

Physical and biogeochemical controls on lake carbon gas emissions in spring

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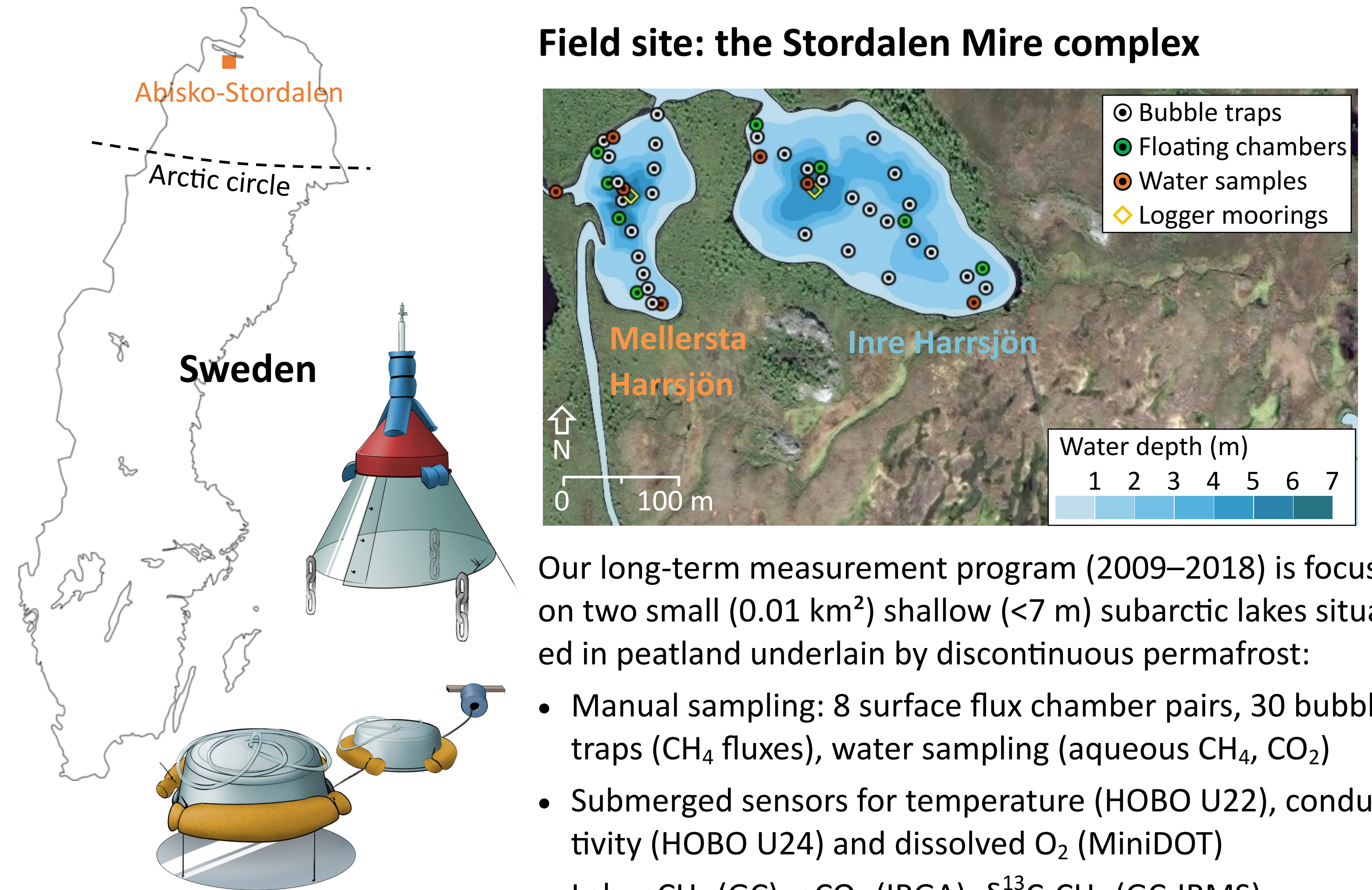
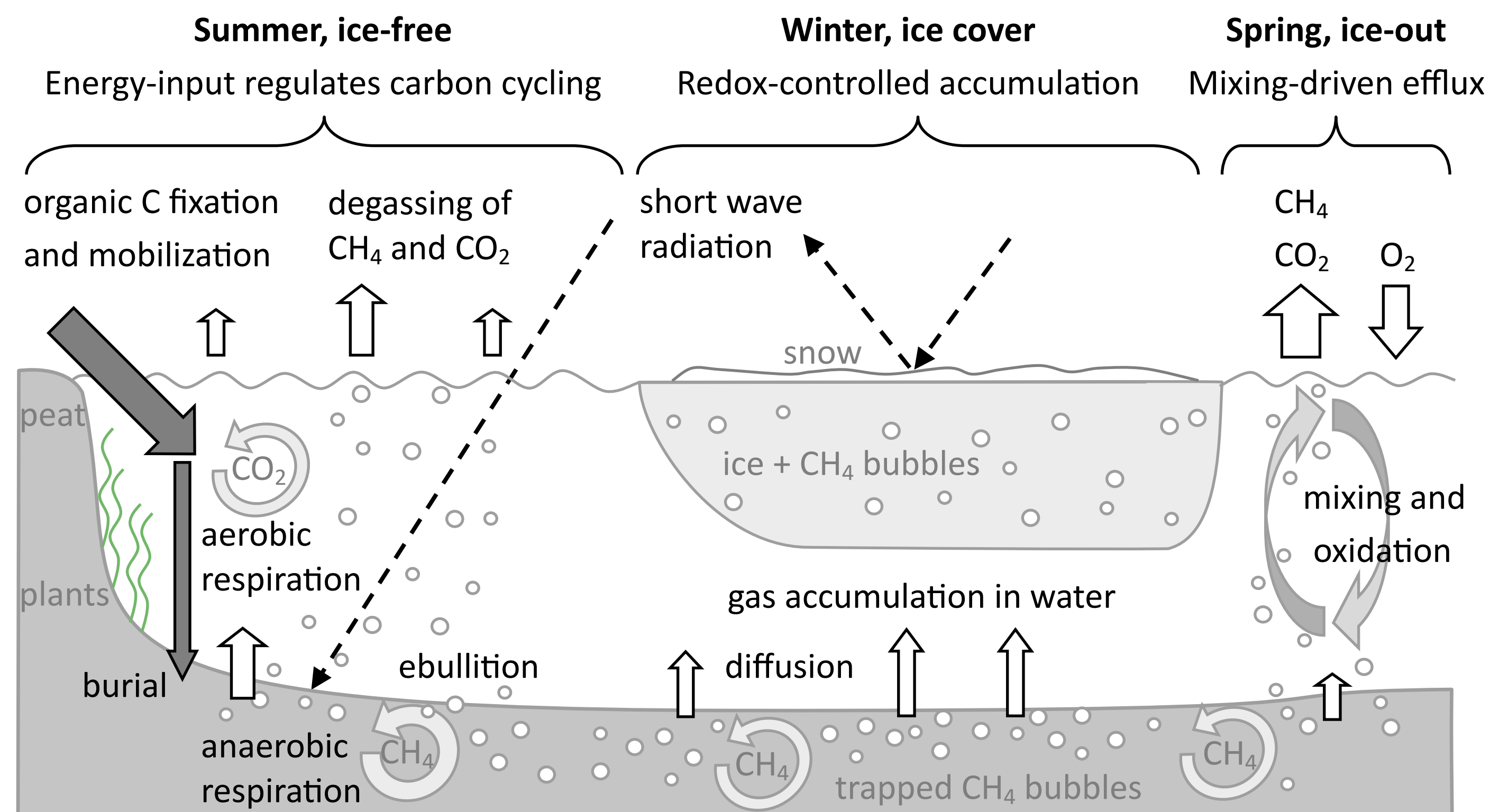
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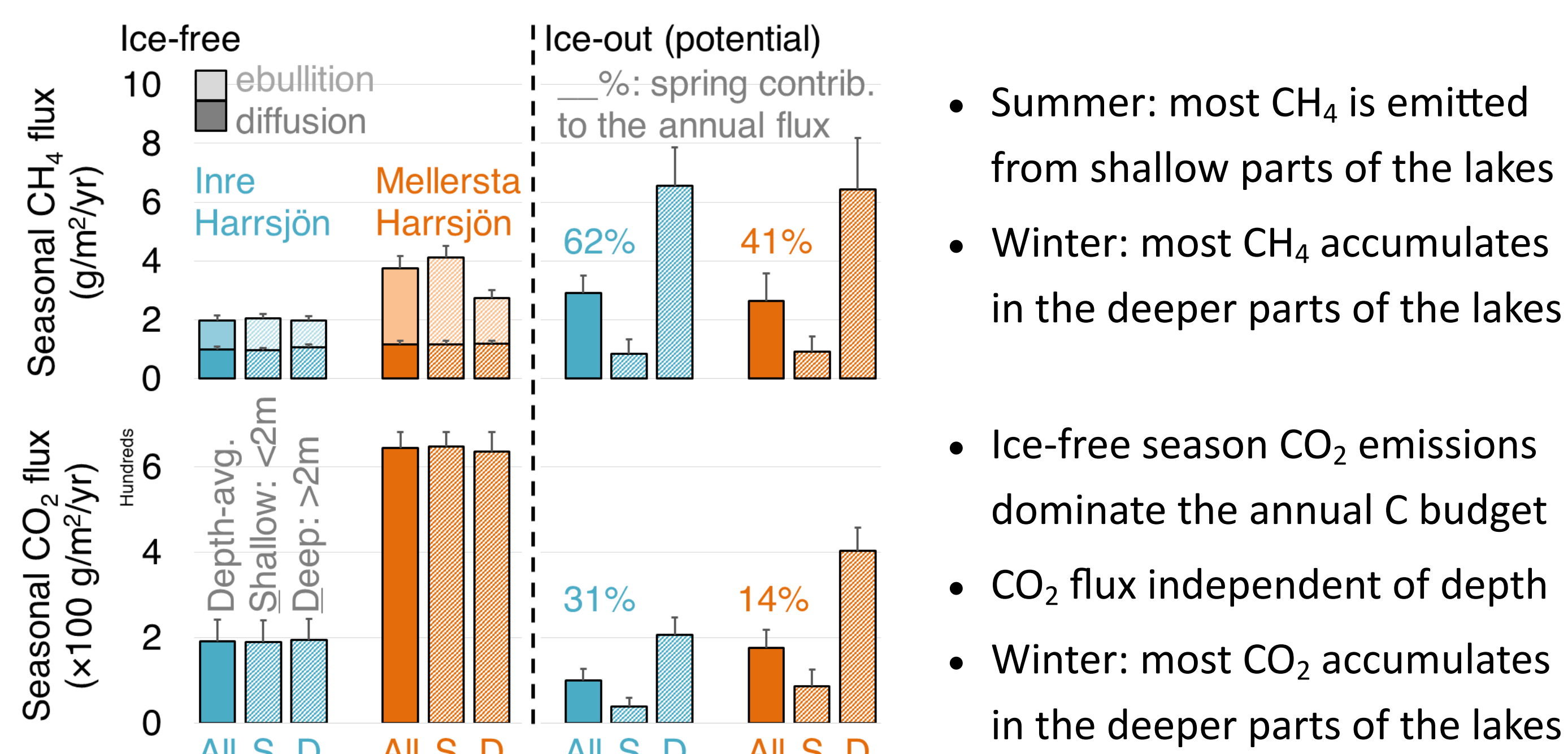
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Quantifying climate forcing trace gas emissions from subarctic lakes

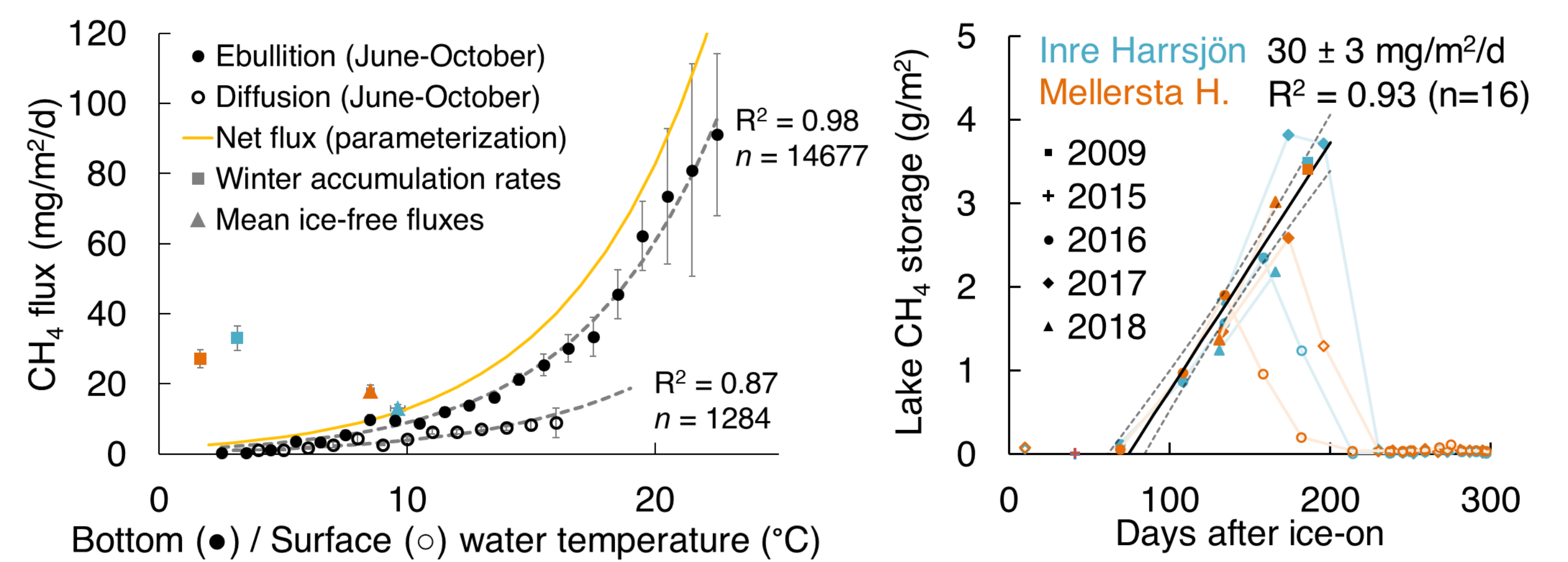
Northern lakes are an important source of radiatively active trace gases methane (CH₄) and carbon dioxide (CO₂) to the atmosphere. Significant emissions can occur in spring, but limited data has led to poor representation in regional budgets. Here we present a detailed study of winter and spring C dynamics for two subarctic lakes.



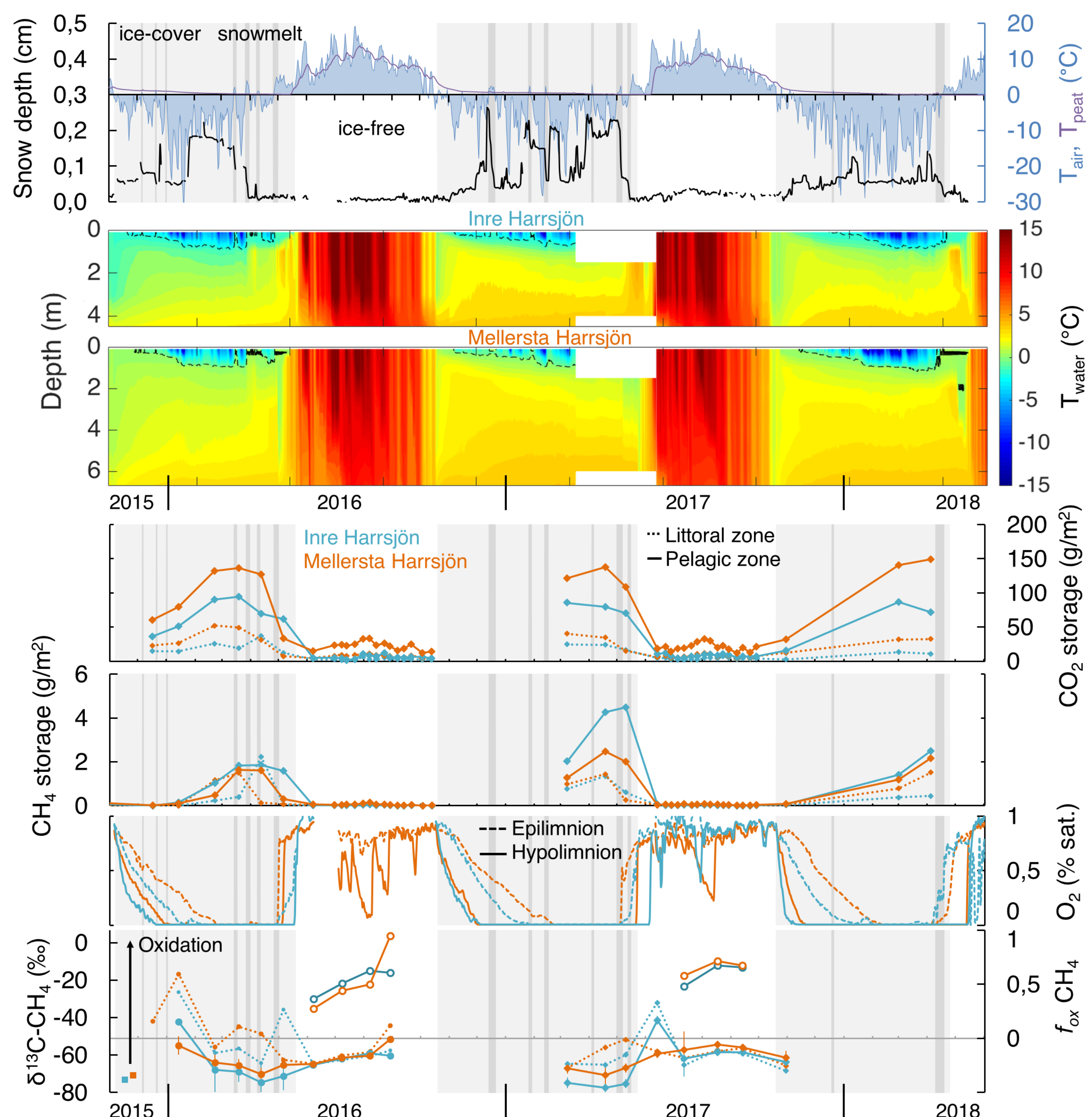
A significant part of annual lake C emissions takes place in spring:



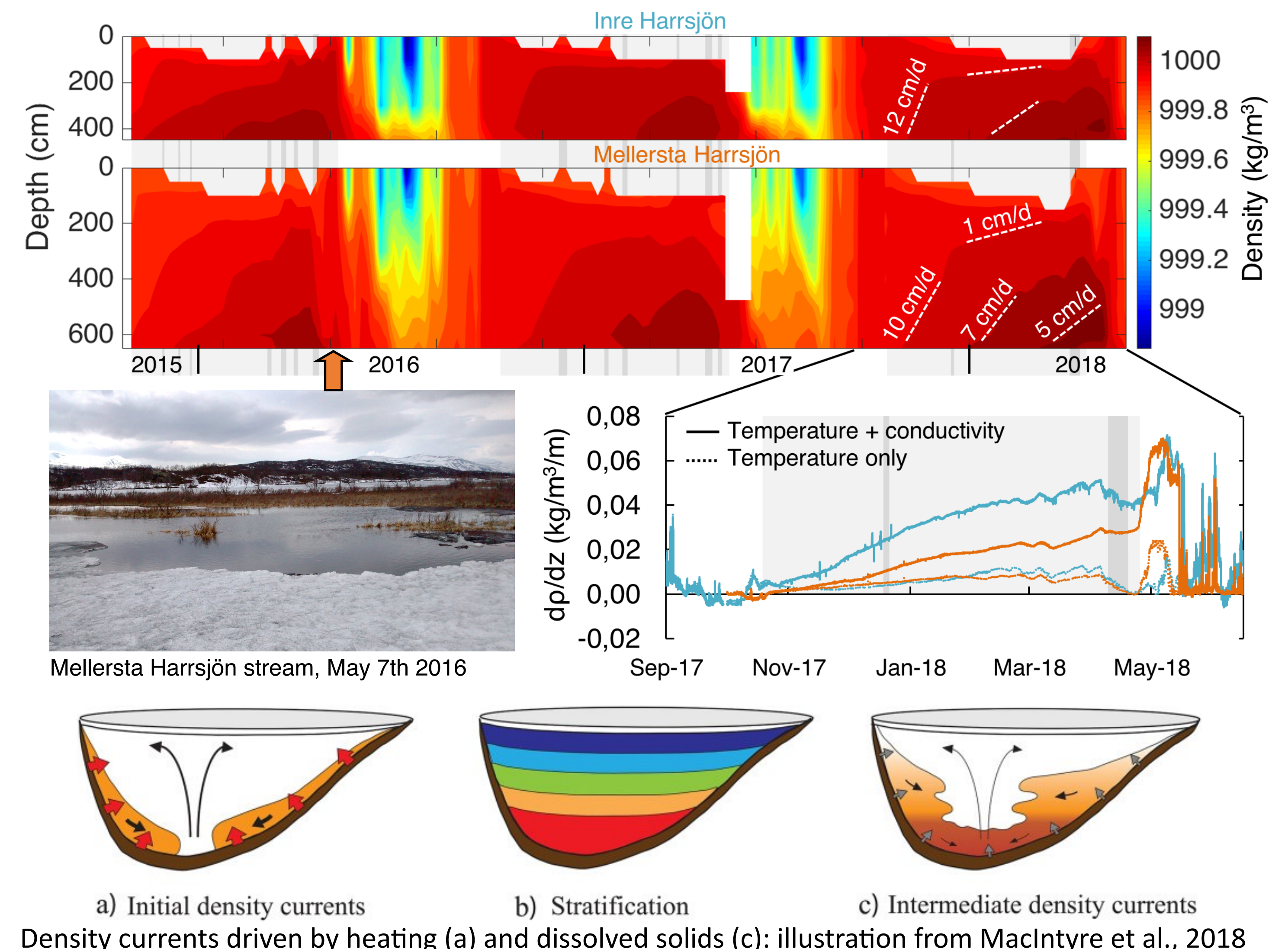
Predictors differ for CH₄ emission (ice-free) and storage (ice-cover):



Substantial accumulation of CO₂ and CH₄ at the lake deepest points:

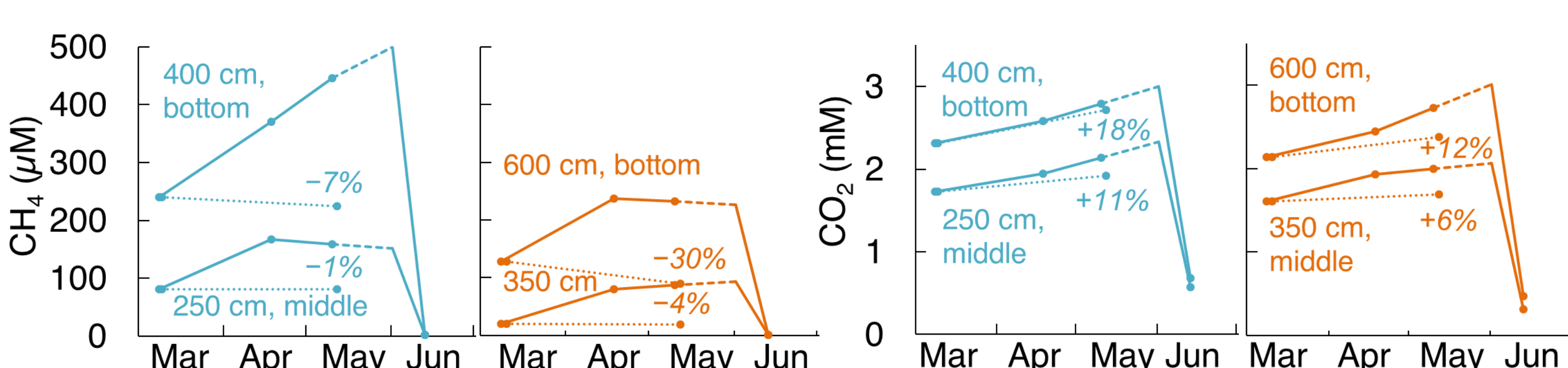


Dissolved solids and snowmelt events control winter stratification:



- Upward motion of isopycnals suggests density currents drive under-ice circulation
- At ice-off, stratification is almost entirely due to accumulated dissolved solids
- Snowmelt events can oxygenate part of the water column before ice-off
- What fraction of accumulated CH₄ is microbially oxidized in spring?
- How will shorter ice-cover seasons affect C gas emissions from northern lakes?

No evidence for water column methanogenesis under ice:



References

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