

International Workshop to Reconcile Northern Permafrost Region Methane Budgets

7-9 March 2017, Seattle, WA

Hyatt at Olive 8, 1635 8th Avenue, Seattle, WA 98101

Sponsors: National Aeronautics and Space Administration (NASA), U.S. Geological Survey (USGS), the U.S. Arctic Research Commission (USARC), and the Study of Environmental Arctic Change (SEARCH)

SCIENTIFIC BACKGROUND:

The Arctic Monitoring and Assessment Program (AMAP) carbon assessment published in 2009 highlighted the disparity in methane emissions estimated by extrapolating data from wetlands, lakes, and coastal waters underlain by permafrost (32 to 112 Tg CH₄ yr⁻¹) and estimates based on spatial and temporal variability of atmospheric methane concentrations (15 to 50 Tg CH₄ yr⁻¹). This difference between bottom-up scaling and top-down estimates has not been reduced in the most recent assessment of methane in the Arctic published by AMAP in 2015. Bottom-up estimates from lakes are thought to be confounded with those of wetlands, and it is important to better distinguish those estimates. At the same time, the amount of methane being emitted from submarine permafrost in the Arctic Ocean and its marginal seas is poorly quantified. Nor do we adequately understand the relative contributions of microbes (i.e., biogenic methanogenesis), fossil sources, and the dissociation of gas hydrates (an ice-like substance formed by methane and water under pressure). The issue of how much methane comes from fossil sources crosses both onshore and marine environments of the permafrost region and includes both natural sources and losses of methane from oil and gas exploration and transport. Top-down estimates of methane emissions from the permafrost region also are highly uncertain, but substantial progress has recently been made by the NASA Carbon in Arctic Reservoirs Vulnerability Experiment (CARVE) campaign in quantifying methane budgets and trends in Alaska. There is an urgent need to better reconcile bottom-up estimates with atmospheric estimates of methane emissions.

WORKSHOP OBJECTIVES:

- (1) Communicate the state of the science among the three methane synthesis groups;
- (2) Communicate the synthesis plans of each group and progress made to date;
- (3) Identify potential connections to sea ice and land ice;
- (4) Refine synthesis plans based on workshop discussions;
- (5) Identify a plan for developing an overall synthesis of methane budgets in the region; and
- (6) Develop a plan for communicating results of workshop to stakeholders.

PROPOSED WORKSHOP PRODUCTS:

- (1) A meeting report in *EOS*, the weekly newsletter of the American Geophysical Union;
- (2) Refined plans for synthesis by each of the three groups;
- (3) A plan for developing an integrated synthesis of methane budgets for the northern permafrost region; and
- (4) Execute the plan for communicating results of the workshop to stakeholders.

AGENDA ORGANIZING COMMITTEE:

David McGuire, Co-Lead
Brendan Kelly, Co-Lead
Henry Huntington, Facilitator
Chip Miller, Atmospheric Component
Lori Bruhwiler, Atmospheric Component
David Olefeldt, Land Component
Merritt Turetsky, Land Component
Jennifer Frederick, Coastal/Ocean Component
Robie Macdonald, Coastal/Ocean Component
(with input from Lisa Sheffield Guy and Helen Wiggins)

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Day 1 Agenda

Tuesday, 7 March 2017

Location: Hyatt at Olive 8, Azure room

AM

Breakfast on your own

- 8:30-9:00 Welcome, Introductions, Logistics, Objectives, Products:
Dave McGuire/Brendan Kelly/Henry Huntington/Lisa Sheffield Guy
- 9:00-9:10 Brett Thornton: Top-down vs. Bottom-up Discrepancies
- 9:10-9:30 General Discussion of Workshop Objectives and Products: Dave McGuire/Brendan Kelly
- 9:30-9:40 Overview of the Atmospheric Component: Lori Bruhwiler and Chip Miller, Moderators
- 9:40-9:50 Scot Miller: Inversions for the North America Arctic-Boreal Region
- 9:50-10:00 Colm Sweeney: Airborne and Tower Measurement Perspectives
- 10:00-10:10 Thibaud Thonat: LSCE Research on CH₄ Dynamics in the Arctic
- 10:10-10:30 Discussion: Henry Huntington, Chip Miller, and Lori Bruhwiler
- 10:30-11:00 Coffee Break (Azure foyer)
- 11:00-11:10 Overview of the Coastal/Ocean Component: Jennifer Frederick, Moderator
- 11:10-11:20 Igor Semiletov: Coastal Siberia Perspectives
- 11:20-11:30 John Pohlman: Beaufort Sea Perspectives
- 11:30-11:40 Ellen Damm: Sea Ice Perspectives
- 11:40-12:00 Discussion: Henry Huntington and Jennifer Frederick

PM

- 12:00-1:30 Lunch on your own
- 1:30-1:40 Overview of the Land Component: David Olefeldt, Moderator
- 1:40-1:50 Jennifer Watts: Dynamic Ecosystem Regulation of Northern Wetland CH₄ Flux
- 1:50-2:00 Torsten Sachs: Scaling Challenges in Heterogeneous Landscapes
- 2:00-2:10 David Bastviken: Lake/Wetland Scaling Challenges
- 2:10-2:30 Discussion: Henry Huntington and David Olefeldt
- 2:30-2:40 Role of Remote Sensing in Reconciling Methane Budgets: Chip Miller, Moderator
- 2:40-2:50 Colin Gleason: Overview of Surface Water Ocean Tomography (SWOT) Mission
- 2:50-3:00 Lesley Ott: Pan-Arctic Inversions Using Satellite Data
- 3:00-3:10 Anthony Bloom: Remote Sensing Constraints on North Wetland CH₄ Process Uncertainty
- 3:10-3:30 Discussion of the Role of Remote Sensing: Henry Huntington and Chip Miller
- 3:30-4:00 Coffee Break (Azure foyer)
- 4:00-4:10 Strategy Towards an Overall Synthesis: Dave McGuire
- 4:10-4:20 Initial Plans for Synthesis: Atmospheric Component: Chip Miller and Lori Bruhwiler
- 4:20-4:30 Initial Plans for Synthesis: Land Component: David Olefeldt
- 4:30-4:40 Initial Plans for Synthesis: Coastal/Ocean Component: Jennifer Frederick
- 4:40-5:00 General Discussion of Strategy Towards and Overall Synthesis: Henry Huntington
- 5:00-5:30 General Discussion of Day 2 Agenda: Dave McGuire and Henry Huntington
- 5:30-7:00 Session for other attendees to briefly present their research (light snacks and cash bar)
- 7:00 Adjourn (dinner on your own)

Day 2 Agenda: Wednesday, 8 March 2017

Location: Hyatt at Olive 8, Azure room

AM

Breakfast on your own

- 8:30-9:00 Day 2 Organization (Refining Plans for Synthesis): Dave McGuire and Henry Huntington
- 9:00-10:30 Breakout Discussions (separate groups for Atmospheric, Land, and Coastal/Ocean Components; to address individual and overall syntheses): Chip Miller/Lori Bruhwiler, David Olefeldt, and Jennifer Frederick
- 10:30-11:00 Coffee Break (Azure foyer; check whether enough progress has been made to shift the summaries into the remainder of the morning)
- 11:00-11:45 Continue Breakout Discussions if necessary (or present summaries of breakouts)
- 11:45-12:00 Quick Check on Progress of Breakout Discussions (or discussion of afternoon agenda)

PM

12:00-1:30 Lunch on your own

(Plan for 1:30 to 3:00 pm assumes breakout summaries were not presented in the morning. If breakout summaries have been presented in the morning, the plan is to use the time for between group discussions.)

- 1:30-1:40 Summary of Atmospheric Component Discussion/Plans: Chip Miller/Lori Bruhwiler
- 1:40-1:50 Summary of Land Component Discussion/Plans: David Olefeldt
- 1:50-2:00 Summary of Coastal/Ocean Component Discussion/Plans: Jennifer Frederick
- 2:00- 3:00 General Discussion of Plans to Develop an Overall Synthesis
- 3:00-3:30 Coffee Break (Azure foyer)
- 3:30-4:00 General Discussion of Connections to Sea Ice: TBD (Brendan Kelly)
- 4:00-4:30 General Discussion of Connections to Land Ice: TBD (Brendan Kelly)
- 4:30-5:00 General Discussion of Day 3 Agenda: Dave McGuire and Henry Huntington
- 5:00 Adjourn
- 7:00 Group Dinner at Wild Ginger

Day 3 Agenda: Thursday, 9 March 2017

Location: Hyatt at Olive 8, Azure room

AM

Breakfast on your own

8:30-9:00 Potential Ties to the Global Carbon Project Methane Budget Analysis: Rob Jackson

9:00-10:30 Planning the Development of the Overall Synthesis:
Dave McGuire and Henry Huntington

10:30-11:00 Coffee Break (Azure foyer)

11:00-12:00 Discussion of Next Steps, Timelines, and Deliverables: Dave McGuire

12:00 Adjourn (lunch on your own)

PM

12:00-1:00 Lunch for Organizing Committee at Urbane Restaurant

1:00-3:00 Debriefing and Discussion among Organizing Committee