An update on the North American Coastal CARbon Synthesis (CCARS)

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OCB Summer Workshop 2015



Outline

- Historical perspective and motivation
- CCARS timeline
- 2014 final workshop
- Science plan

Global modeling of ocean C fluxes: Dunne et al. [2007]

Relative contribution of three depth regions



Changing view of aquatic systems in global C cycle (Regnier et al. 2013)



^{&#}x27;LUC' affected ecosystems

Important issues related to carbon cycling in the coastal zone

- Carbon sequestration
- Eutrophication
- Harmful algae
- Hypoxia
- Acidification
- Wetlands Loss
- Fisheries

Carbon is the <u>common</u> <u>currency</u> for describing many of these issues.

But understudied ...



Better constraints on coastal carbon cycle = better understanding of these issues.

A difficult problem ... boundaries are messy



Importance of coastal margins highlighted in several reports

An Implementation Strategy for U.S. Ocean Carbon Research

Science Implementation Strategy for the North American Carbon Program



U.S. Carbon and In

North American Carbo

Denning

(2002)







Doney (2004)

North American **Continental Margins**



A Synthesis and Planning Workshop

Hales et al. (2008)

Need improved estimates of "North American coastal ocean and continental margin air-sea fluxes, landocean and coastal open ocean exchange, and biogeochemical cycling ... in order to close the carbon budget over North America" (Doney, 2004)

CCARS timeline

- 2009 Initial Breakout at NACP Meeting
- 2010 NASA Community Workshop
- 2010-2012 Preliminary budgets published in OCB Newsletter issues
- 2012 East Coast Workshop + report (Najjar et al., 2012)
- 2013 Gulf of Mexico Workshop + report (Benway and Coble, 2014)
- 2014 West Coast Workshop
- 2014 Summer Synthesis Workshop
- 2015 Science Plan



Report of the Gulf of Mexico Coastal Carbon Synthesis Workshop





CCARS Community Workshop August 19-21, 2014 Woods Hole, MA

Goals:

- Present updated coastal carbon budgets
- Set future research priorities to guide science plan development

CCARS Workshop

- 58 participants
- 22 posters
- Presentation and breakouts on processes and regions
- Group discussion
- Science plan outline refinement, assignment of writing tasks
- http://www.whoi.edu/website/ccars

Overarching issues and strategic priorities

- Satellite algorithms (pCO₂, primary production, etc.)
- Models with observations
 - Mechanistic understanding of flux drivers
 - Link subdomains (wetland-estuary, shelf-open, etc.)
 - Key processes to resolve (benthic, submerged veg.)
- Sentinel sites may be a good approach to span coastal/estuarine typologies
- Tidal wetland / estuary exchange

Immediate Observing Needs

- Spatial:
 - Mexican and Canadian coastlines
 - Tidal wetland
- Temporal:
 - Winter (most regions)
 - Extreme events (autonomous technology)
- Respiration paired with primary production (all regions)
- Gas flux through ice (Arctic)
- Submerged aquatic vegetation (East coast, Gulf of Mexico)
- Inorganic and organic C system (Great Lakes)
- Carbon burial rates in sediments
- Groundwater fluxes (East coast, Gulf of Mexico)
- Satellite calibration / validation (Great Lakes)

Science plan

- Draft is 95% done!
- Community review to begin August 2015
- Finalized late fall 2015





References

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