UPDATE ON OCEAN ACIDIFICATION

Presentation to Commission

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Ocean Acidification

- Atmospheric CO_2 concentrations are increasing
- Oceans absorb ~25% of this CO_2
- Causes changes in ocean chemistry
  - Increasing acidity (Ocean Acidification)
  - Decreasing carbonate ion saturation

Ocean Acidification

- Changes in ocean chemistry can negatively affect marine ecosystems
  - Decrease in saturation of calcium carbonate affects shell formation
  - Causes physiological stress
  - Affects chemical state of nutrients and metals, decreasing their availability
- Globally, starting to see ecosystem level effects
  - Corals
  - Calcareous plankton
  - Shellfish

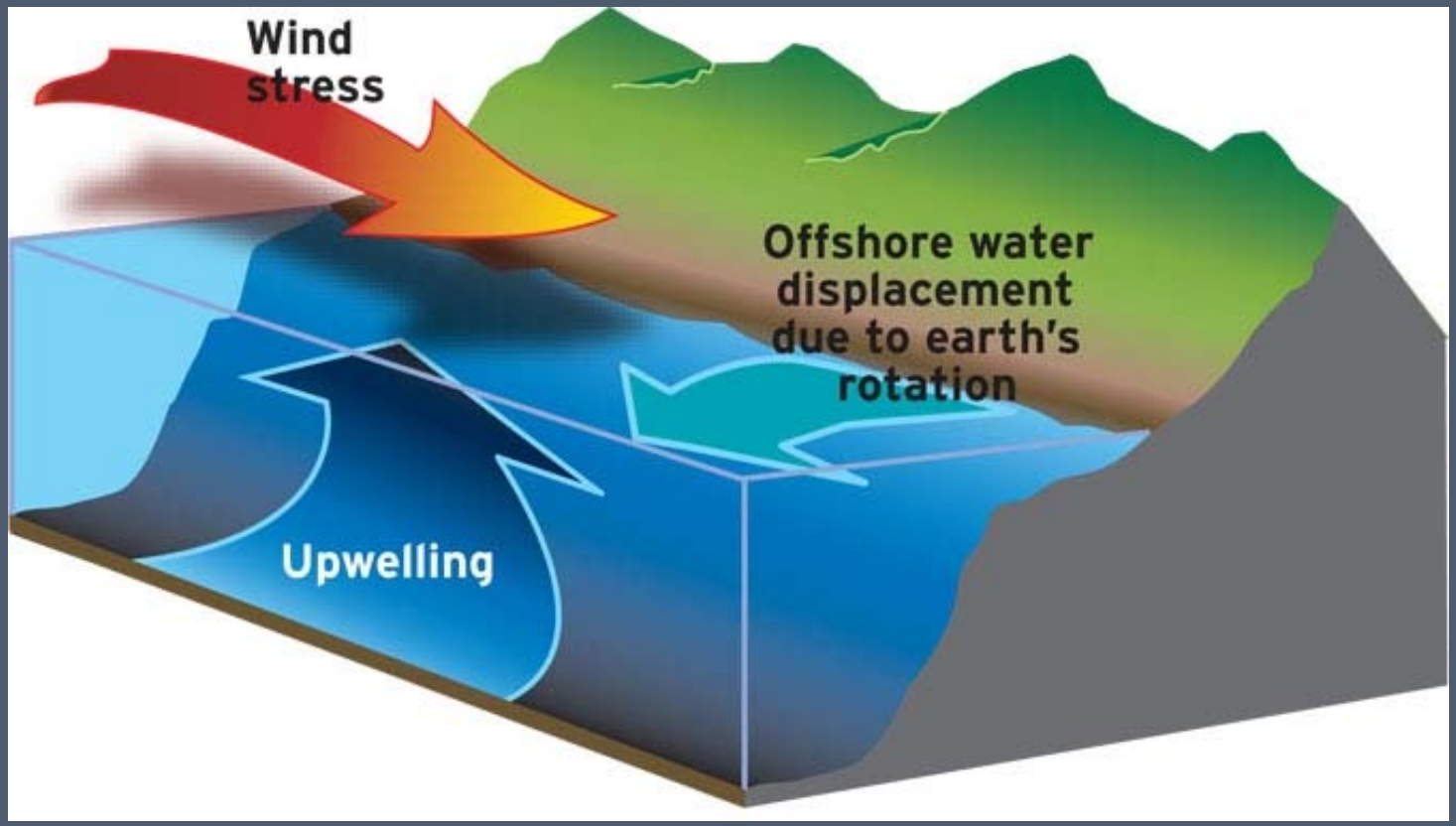
Urchin larvae

Pteropod shells

Ocean Acidification Regulation

- May 2009- EPA sued for failing to address ocean acidification on the coast of Washington State under the CWA
  - 2000 the pH of Washington's coastal waters has declined by more than 0.2 units, violating water-quality standards for pH.
- Nov 2010- EPA issues memorandum on how states can begin addressing ocean acidification under the CWA
  - States should list waters not meeting water quality standards including pH on their 2012 303(d) lists.
  - Recognition that lack of data will preclude listings in many states
  - Will issue further guidance pending the results of other federal programs

West Coast Susceptibility



Deep, cold water =

lower pH, lower $CaCO_3$ saturation

West Coast Susceptibility

- Upwelling of lower pH waters has been observed along the U.S. West Coast
- These upwelling events are correlated with observed reductions in shellfish larval recruitment and settlement
  - Significant oyster larvae mortalities (80%)
  - Virtually no natural oyster seed sets in Willapa Bay (largest oyster producing region on West Coast) for 6 years
- More research is needed to untangle acidification effects from other risk factors, such as episodic freshwater inflow, pathogen increases, or low dissolved oxygen

West Coast Reaction

- Shellfish industry sought help of research community
- Held workshops at SCCWRP to discuss existing efforts to understand OA effects on West Coast ecosystems
- Wide-spread desire to develop a West Coast Monitoring program

The California Current Acidification Network (C-CAN)

- Emerged from the West Coast Ocean Acidification–Shellfish Workshop, held July 2010, at SCCWRP

- The goal is to facilitate collaborations among scientists, agencies, and industry professionals:
  - Determine what is causing shellfish losses,
  - What role ocean acidification and other factors might be playing in this problem,
  - How to adapt to these changes in order to sustain West coast shellfish resources.

http://c-can.msi.ucsb.edu/

What Should the Network Do?

- Standardize protocols and parameters
  - Minimum: temperature, salinity, oxygen, and two or more CO_2-parameters needed to calculate aragonite saturation
- Increase scientific understanding of OA
  - Link physics and chemistry to biological effects
- Aid shellfish industry decisions through predictive modeling
  - Platform for data exchange and visualization
  - Describe spatial and temporal trends

Who Should Be Targeted?

- Three prospective user groups:
  - "Low" quality monitoring but high temporal coverage– e.g. Seattle Aquarium
  - "Moderate" quality monitoring – Waste Water Treatment Plants
  - "High" quality monitoring – Academic Research

C-CAN Subcommittees

- Carbon Chemistry
  - Propose parameters, means, and precision
- Biological Parameters
  - Propose parameters, means, and sampling frequency
- QA/QC
  - Propose methods, training, instrument evaluation, intercalibration
- Information Management
  - Propose data exchange and funding
- Existing Monitoring Inventory
  - Define capabilities available that meet proposed standards

Next Steps

- C-CAN committees continue to meet
  - SCCWRP is monitoring progress and recommendations
- C-CAN is serving as an template for an international monitoring effort
  - International OA monitoring network meeting scheduled for June 2012 in Seattle
  - SCCWRP will moderate
- SCCWRP continues to be a welcome participant
  - What is an appropriate level of involvement for SCCWRP?

Questions?