Q-Arctic annual project meeting 2022

Our ERC-synergy project Q-Arctic (https://q-arctic.net/) started one year ago in October 2021. Q-ARCTIC plans to establish a next generation coupled land-surface model for the Arctic permafrost domain. The aim is to explicitly resolve highest resolution landscape features and disturbance processes in the Arctic: Model development will be informed by novel remote sensing methodologies linking landscape characteristics and change potential at an exceptional level of detail. Interdisciplinary observations at multiple spatiotemporal scales will deliver novel insight into permafrost carbon cycle processes.

Our first general assembly, to be held in Jena in November 2022, will focus on discussing future collaboration options with external project partners. The hybrid workshop will first give all participants the opportunity to report on their recent activities and future plans in relevant research fields. Subsequently, we will discuss common objectives, strategies for collaboration, and how to best divide up the related tasks. This will first be organized in two rounds of breakout sessions, and then in plenary on the final workshop day.

Workshop time and place

- Time: Nov 14 – 16, 2022 (Mon – Wed, noon to noon)
- Where: Max Planck Institute for Biogeochemistry, Jena, Germany (auditorium)

Detailed scientific targets

Process modeling

Overarching: Discuss approaches for high-resolution modeling of Arctic domains using offline land surface models and ESMs.

1. High resolution modeling: what do we learn from regional case studies?
2. Data structure and data flow: What is the optimized setup for land surface models adapted to processes in the Arctic. What additional/refined input datasets will be required to inform a next-generation, very high-resolution model?
3. Conceptual advance: development of sub-grid scale hydrology for the permafrost region
4. Coupled modelling: feedbacks from land surface to the atmosphere – what is missing?
5. Statistical modeling approaches on few meter scale (e.g. thermokarst lakes) – scale which we will never get right on tile level

In-situ observations

Overarching: Develop strategies how the currently available Arctic-Boreal observational database, across measurement techniques, can be optimally synthesized to maximize information gain.

1. Ongoing efforts: What databases already exist that are generally available? Which group is underway of compiling new databases, with what specific target?
2. Planned efforts: What are databasing goals in the near future within the groups participating in the discussion? Are other efforts known that are relevant?
3. Collaboration strategies: Is there interest in combining efforts? How could the task of synthesizing data be shared between groups?
4. Ownership, user-rights: What aspects would need to be considered when aiming at building up databases that are supposed to be shared between groups, and eventually with the wider community?
5. Observation gaps: Can we merge efforts to close critical gaps in current databases, and enhance the representativeness of the existing observational networks?

Remote sensing

Overarching: Advancing circumpolar monitoring, contributing to and benefitting from community efforts

1. Review of focus sites: What are representative regions/sites for calibration and validation? What are site priorities from the side of modeling and in situ components?
2. Collaboration with drone observations: what is by now available internal/external? What are further plans, specifically type of observations? What is the utility of these data for satellite retrievals?
3. Contribution to/building on synthesis activities: What can we build on from other activities, especially the IPA synthesis activity on drained lake basins (DLB)? Could we contribute to a next level/phase of the DLB synthesis?
4. Synchronizing retrievals at circumpolar scale with external activities, especially AWI, Permafrost discovery gateway, Woodwell, Permafrost_cci
5. Further networking: What can we contribute to AMPAC, specifically wetland benchmarking and data collection? How can we benefit from AMPAC?

The Q-Arctic PIs are looking forward to your contributions to this workshop!

Annett Bartsch, Victor Brovkin, Martin Heimann, Mathias Göckede

Agenda (all times in CET)

Workshop day 1: Monday, November 14 (all plenary sessions)

1:00 – 1:10 pm: Mathias Göckede, MPI-BGC: Workshop introduction (Overall objectives, organization, virtual access)

1:10 – 1:40 pm: Mathias Göckede, MPI-BGC: Overview presentation Q-Arctic project

1:40 – 2:00 pm: Tobias Stacke, MPI-M: Very high-resolution simulations: added value and challenges of a global high-resolution model

2:00 – 2:20 pm: Meike Schickhoff, MPI-M: High-resolution modelling: what do we learn from the Chersky case study?

2:20 – 2:40 pm: Philipp de Vrese, MPI-M: Land-atmosphere interactions in JSBACH: development of sub-grid scale hydrology for the permafrost region

2:40 – 3:10 pm: COFFEE BREAK

3:10 – 3:30 pm: Helena Bergstedt, b.geos: Mapping drained lake basins in permafrost lowlands on a circumpolar scale

3:30 – 3:50 pm: Jan Nitzbon, Moritz Langer, AWI: Modeling permafrost evolution accounting for subgrid thermos-hydrologic processes and uncertain ground properties and ice contents

3:50 – 4:10 pm: Torsten Sachs, GFZ: Ground-based and airborne eddy covariance measurements of Arctic CH_4 fluxes

4:10 – 4:30 pm: SHORT BREAK, ZOOM SETUP

4:30 – 4:50 pm: Fabrice Lacroix, Univ. Bern: Modeling the high-latitude nitrogen feedback in QUINCY

4:50 – 5:10 pm: Gabriel Hould Gosselin, Univ. Montreal: From microbiology to fluxes: a nested measurement program in the forest-tundra ecotone of northwestern Canada

5:10 – 5:30 pm: David Olefeld, McKenzie Kuhn, Univ. Alberta: Boreal-Arctic Wetland and Lake Dataset (BAWLD): a methane-centric land cover classification and flux scaling approach for estimating current and future methane emissions

5:30 – 5:50 pm: Brendan Rogers, WCRC: Permafrost Pathways: Connecting science, people, and policy for Arctic justice and global climate

5:50 – 6:10 pm: Ted Schuur, NAU: Permafrost and Climate Change: Carbon Cycle Feedback from the Warming Arctic

6:10 – 6:20 pm: Mathias Göckede, MPI-BGC: wrap-up, outlook for 2nd workshop day

7p – 9:00 pm: Joint workshop dinner at Jena downtown location

9:00 – 9:30 pm: Martin Heimann, MPI-BGC: Arctic climate change perspectives

Workshop day 2: Tuesday, November 15 (morning: plenary; afternoon: breakouts)

9:00 – 10:30am: Plenary discussion: Summarize overview presentations from Monday. What actions are needed for maximizing synergy effects between ongoing projects, and disciplines? In preparation of breakout discussions: What are our common goals as a community, how can we divide up the tasks?

10:30 – 11 am: COFFEE BREAK

11:00 – 11:30 am: Annett Bartsch, b.geos: Overview on remote sensing activities within the context of Permafrost_CCI & AMPAC-Net

11:30 – 12:00 pm: Guido Grosse, AWI: Permafrost region disturbance monitoring with high temporal resolution optical image time series on continental to panarctic scales

12:00 – 12:30 pm: Anna Virkkala, WCRC: Arctic-boreal carbon flux network expansion, synthesis, and upscaling

12:30 pm: Group photo

12:30 – 1:30 pm: LUNCH BREAK

1:30 – 2:00 pm: Victor Brovkin, MPI-M: Challenges of closing the scaling gap in Q-ARCTIC

2:00 – 2:30 pm: Eleanor Burke, UK Met Office: Permafrost modelling for RECCAP2 and ISIMIP

2:30 – 2:40 pm: BREAK (switch to breakout rooms)

2:40 – 4:00 pm: FIRST PARALLEL BREAKOUT SESSION

1.) Highest resolution land-surface modeling – conceptual and technical challenges
2.) In-situ and remote sensing observations at high Northern Latitudes – coordination of efforts to close data gaps, and build databases

4:00 – 4:40 pm: COFFEE BREAK (switch to breakout rooms)

4:40 – 6:00 pm: SECOND PARALLEL BREAKOUT SESSION

3.) Aquatic processes in permafrost ecosystems – knowledge gaps, observational data, and integration into process models
4.) Arctic and Boreal disturbance processes – integration of observational data into models, need for new information
5.) Bridging scales – strategies to link small-scale, process-based information to studies integrating across regional scales

6:30pm – late: Joint workshop dinner

Workshop day 3: Wednesday, November 16

9 – 10:30 am: Reports and discussion of breakout sessions from previous day

10:30 – 11am: COFFEE BREAK

11am – 12:30am: Plenary discussion on next steps:
- Synergy between disciplines
- Follow-up activities
- further, targeted workshops
- communication strategies to keep discussions active among groups
- task assignments for working groups