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Arctic-Coastal Land Ocean Interactions

Project PIs:

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Coastal Land Ocean Interactions in the Arctic

Arctic-COLORS (Arctic-Coastal Land Ocean Interactions) *is a Field Campaign Scoping Study funded by NASA's Ocean Biology and Biogeochemistry Program*

➔ **Deliverable:** a comprehensive report to NASA outlining the major scientific questions, and developing the initial study design and implementation concept for this new campaign

➔ Focus on **coastal ocean processes** ***amenable to study by airborne or space-based assets.***

➔A needed **linkage** between field campaigns focusing on the Arctic open ocean environment (e.g. ICESCAPE, ArcticNET, TARA) and field activities focusing on Arctic river processes, chemistry and fluxes (e.g. ABoVE)

➔ **Overarching objective**: to better understand the impact of climate change on land-ocean processes in the Arctic Ocean and its effect on coastal ocean biology, biogeochemistry, biodiversity.

Critical Science and Societal Issues at high Northern Latitudes

1) Rapid warming/ melting on land and ocean. Expected to continue over the next century (Goetz et al, 2011)

1) More reduced carbon within a few meters of atmosphere than gaseous carbon in the present atmosphere (Tarnocai, et al, 2009)

1) Rapidly changing hydrology, and lateral carbon and nutrient fluxes

2) Changing dynamics of gas exchange on land and coastal waters (e.g. CH_4 : Bloom et al, 2010; CO_2: Else et al, 2008)

1) Human/ economic challenges (natural resource extraction, subsistence fishing and hunting, defense, shipping)

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Science Objectives:

1. Quantification of ***Arctic riverine fluxes of constituents with a significant impact on coastal biology, biodiversity, biogeochemistry****, and the processing rates of these constituents in coastal waters.*

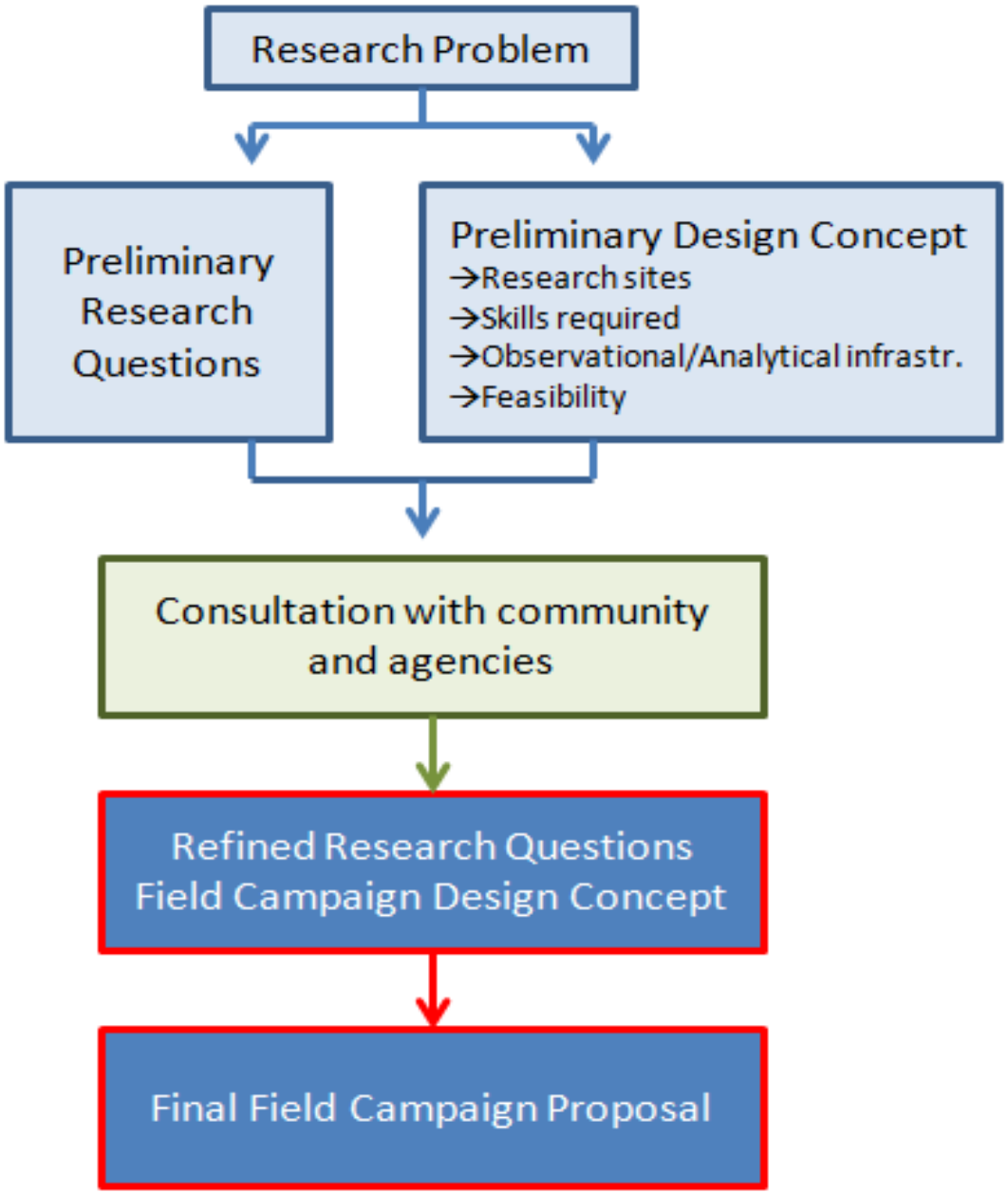
2. Evaluation of the ***impact of natural and anthropogenic forcing, such as the thawing of Arctic permafrost****, within the river basins. What are the cascading impacts to* ***coastal ecosystems*** *and* ***economic well being****?*

*3. Evaluation of the i****mpact*** *of* ***changing Arctic riverine, landfast and sea ice dynamics*** *on coastal ecosystems and biogeochemistry.*

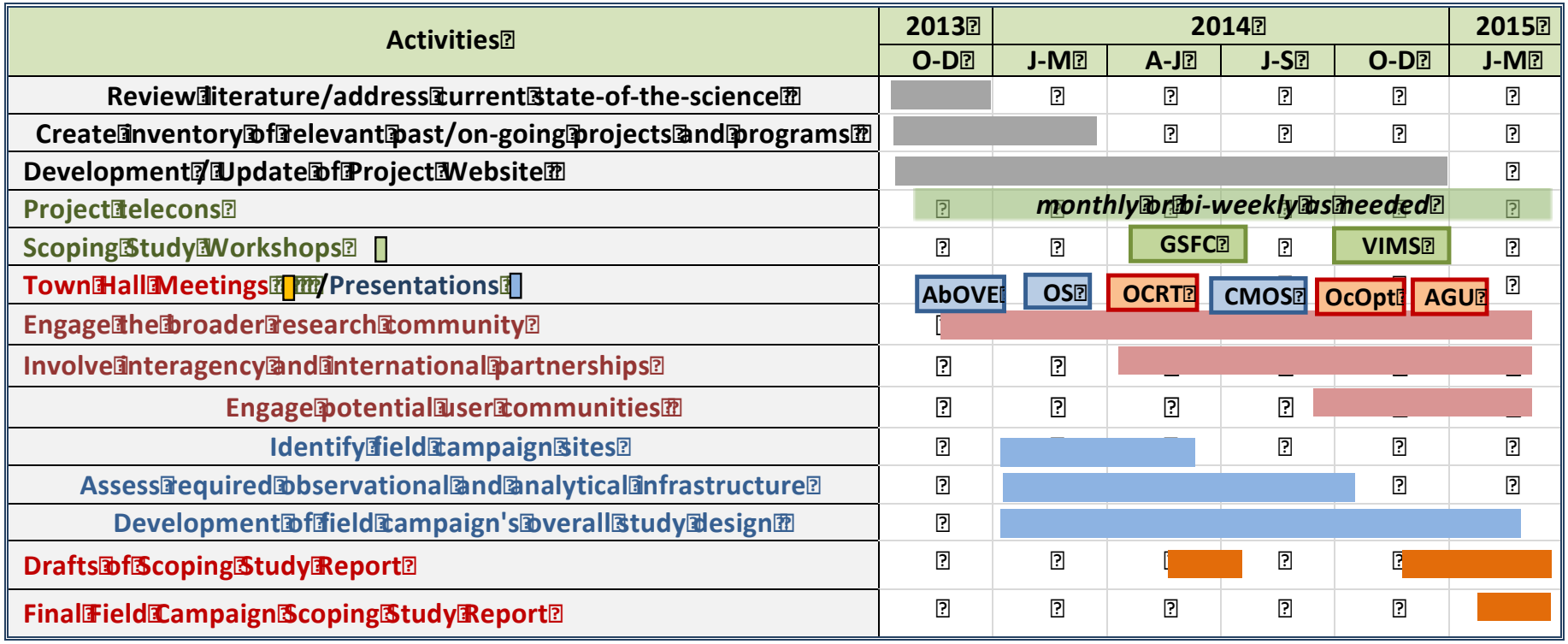
4. Establishment of ***baselines for comparison to future changes with model development*** *to assess the impacts of future changes on coastal ecosystems and biogeochemistry.*

Arctic – COLORS ROI Strawman

Arctic-COLORS Scoping study approach



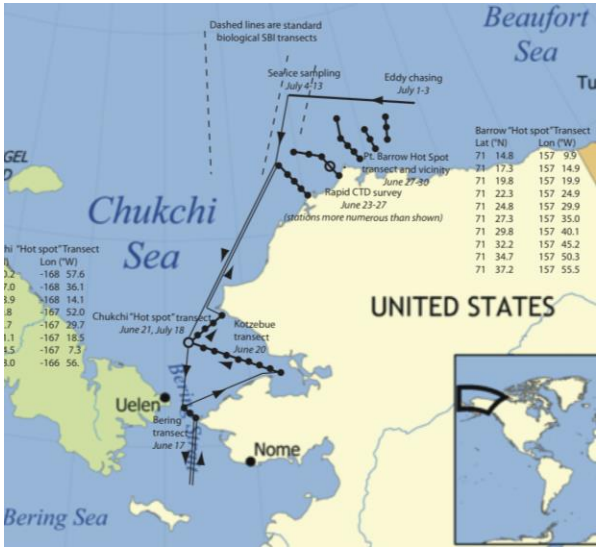
Arctic – COLORS Timeline



Potential linkages to previous field campaigns:

MALINA FIELD SEASON DURING 2009

NASA ICESCAPE: Impacts of Climate on Ecosystems and Chemistry of the Arctic Pacific Environment



"What is the impact of climate change on the biogeochemistry and ecology of the Chukchi and Beaufort seas?"

FIELD SEASONS DURING 2010 AND 2011

Potential linkages to present and developing field campaigns:

ArcticNet

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2004-2014 and beyond?

ArcticNet

ArcticNet is a Network of Centres of Excellence of Canada that brings together scientists and managers in the natural, human health and social sciences with their partners from Inuit organizations, northern communities, federal and provincial agencies and the private sector. The objective of ArcticNet is to study the impacts of climate change and modernization in the coastal Canadian Arctic. Over 145 ArcticNet researchers from 30 Canadian Universities, 8 federal and 11 provincial agencies and departments collaborate with research teams in Denmark, Finland, France, Greenland, Japan, Norway, Poland, Russia, Spain, Sweden, the United Kingdom and the USA.

Highlights

2011-2013 Annual Report
ArcticNet's multidisciplinary research program is addressing the challenges and opportunities facing the Canadian Arctic.

Arctic Inspiration Prize
The Prize recognizes teams who implement their Arctic knowledge into concrete actions to benefit the Canadian Arctic.

IRIS Report
IRIS 4: From Science to Policy in Nunavik and Nunatsiavut was launched in Kuujjuaq on 29 November 2012.

Quick Links

Safety Training Fund
2014 Amundsen Expedition
Schools on Board
Student Association
Photo Gallery
Research Projects Phase 3
Inuit Research Advisors
Polar Data Catalogue
ArcticNet Meetings
Billboard

Arctic Change 2014

ArcticNet and its national and international partners will welcome the Arctic research community to Ottawa for the International Arctic Change 2014 Conference from 8-12 December 2014.

ArcticNet

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2014 Amundsen Expedition

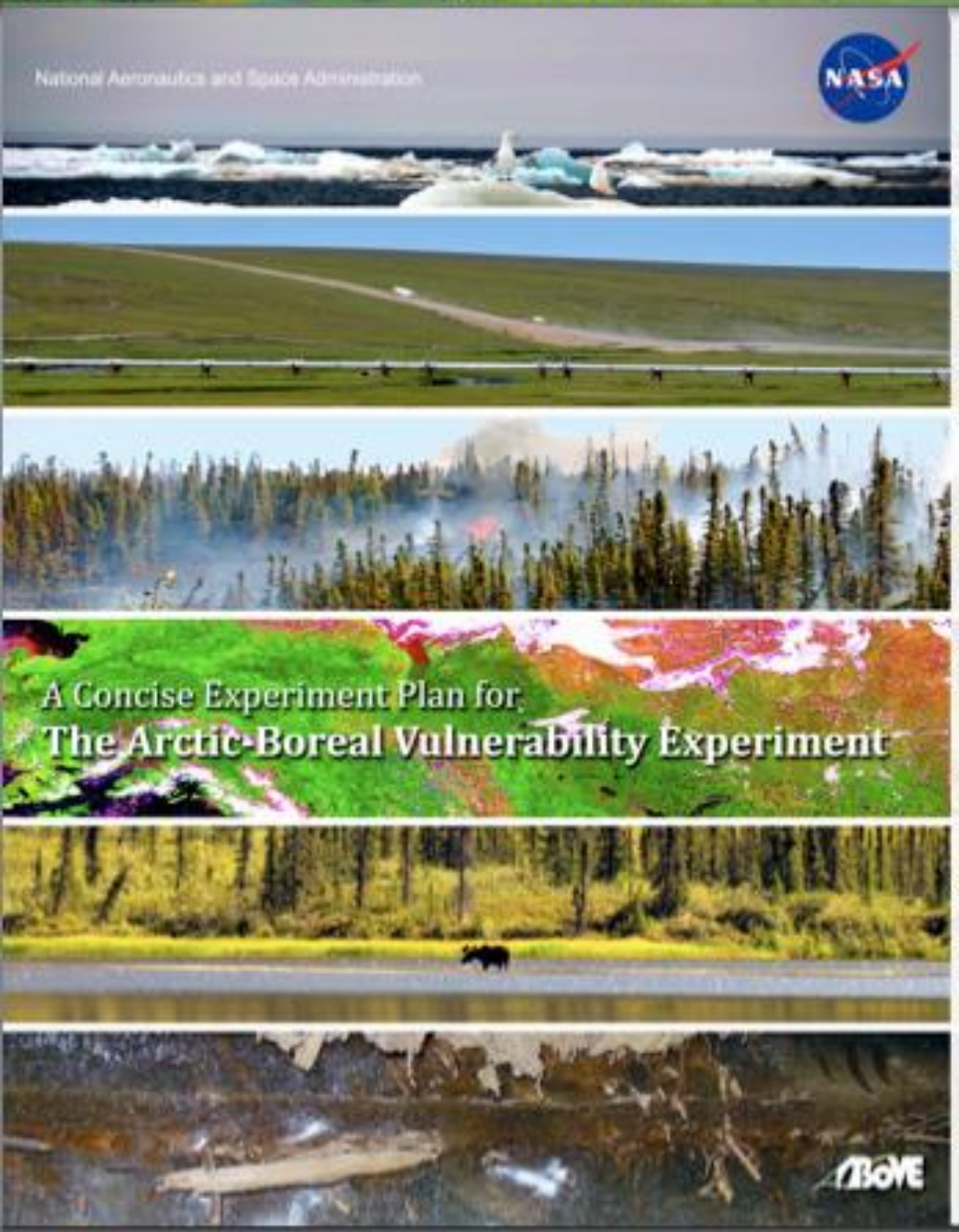
The CCGS *Amundsen* is one of the few Canadian Coast Guard ships to have a dual purpose. The Coast Guard maintains the infrastructure operational and available for science for up to 152 days of operations per year, over a period of 6 months from mid-May to mid-November. Special arrangements can also be negotiated with the Coast Guard to extend the availability of the CCGS *Amundsen* in a given year to accommodate circum-annual science programs in the Arctic. The Coast Guard uses the icebreaker for its own icebreaking/escort operations from December to Mid-April (141 days of operation).

2014 Schedule

On 08 July 2014 the CCGS *Amundsen* is scheduled to leave its home port of Quebec City for a 96-day journey to the Canadian Arctic in support of ArcticNet's marine-based research program, the ArcticNet-BREA program, NETCARE (Network on Climate and Aerosols) and a collaboration with researchers from the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) and the National Institute of Polar Research (NIPR). Based on the science objectives, the expedition has been divided into 5 separate segments:

Leg 1a - ArcticNet/NETCARE (08 - 24 July) Quebec City to Resolute
Leg 1b - ArcticNet (24 July - 14 August) Resolute to Kugluktuk
Leg 2a - ArcticNet/BREA (14 August - 9 September) Kugluktuk to Barrow, Alaska
Leg 2b - ArcticNet/Japanese (9 - 25 September) Barrow, Alaska to Kugluktuk
Leg 3 - ArcticNet (25 September - 12 October) Kugluktuk to Quebec City

Peter Griffith Chief Support Scientist



The Arctic-Boreal Vulnerability Experiment (ABoVE)

Science Definition Team (SDT) has refined their objectives and completed a Concise Experiment Plan.

Document now available at http://above.nasa.gov/acep.html? and open for comment through May 28, 2014.

NASA Terrestrial Ecology solicited ABoVE research in 2014 through NASA ROSES Appendix A.4 TERRESTRIAL ECOLOGY

Anticipated Field work begins in 2015

The Arctic-Boreal Vulnerability Experiment (ABoVE) INTERSECTING QUESTIONS

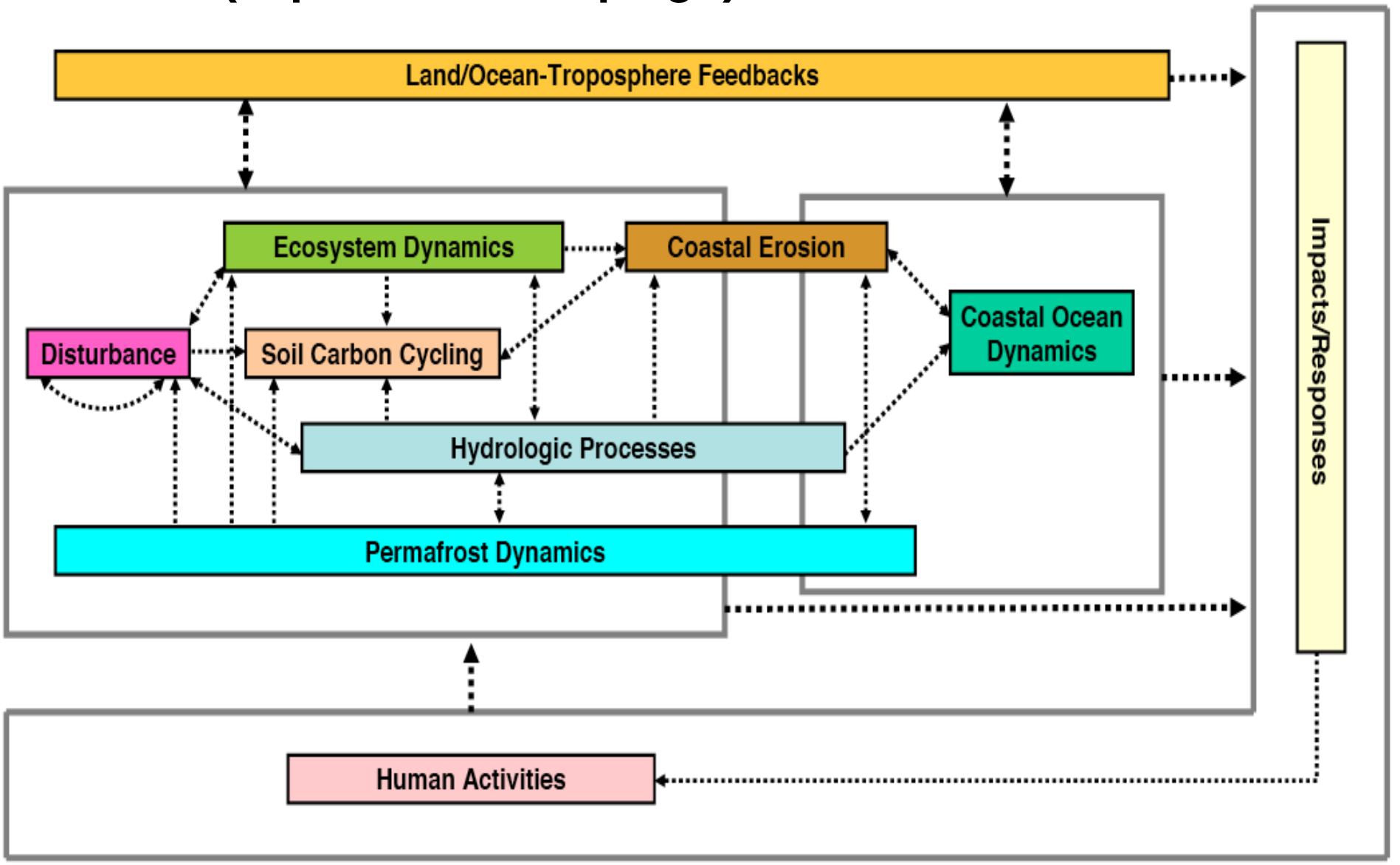
- How are environmental changes affecting critical **ecosystem services** - natural and cultural resources, human health, infrastructure, and climate regulation - and how are human societies responding?

- What are the causes and consequences of changes in the **hydrologic system**, specifically the amount, temporal distribution, and discharge of surface and subsurface water?

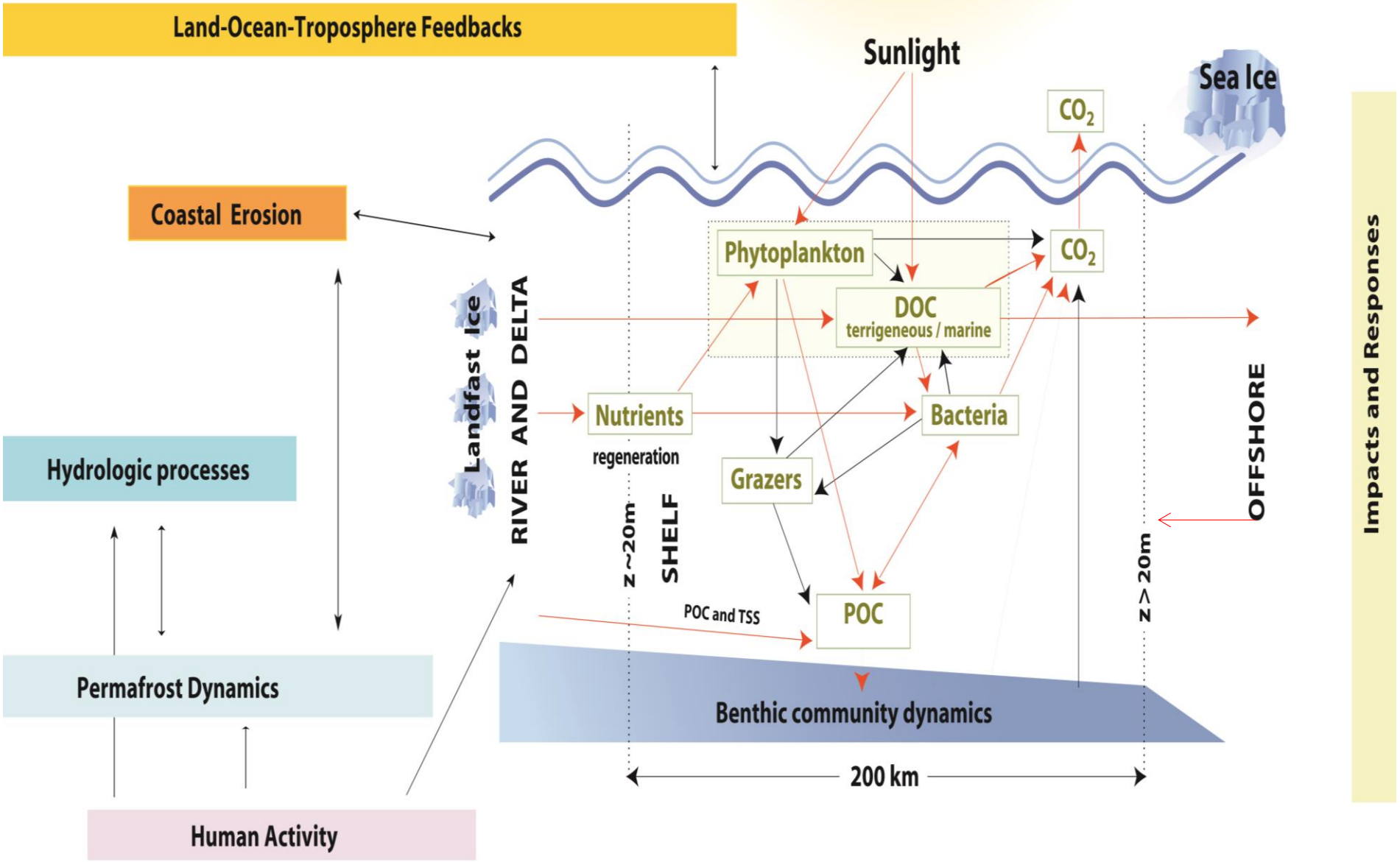
- How are the magnitudes, fates, and surface-atmosphere exchanges of **carbon pools** responding to environmental change, and what are the **biogeochemical** mechanisms driving these changes?

- What processes are contributing to changes in **disturbance regimes** and what are the impacts of these changes?

Key processes under study during the ABoVE (experiment/campaign)



Arctic-COLORS within the context of the ABoVE experiment



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Coastal Land Ocean Interactions in the Arctic

Name	Role	Expertise
Carlos Del Castillo	Co-PI	Ocean optics; CDOM & DOC river fluxes; DOM biogeochemistry
Marjorie Friedrichs	Co-PI	Coupled physical-biogeochemical modeling; data assimiliation; remote sensing of primary productivity
Peter Hernes	Co-PI	River and coastal biogeochemistry, organic biomarkers, land-water interactions; CDOM photochemistry
Antonio Mannino	Co-PI	Coastal C cycling; CDOM and DOM biogeochemistry; ocean color remote sensing; estuarine biogeochemical processes
Patricia Matrai	Co-PI	Arctic air-sea- sea ice exchange of gases and biogenic aerosols; Arctic primary production
Joseph Salisbury	Co-PI	Coastal DIC processes; land-ocean interactions; remote sensing
Maria Tzorziou	Co-PI	Estuarine and coastal biogeochemistry, land/ocean/atmosphere interactions, remote sensing, optics
Marcel Babin	Collab.	Ocean optics; Arctic biomass production; remote sensing of ocean color; lead for MALINA expedition in Beaufort Sea
Emmanuel Boss	Collab.	Ocean optics; on-going field activities in the Arctic
Eddy Carmack	Collab.	Climate; coastal runoff influences regional ocean circulation and climate
Lee Cooper	Collab.	Arctic Ocean OM biogeochemistry; stable & radioisotopes; SBI PI
Jerome Fiechter	Collab.	Coupled physical-biogeochemical modeling; Gulf of Alaska
Joaquim Goes	Collab.	Phytoplankton physiology & productivity; Bering Sea; climate change
Lawrence Hamilton	Collab.	Arctic human dimension; social-environmental interactions

http://arctic-colors.gsfc.nasa.gov.

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Coastal Land Ocean Interactions in the Arctic

Name	Role	Expertise
David Kirchman	Collab.	Microbial Ecology including Arctic Ocean
Richard Lammers	Collab.	Arctic hydrology and meteorology
	Collab.	
Diane Lavoie	Collab.	Model climate change impacts on PP & C fluxes in Canadian Arctic
Bonnie Light	Collab.	Radiative transfer in ice & snow, optical & structural properties of Arctic sea ice, and laboratory and field investigations of ice physics
Jeremy Mathis	Collab.	Arctic region air-sea fluxes of CO2; ocean acidification
James McClelland	Collab.	Arctic land-sea coupling/coastal ecosystem dynamics
Donald McLennan	Collab.	Arctic land-sea coupling coastal ecosystem dynamics
Paul Overduin	Collab.	Permafrost, terrestrial and submarine; Coastal geomorphodynamics
Michael Rawlins	Collab.	Arctic meteorology; climate models; ABoVE SDT member
Michael Steele	Collab.	Arctic freshwater export; physical oceanography
Robert Striegl	Collab.	River carbon chemistry – Yukon; ABoVE SDT member
James Syvitski	Collab.	Rivers, deltas, estuaries, particle dynamics, sediment transport & stratigraphy
Suzanne Tank	Collab.	Ecology & Biogeochemistry at land-river-ocean interface in Canadian Arctic

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For further discussions:

Come to the session on May 6th in the Maple Room the first ½ hour of lunch break

More information
Feedback
Ideas

http://neptune.gsfc.nasa.gov/osb/index.php?section=279
http://arctic-colors.gsfc.nasa.gov.