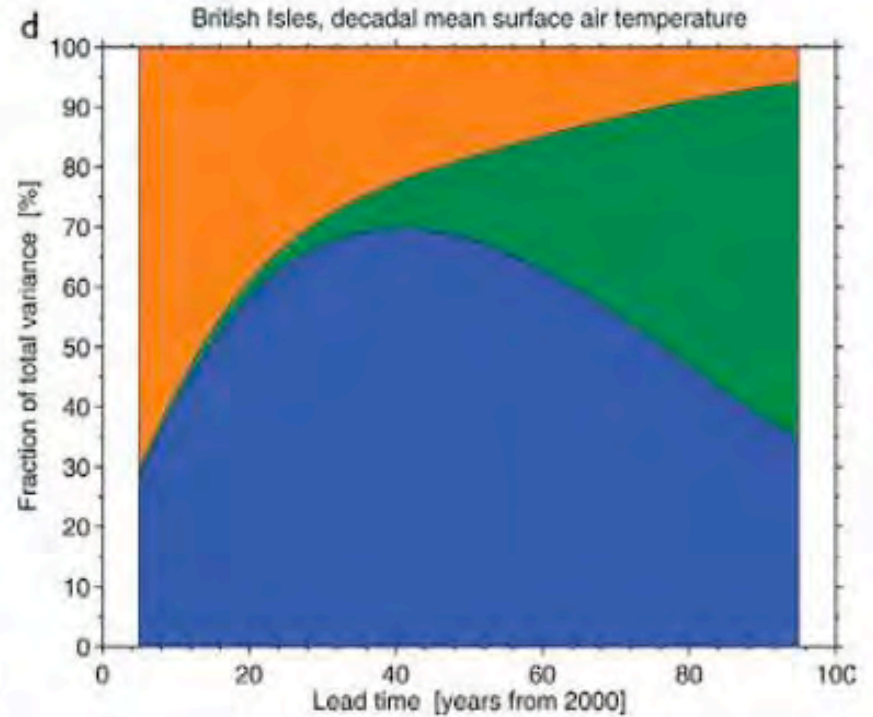


Putting It All Together

Global



Regional



GREEN = Emissions Uncertainty

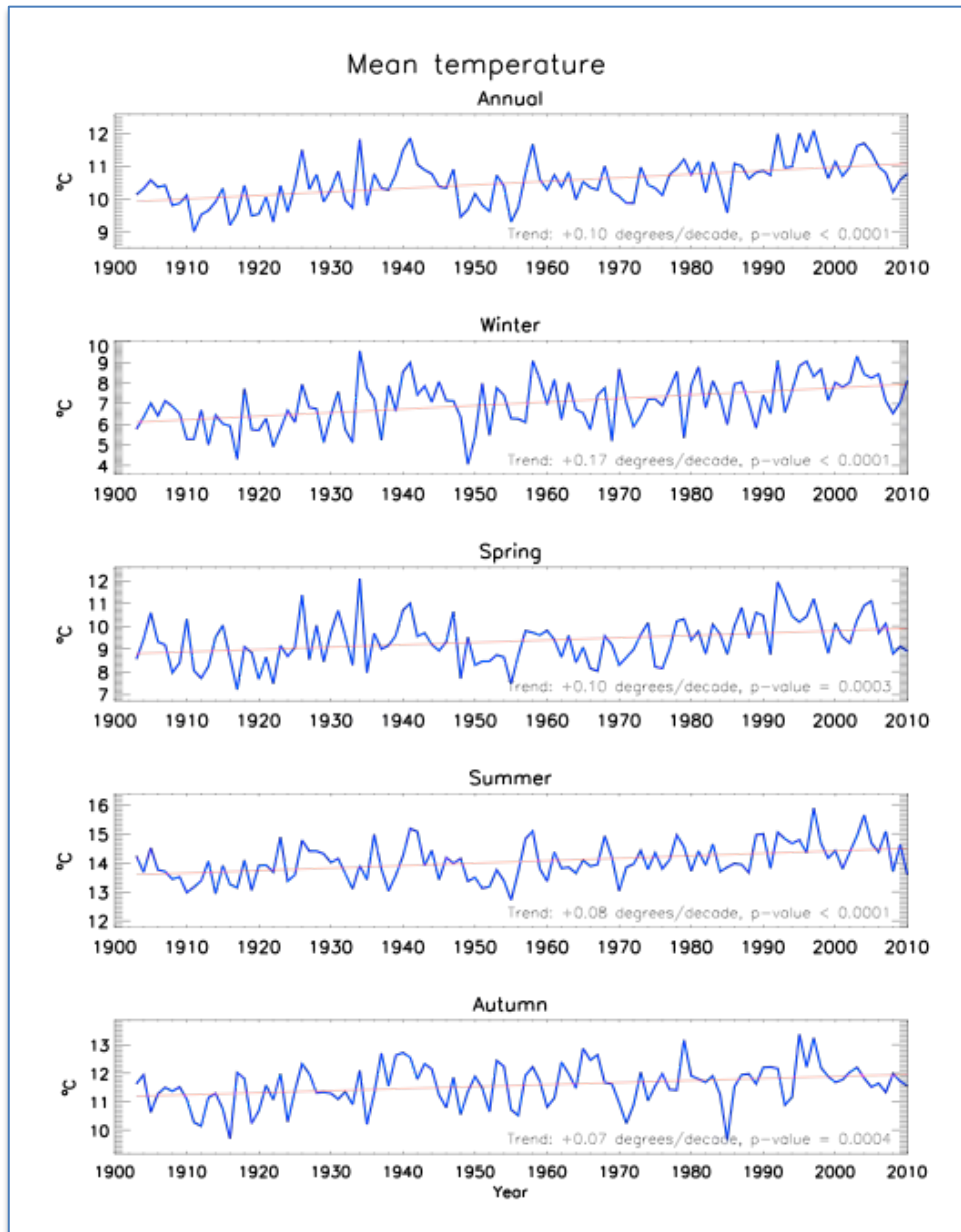
ORANGE = Natural Climate Variability

BLUE = Climate Sensitivity

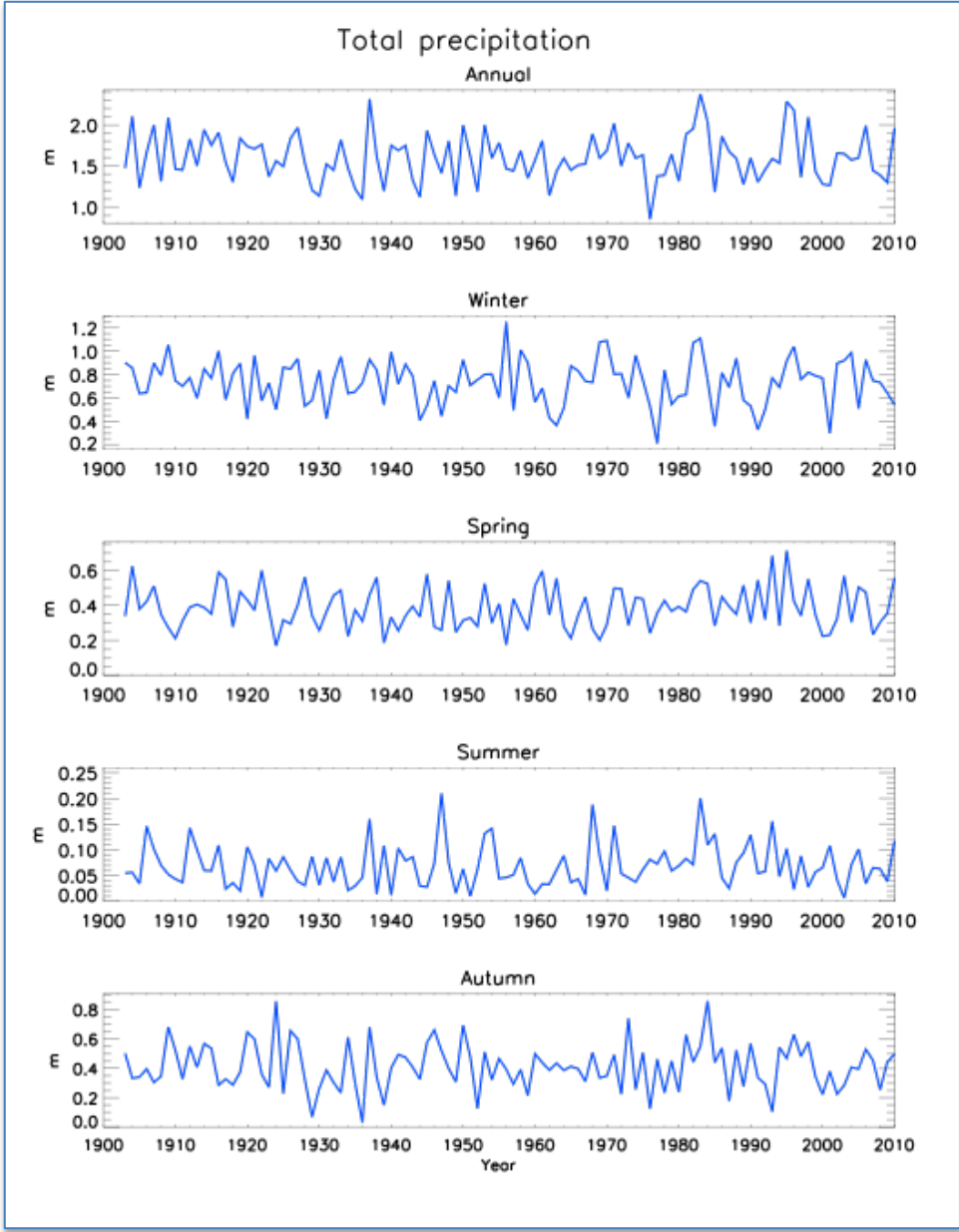


Processes/Historical Data/
Future Projections

Temperature and Precipitation



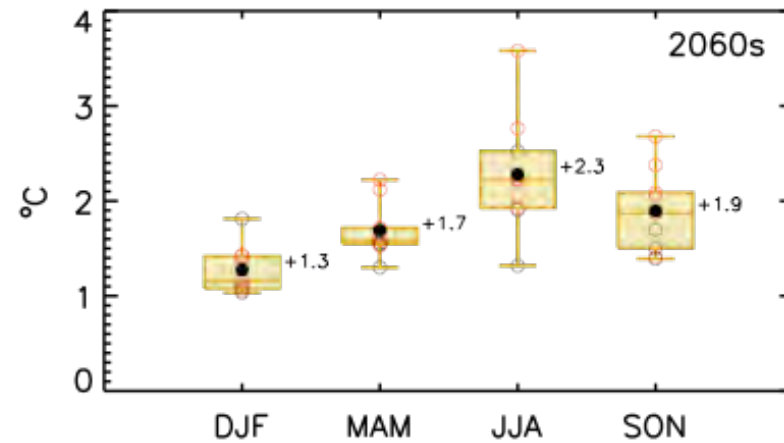
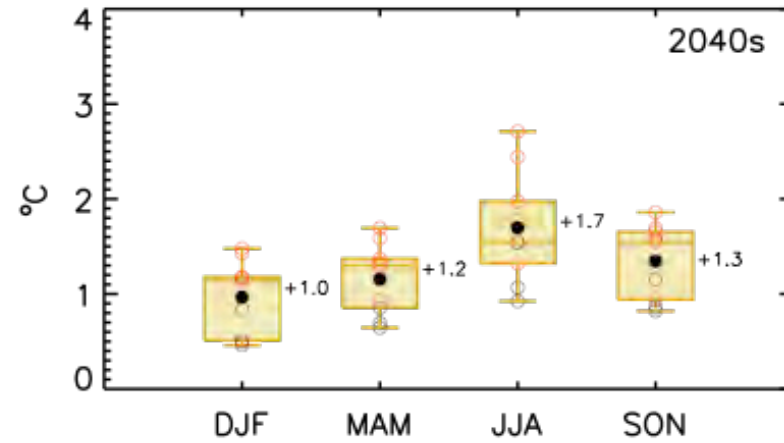
Historical Climate Network, N. Bend



Historical Climate Network, N. Bend



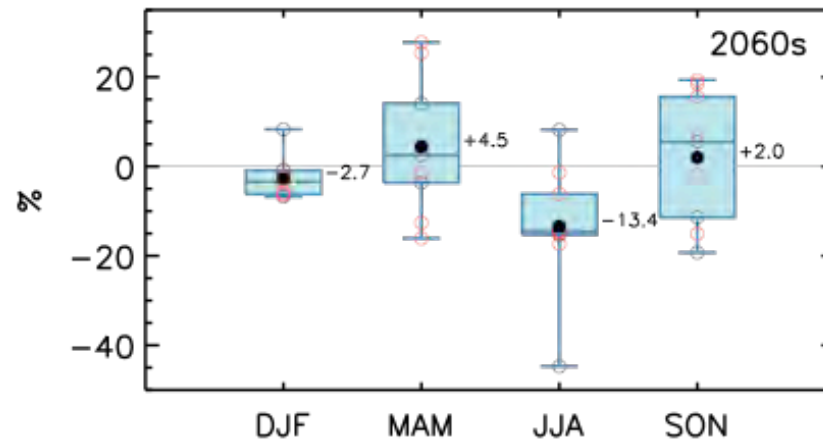
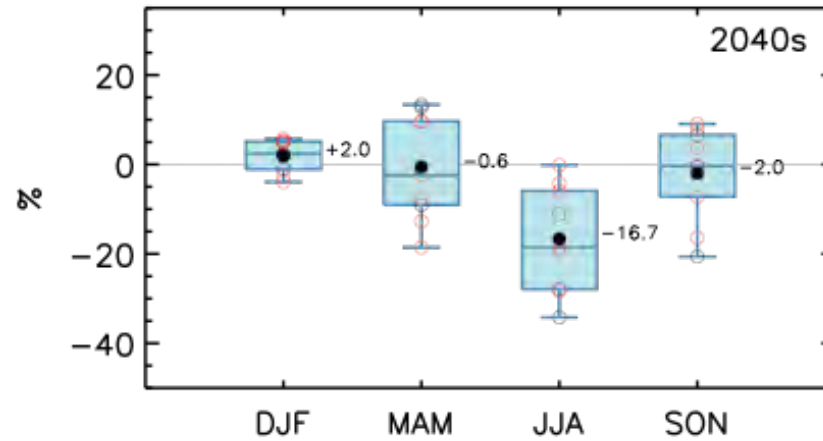
Lower Coquille – Projected Temperature Changes



Compared to 1971-1998 baseline. A2 emissions.



Lower Coquille – Projected Precipitation Changes



Compared to 1971-1998 baseline. A2 emissions.



Take Home

Historic Trends

Temperature Up 0.10 °C/decade (1.8 °F/20th Century)

Precipitation Flat

Future Projections (~2050)

+ 1-2.5 °C (1.8-4.5 °F) Greatest Increase in Summer

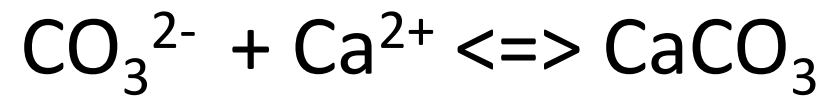
Probable Decrease in Summer Precipitation

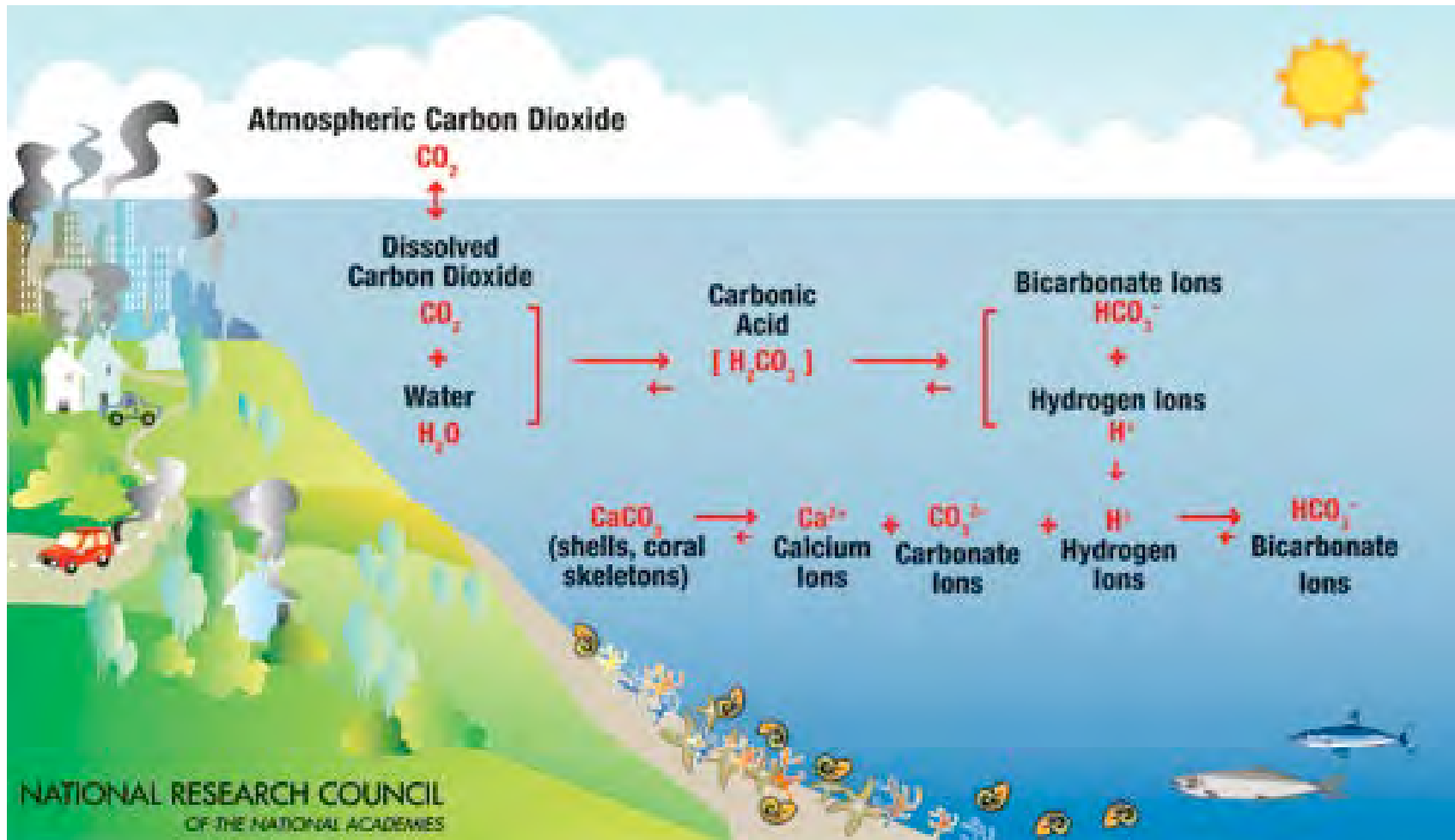
Ocean Acidification



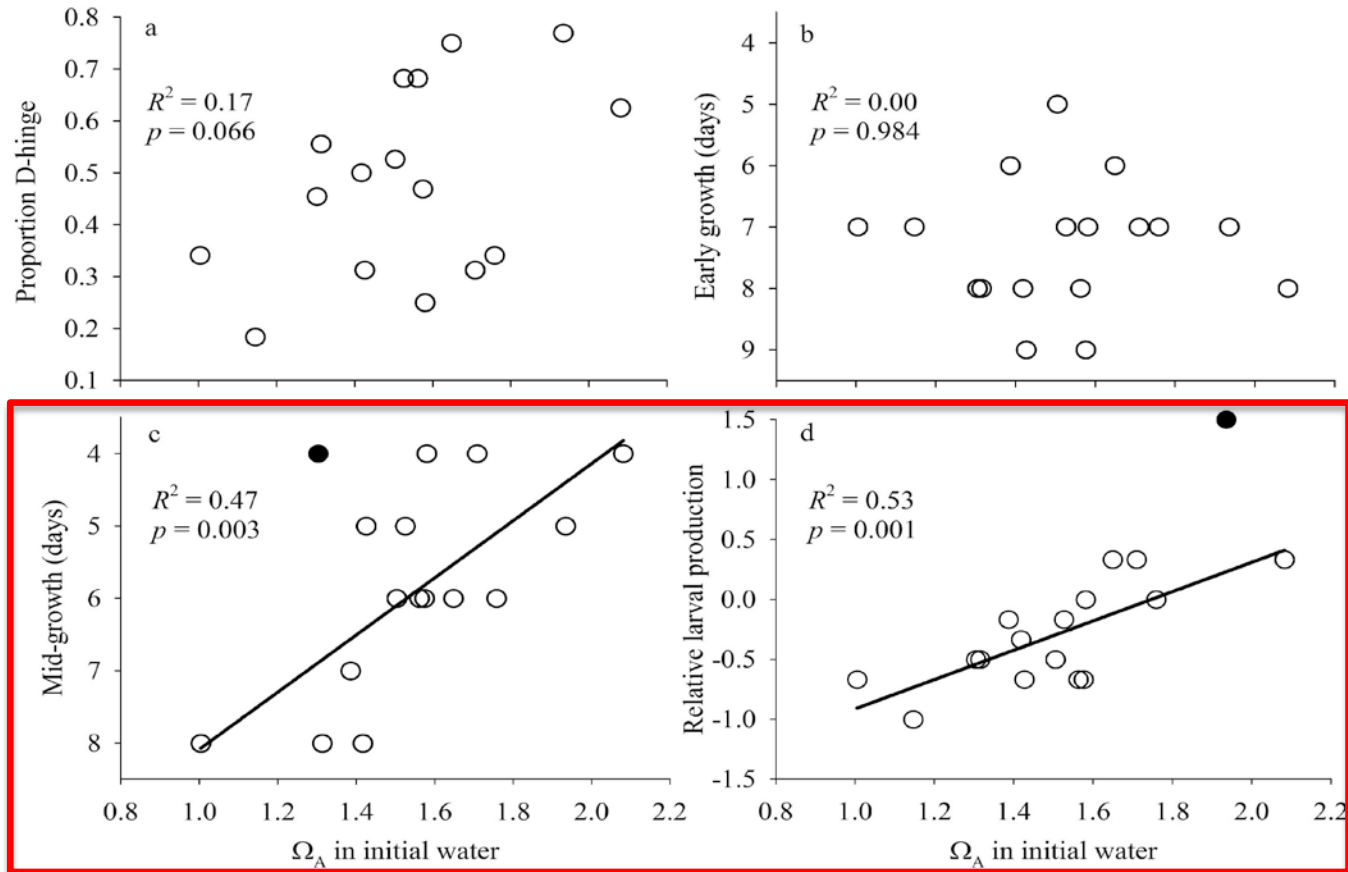
“Calcifiers”

(Photos of shell-building organisms)





Effect of Acidification on Pacific Oysters in the Netarts Estuary



← Increasing acidification (higher CO_2)



Take Home

pH ↓

More Acidic

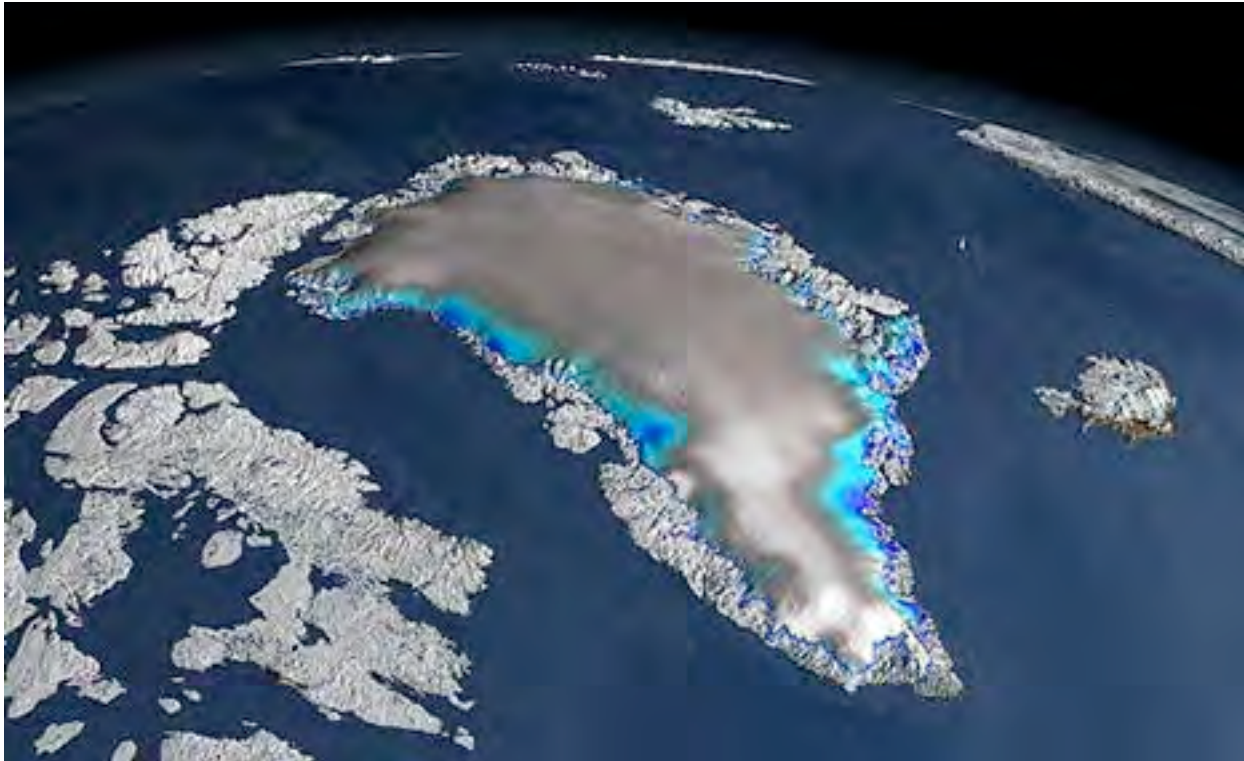


Sea Level Rise

Thermal Expansion

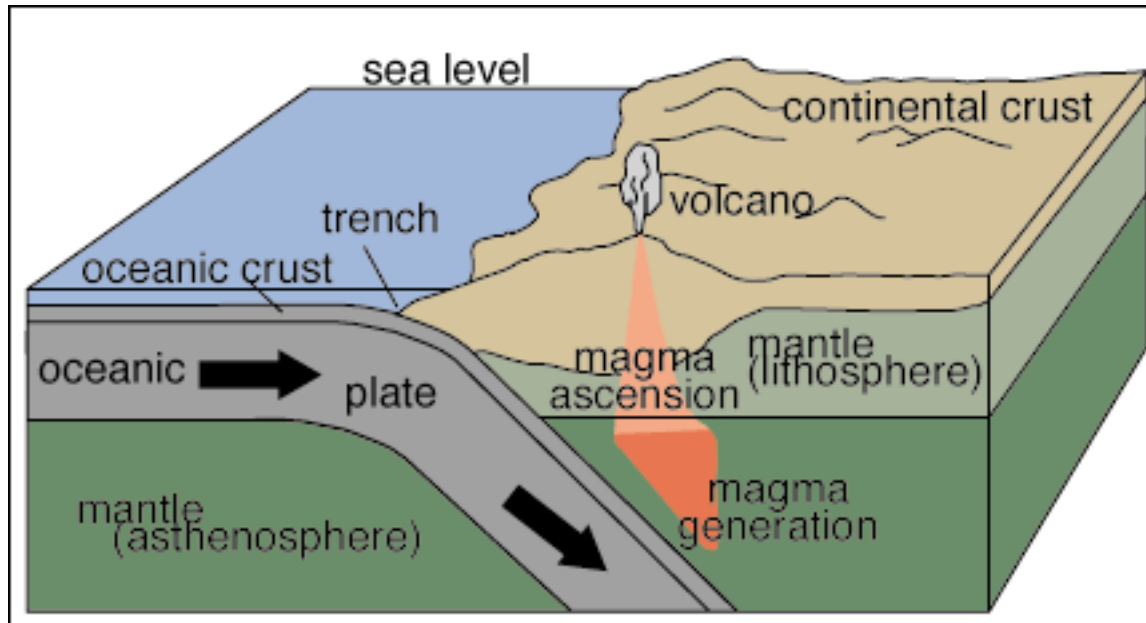
Melting Glaciers/Ice Caps

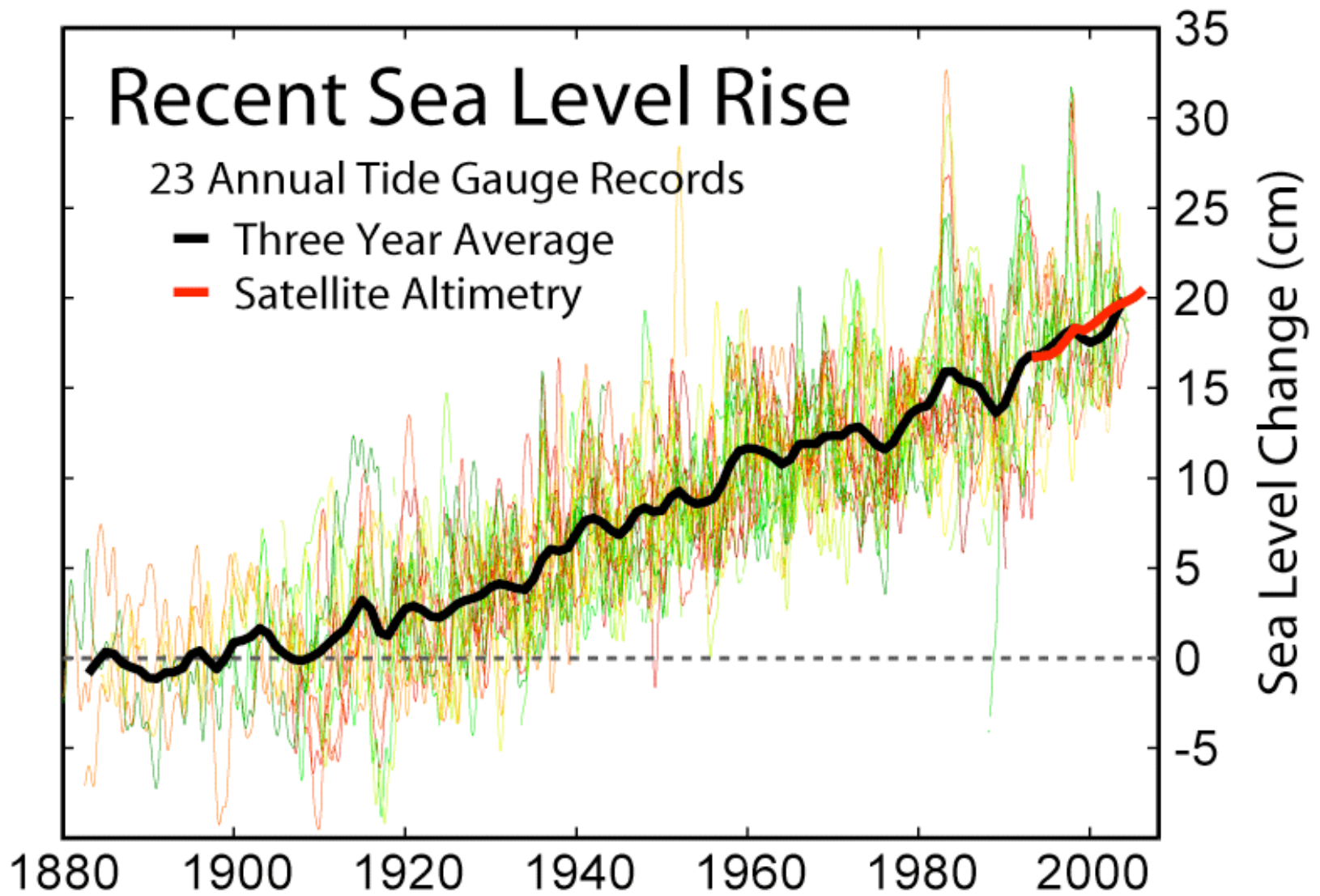
Melting of Antarctic/ Greenland Ice Sheets

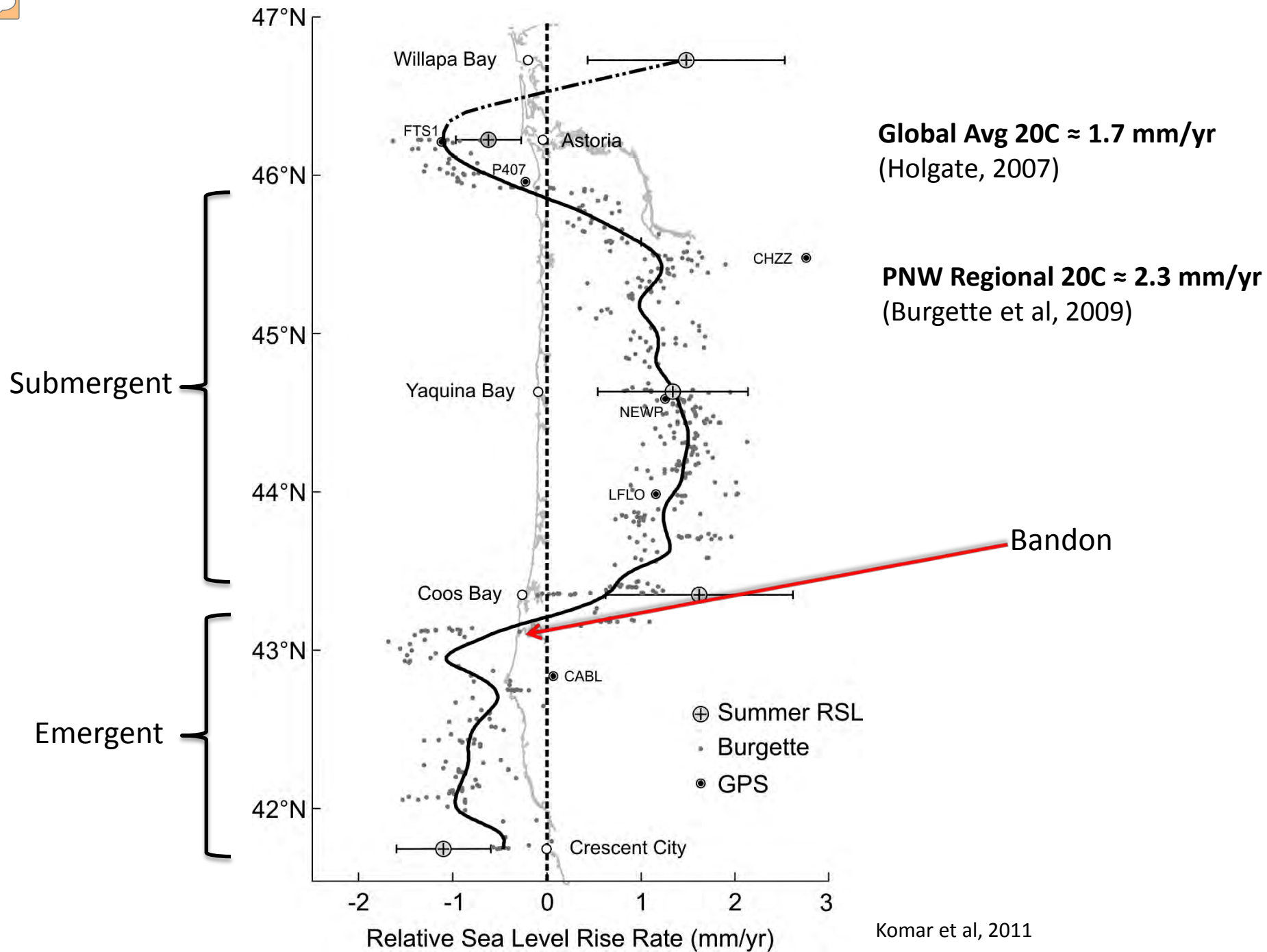


NASA Goddard Photo and Video

Tectonic Effects

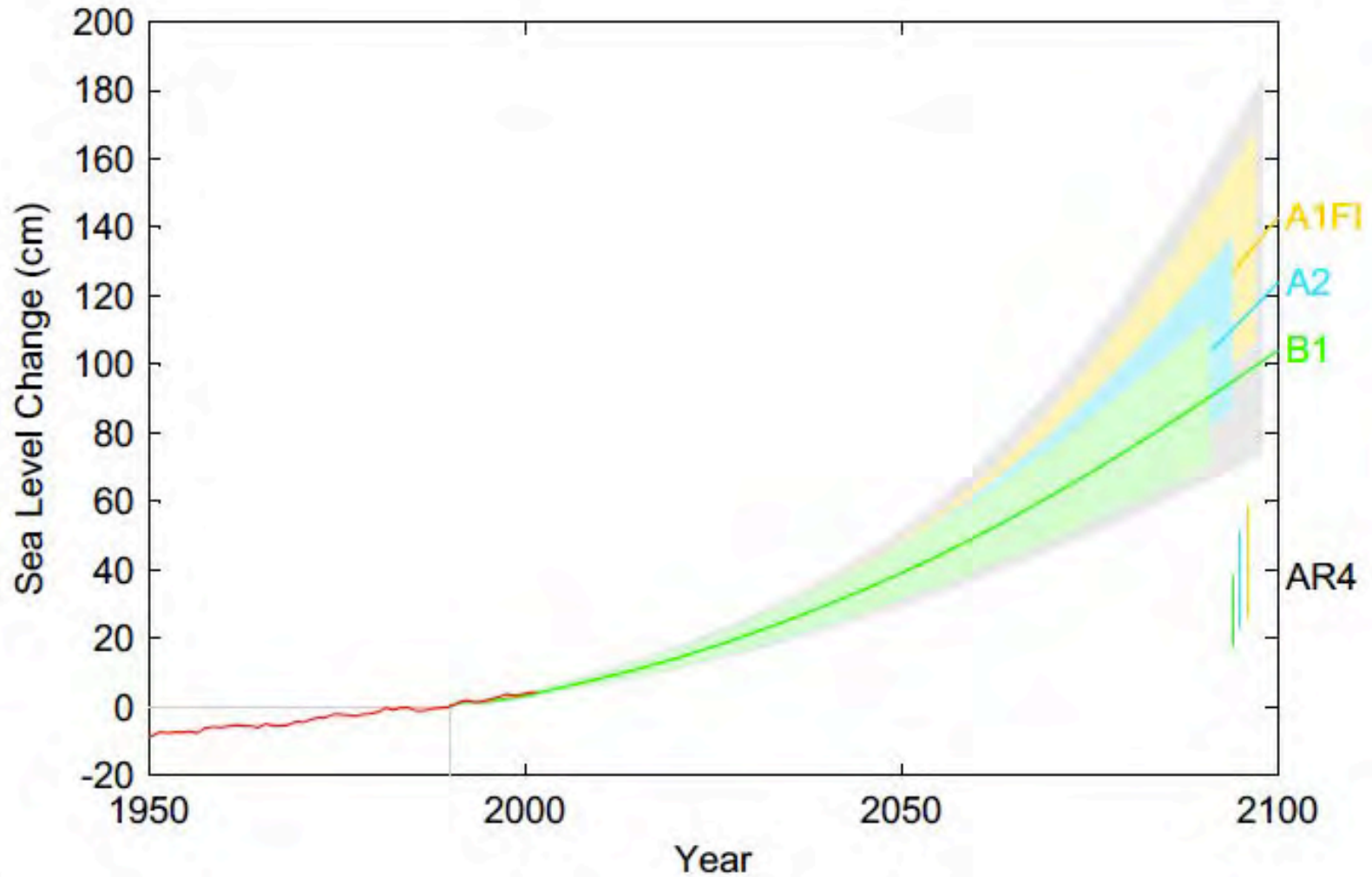








SLR Projections





Take Home

Global SLR in 21st Century*

~20 – 60 cm (IPCC)

Other Sources – up to ~200 cm

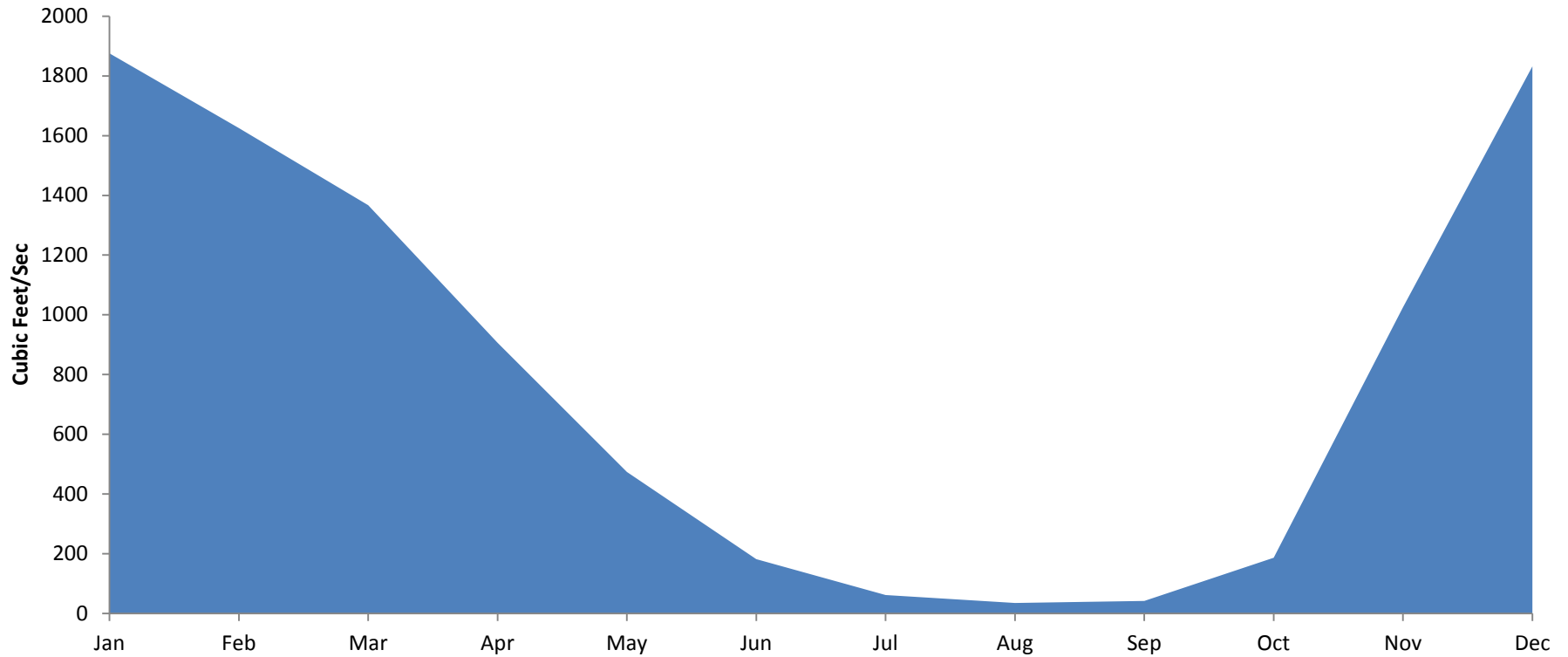
Tectonics May Decrease Local SLR by 0-1mm/yr

* Very Active Research Topic

Hydrology/Stream Flow

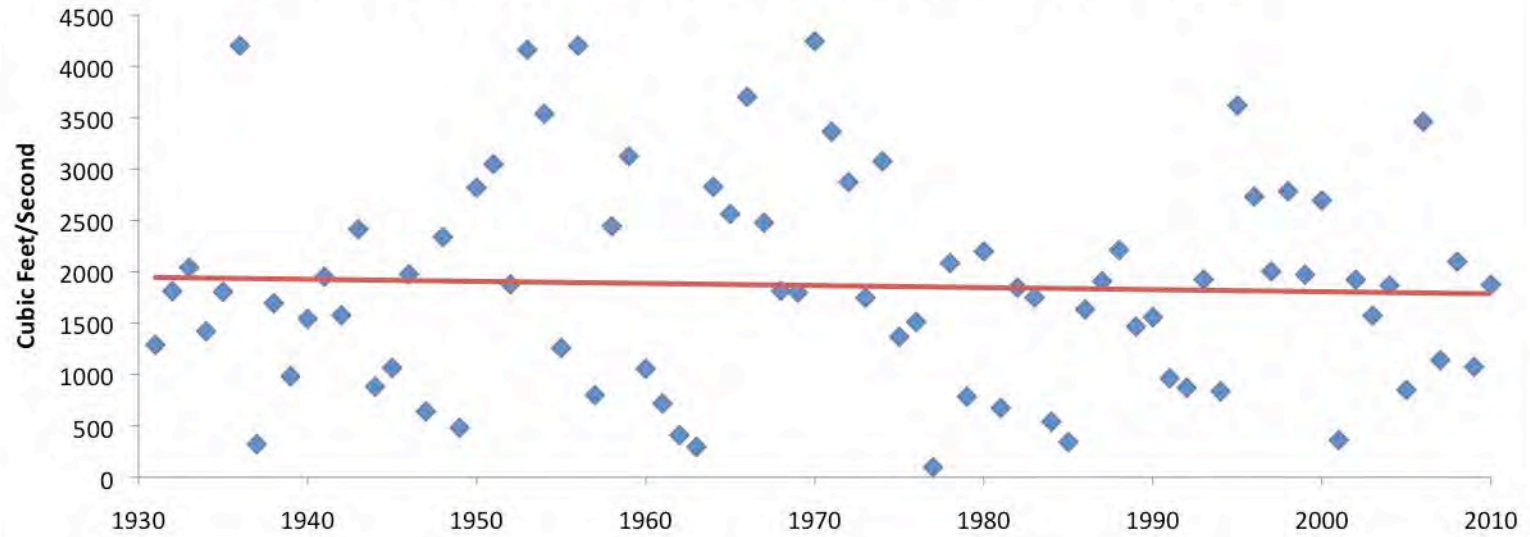


South Fork Coquille R at Powers: Average Discharge (1930-2010)

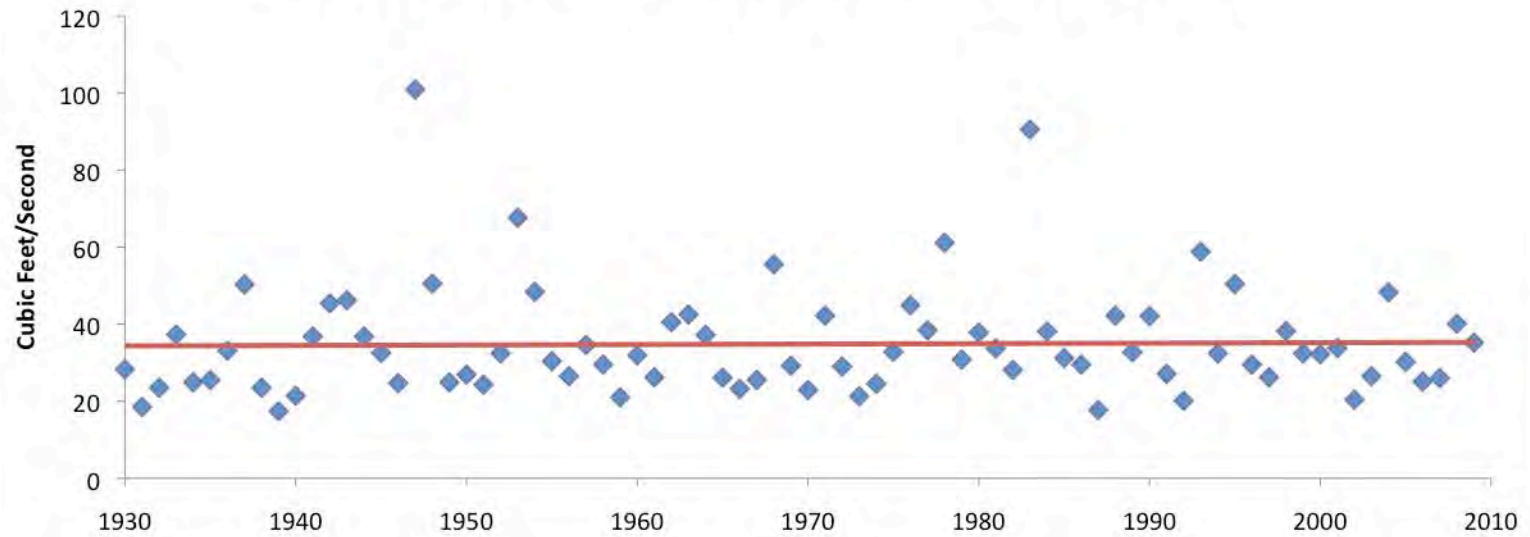




South Fork Coquille R at Powers: January Discharge



South Fork Coquille R at Powers: August Discharge



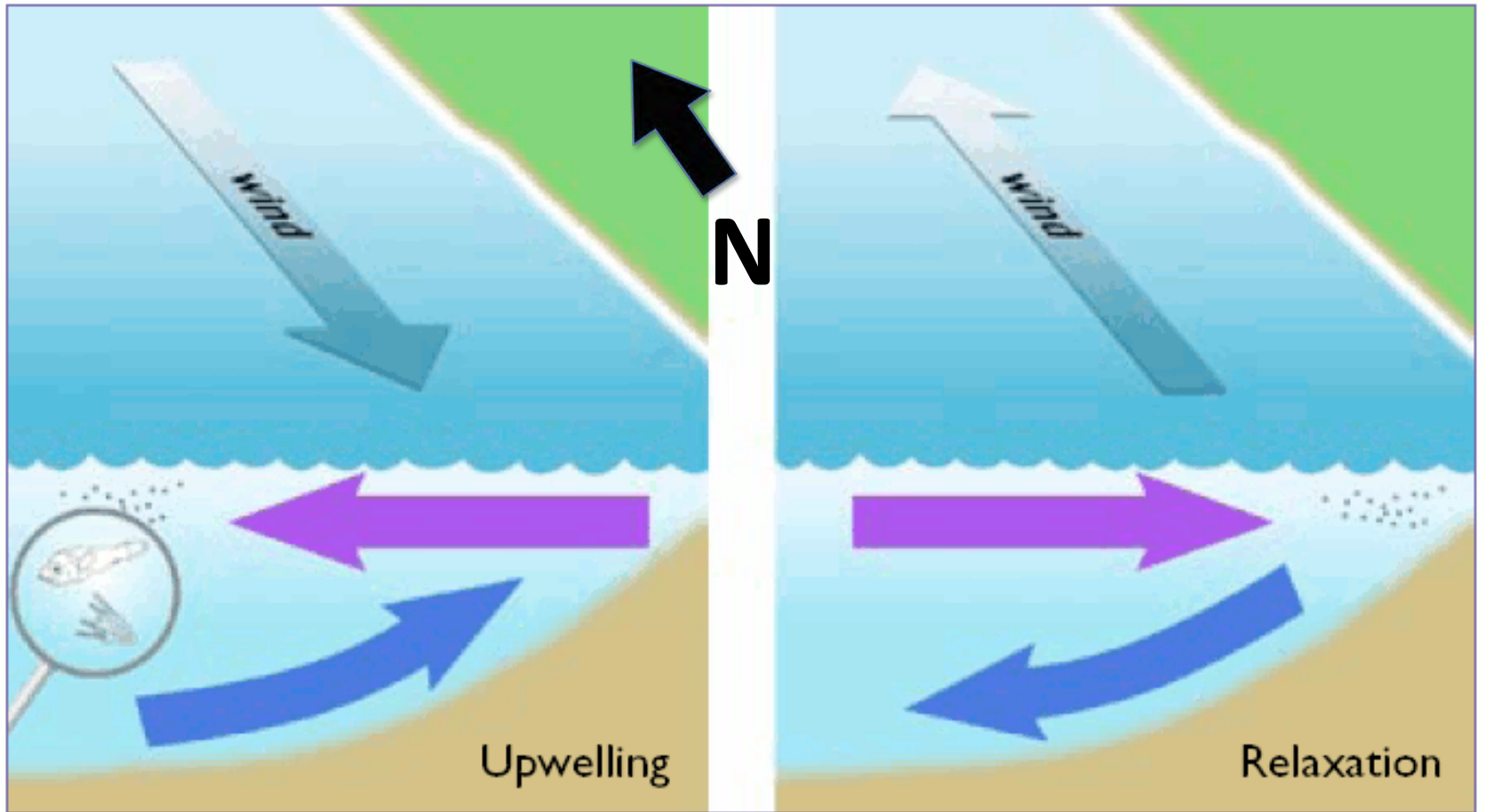


Take Home

High Degree of Seasonality

No Trend in Historical Data

Upwelling



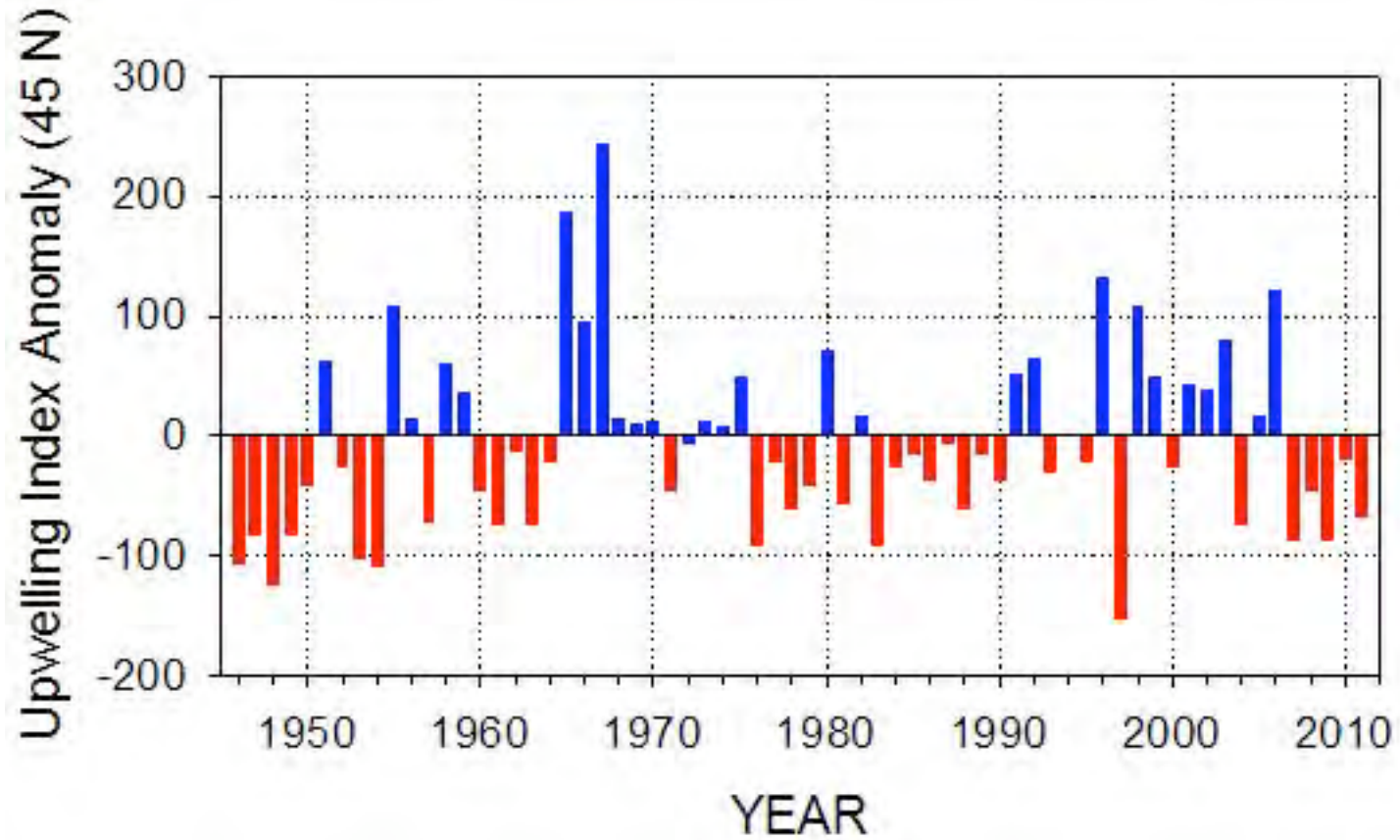
PNW Summer

PNW Winter

www.PISCO.org



Upwelling Index Anomaly





Take Home

Changes to Upwelling = ?

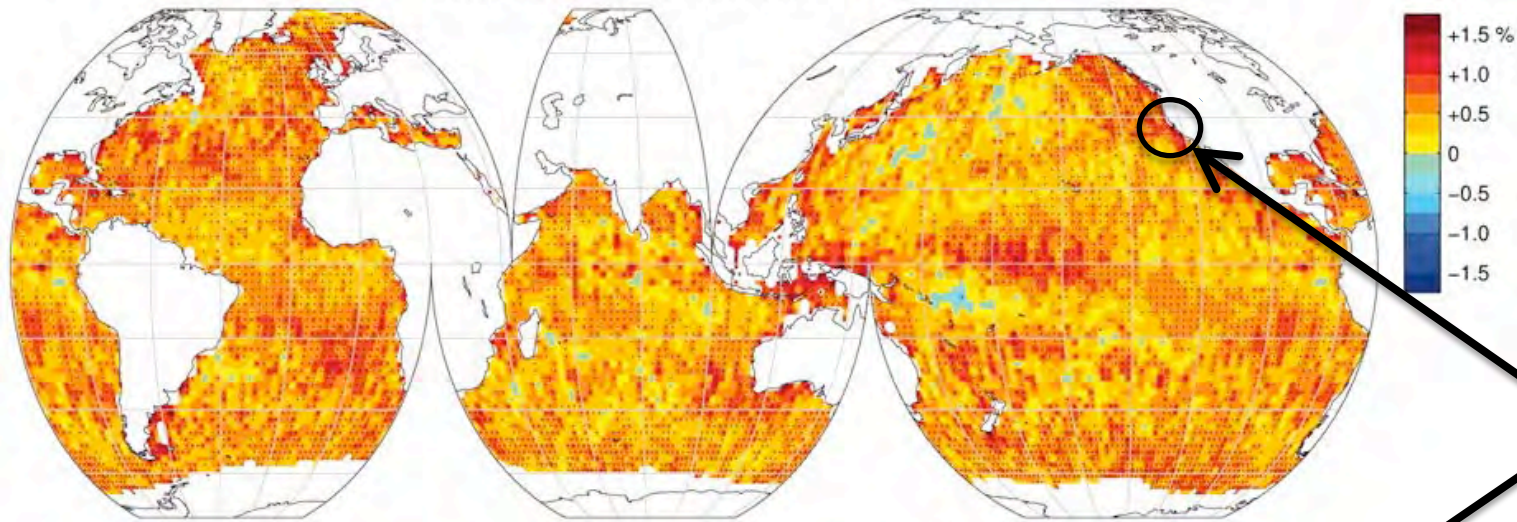
Deeper Waters = More Acidic

Increased Upwelling (hypothetical) =
More Acidic Waters Alongshore

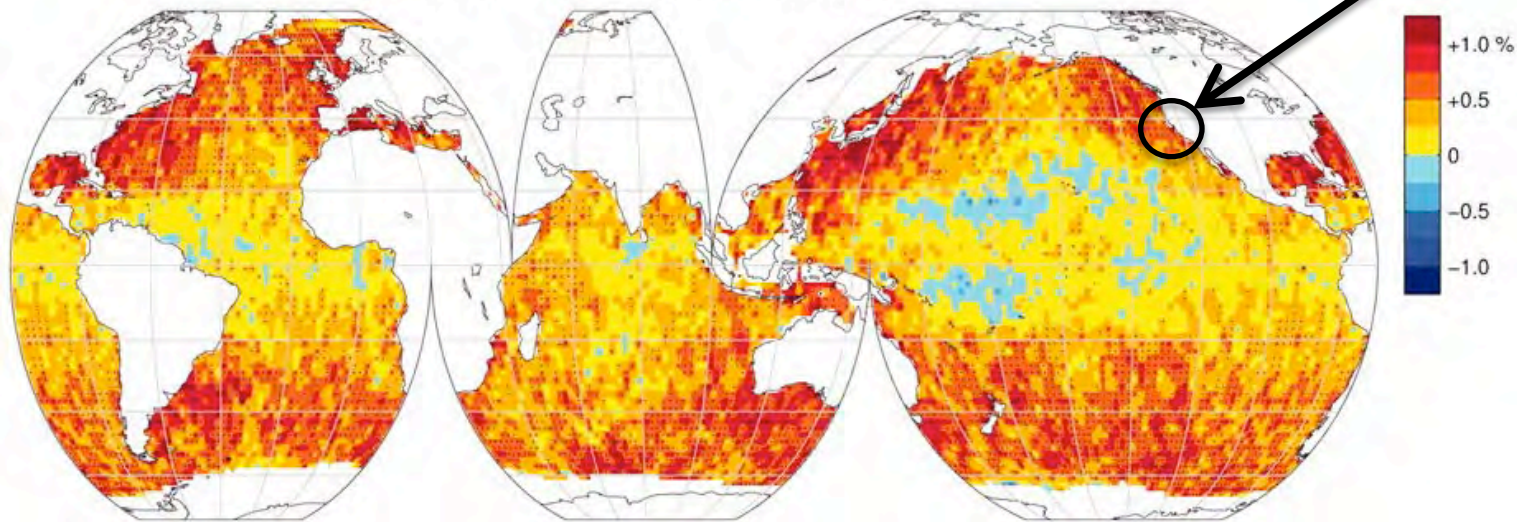
Waves/Storms



99th percentile wind speed (1991-2008)



99th percentile significant wave height (1985-2008)





Take Home

Research Suggests

Increases in Wave Heights

Changes in Storminess Patterns

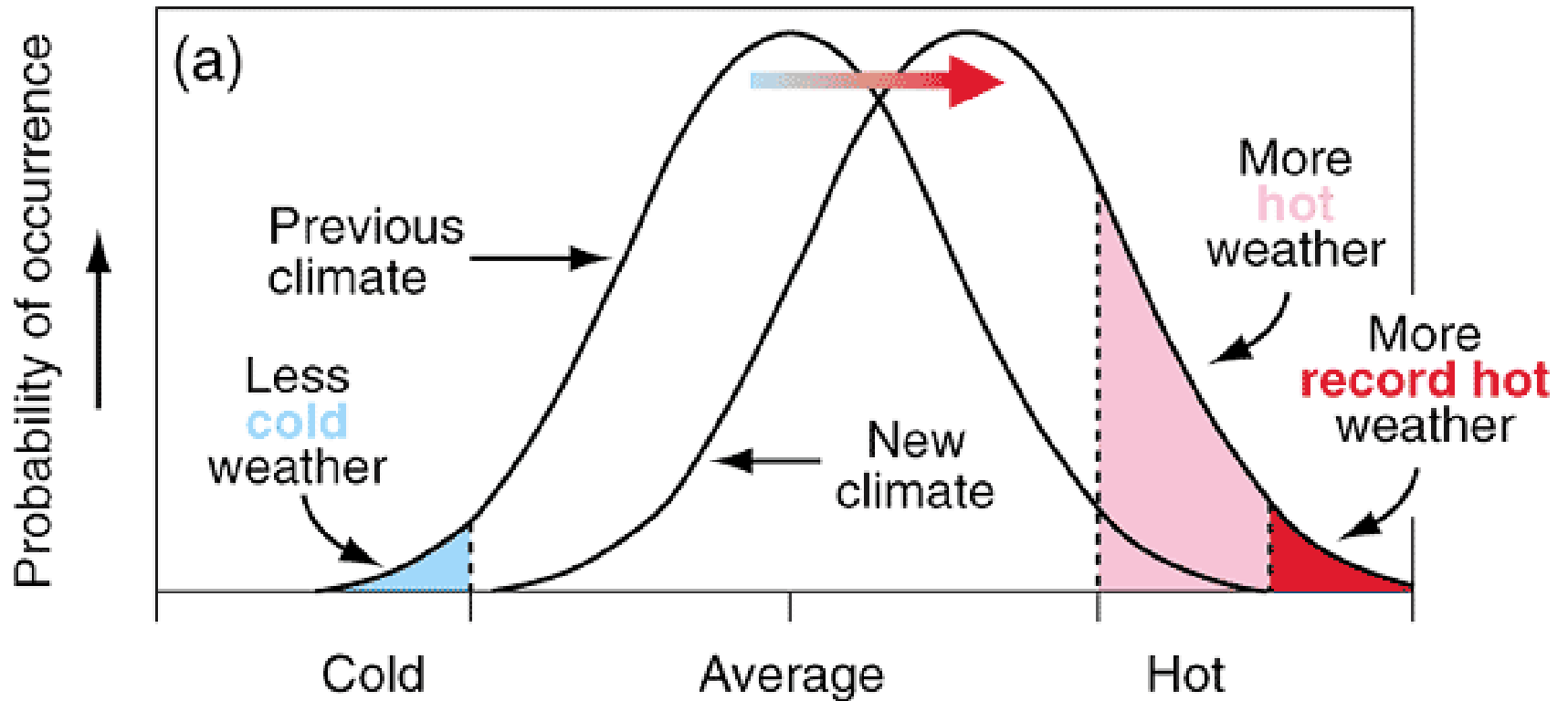
(No Definitive El Nino/
Climate Change Connection)

Extremes



Temperature

Increase in mean





Extremes Discussion

What extreme metrics are useful?

Number of Summer days ($>25^{\circ}\text{C}/77^{\circ}\text{F}$)?

Warm Spell Duration (6 days $> 90^{\text{th}}$ T_{max})?

Percentage of Days $T_{\text{min}} < 10^{\text{th}}$ Percentile?

Others?

See “CLIMDEX” at www.climdex.org

Wrap Up/Take Home

Temperature	+ 1-2.5 °C (1.8-4.5 °F) Greatest in Summer
Precipitation	Suggestion of Drier Summers
Ocean Acidification	Increased Acidity
Local Relative SLR	Global Minus 0-1mm/year

Hydrology/Stream Flow	Highly Seasonal; No Historic Trends
Upwelling	Correlated with Winds; Difficult to Project
Waves/Storms	Suggestion of Increased Waves/Storms

Citations

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