A wide-angle photograph of an Arctic landscape. In the foreground, there is a calm body of water with a dark blue-grey hue. In the middle ground, a range of low, rugged mountains or hills stretches across the horizon, their peaks partially covered in snow or ice. The sky above is filled with heavy, grey clouds, creating a somber and atmospheric scene. The overall color palette is dominated by blues, greys, and whites.

# Observing and simulating diapycnal mixing in the Canadian Arctic Archipelago

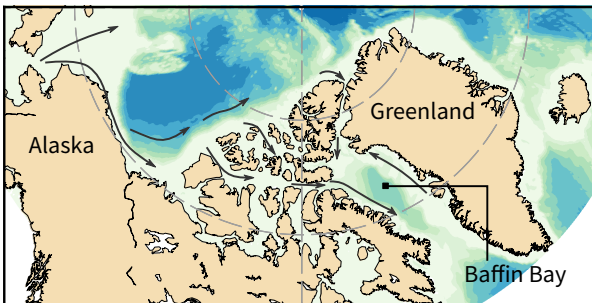
**Ken Hughes,<sup>1</sup> Jody Klymak,<sup>1</sup>  
Xianmin Hu,<sup>2</sup> Paul Myers,<sup>2</sup>  
Bill Williams,<sup>3</sup> Humfrey Melling<sup>3</sup>**

<sup>1</sup>University of Victoria,

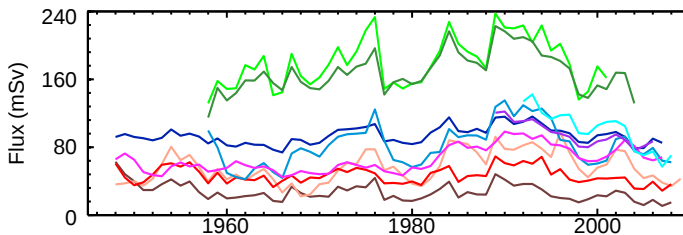
<sup>2</sup>University of Alberta,

<sup>3</sup>Institute of Ocean Sciences

# Large-scale flow estimates disagree



Freshwater flux through the Archipelago from 10 models



# Past observations indicate strong mixing

Rationale

Approach

Processes

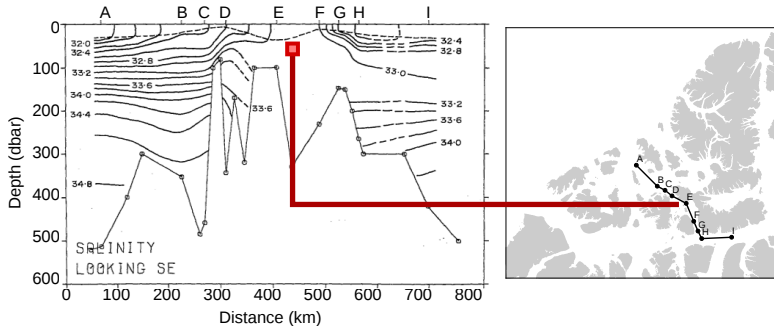
Simulated flow

Inverse method

Budget

Tides?

Conclusions



Rationale

Approach

Processes

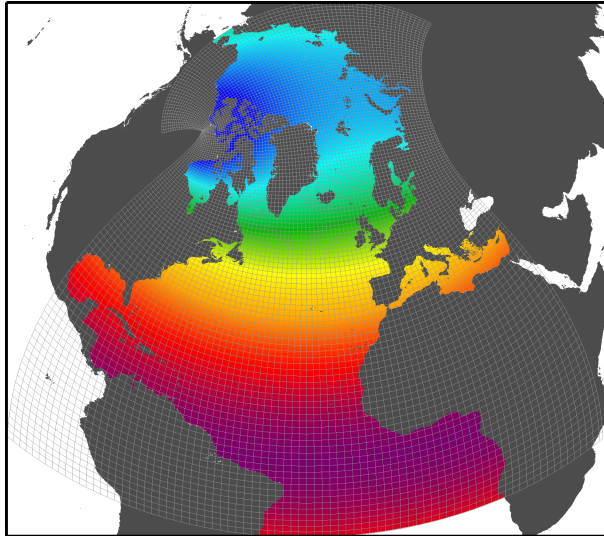
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Inverse method

Budget

Tides?

Conclusions





Rationale

Approach

Processes

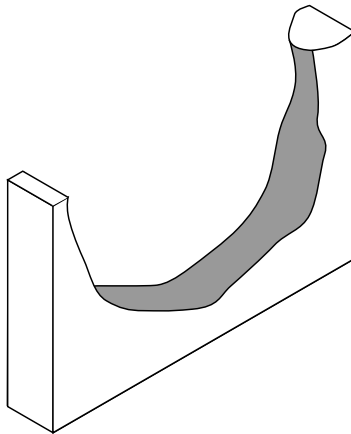
Simulated flow

Inverse method

Budget

Tides?

Conclusions



# Several processes control throughflow

Rationale

Approach

Processes

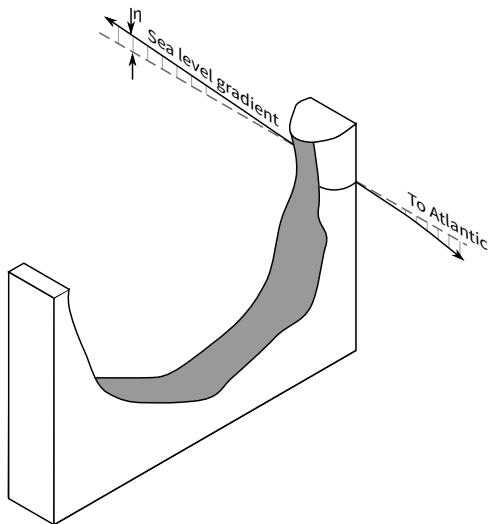
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Inverse method

Budget

Tides?

Conclusions



# Several processes control throughflow

Rationale

Approach

Processes

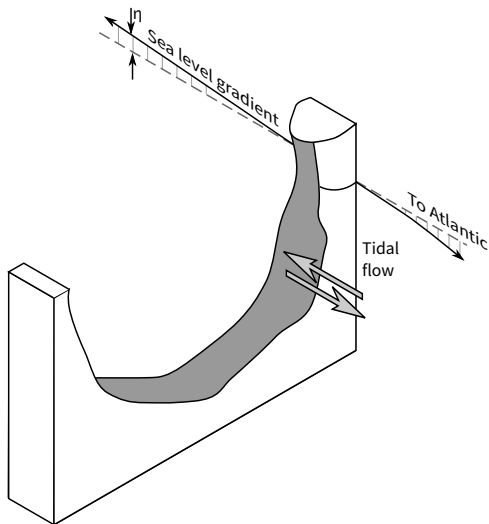
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Inverse method

Budget

Tides?

Conclusions



# Several processes control throughflow

Rationale

Approach

Processes

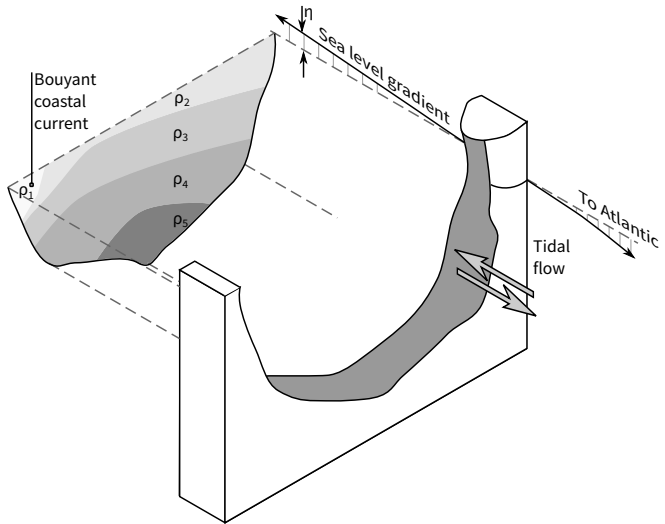
Simulated flow

Inverse method

Budget

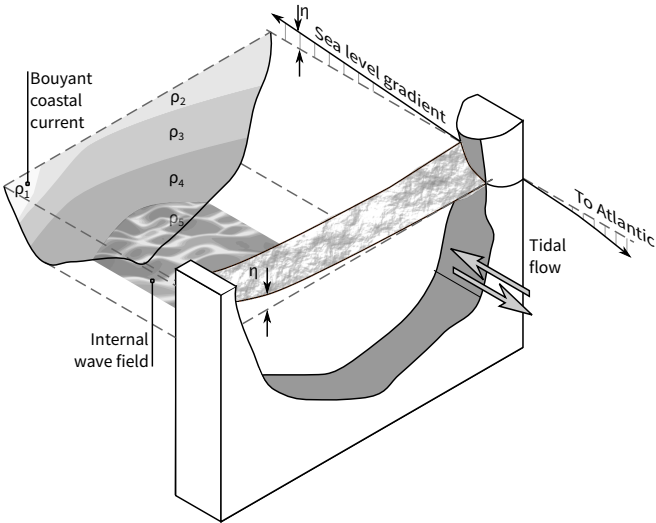
Tides?

Conclusions



# Several processes control throughflow

- Rationale
- Approach
- Processes
- Simulated flow
  - Inverse method
  - Budget
  - Tides?
- Conclusions



# Several processes control throughflow

Rationale

Approach

Processes

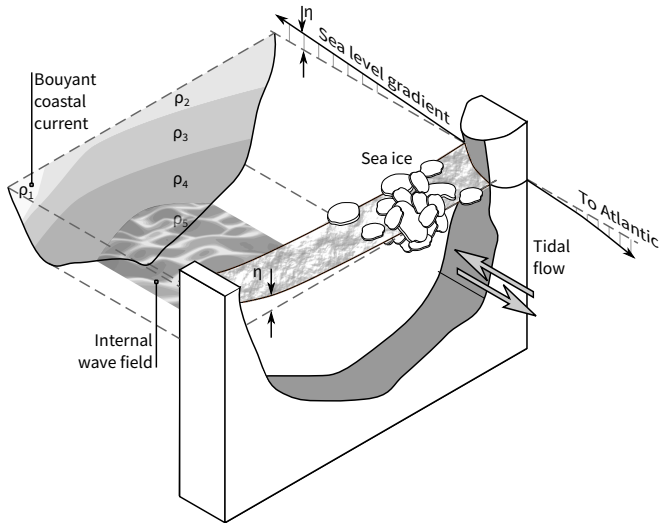
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Inverse method

Budget

Tides?

Conclusions



# Several processes control throughflow

Rationale

Approach

Processes

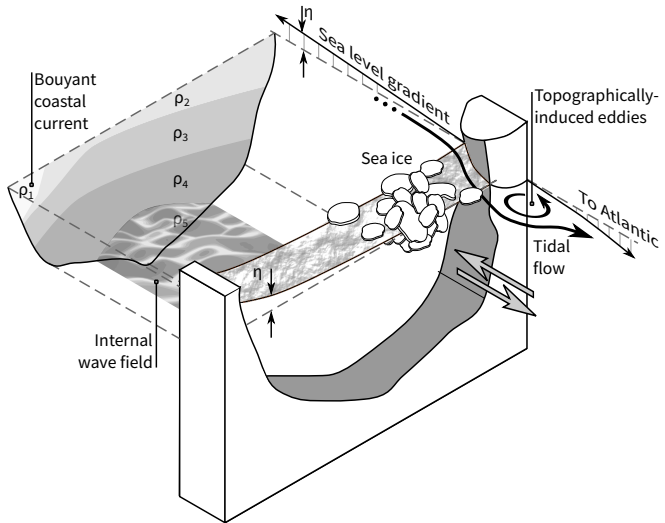
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Inverse method

Budget

Tides?

Conclusions



# Several processes control throughflow

Rationale

Approach

Processes

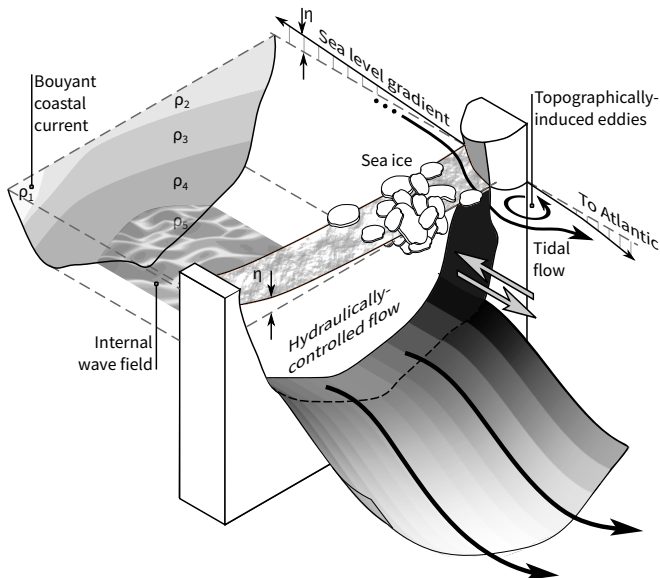
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Inverse method

Budget

Tides?

Conclusions





Rationale

Approach

Processes

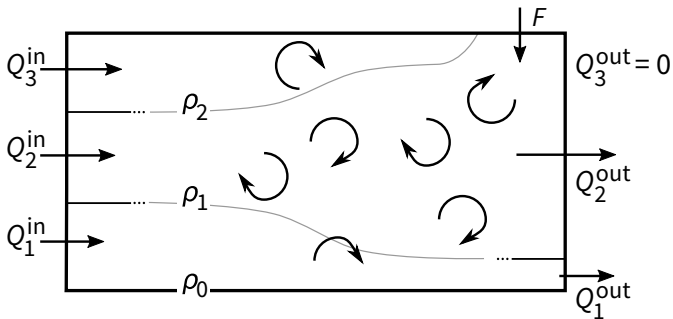
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Inverse method

Budget

Tides?

Conclusions



Rationale

Approach

Processes

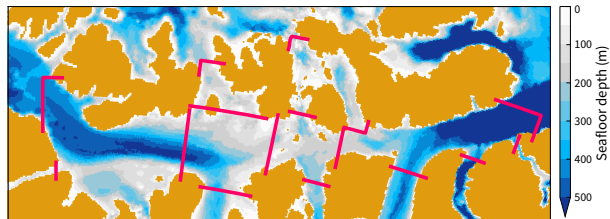
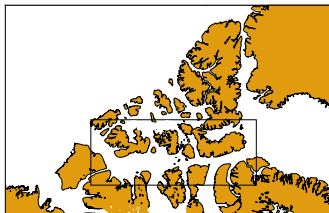
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Inverse method

Budget

Tides?

Conclusions



Rationale

Approach

Processes

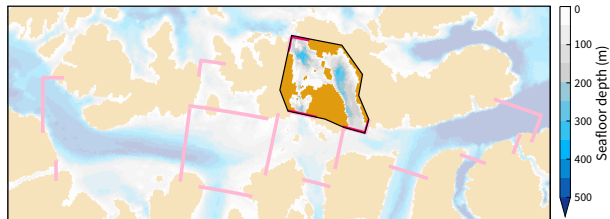
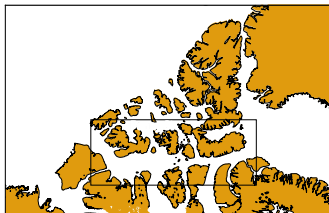
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Inverse method

Budget

Tides?

Conclusions



Rationale

Approach

Processes

Simulated flow

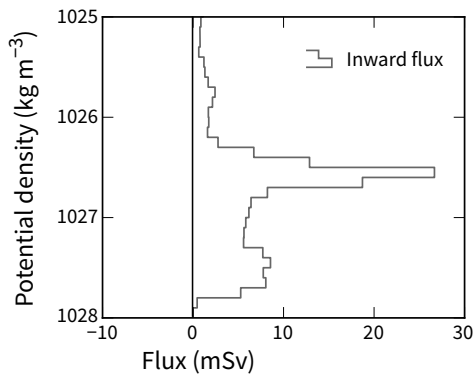
Inverse method

Budget

Tides?

Conclusions

## Transport changes in Queens Channel



Rationale

Approach

Processes

Simulated flow

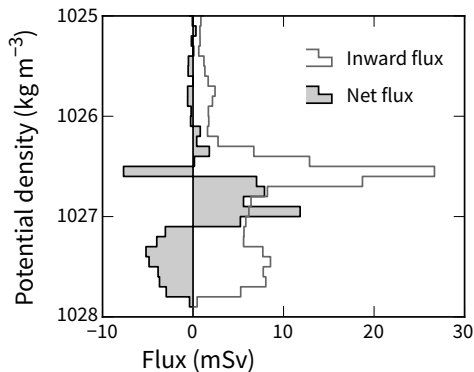
Inverse method

Budget

Tides?

Conclusions

## Transport changes in Queens Channel



Rationale

Approach

Processes

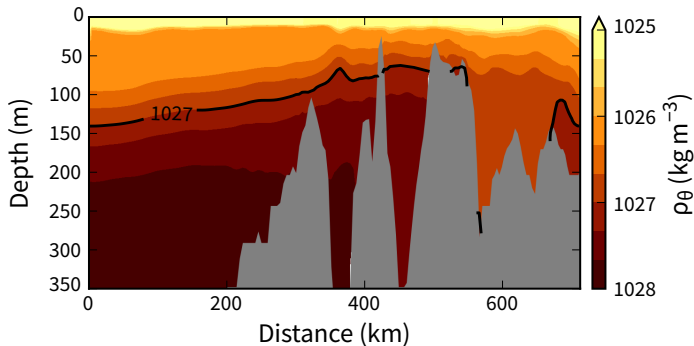
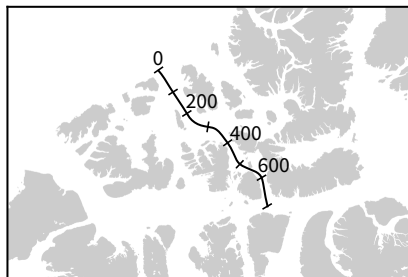
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Inverse method

Budget

Tides?

Conclusions



Rationale

Approach

Processes

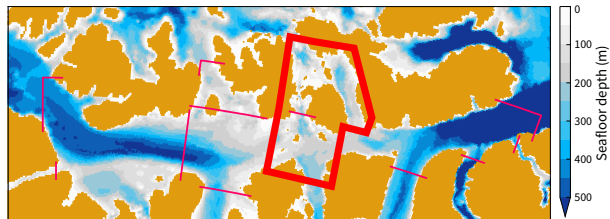
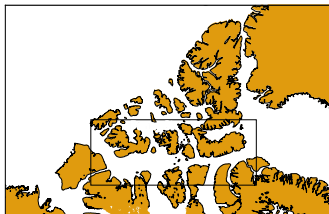
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Inverse method

Budget

Tides?

Conclusions



Rationale

Approach

Processes

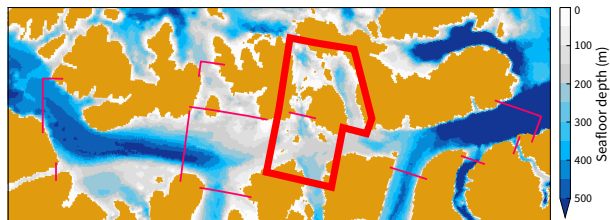
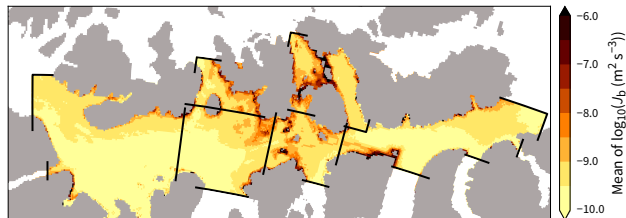
Simulated flow

Inverse method

Budget

Tides?

Conclusions





Rationale

Approach

Processes

**Simulated flow**

Inverse method

**Budget**

Tides?

Conclusions

Rationale

Approach

Processes

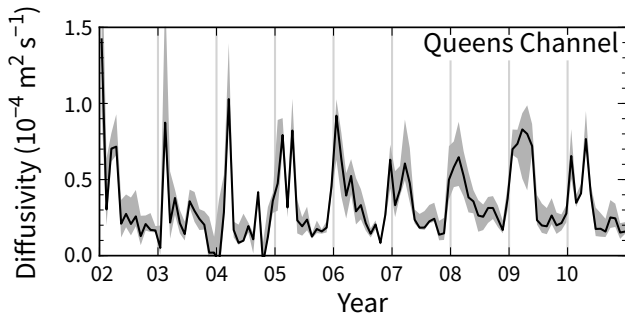
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Inverse method

Budget

Tides?

Conclusions



Rationale

Approach

Processes

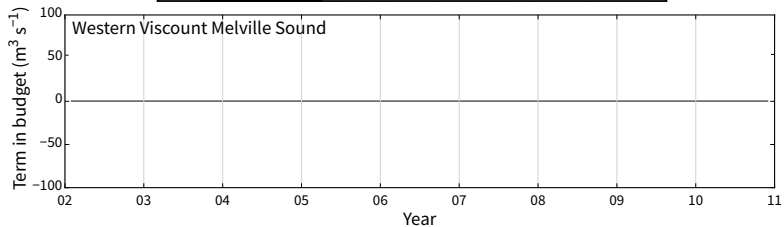
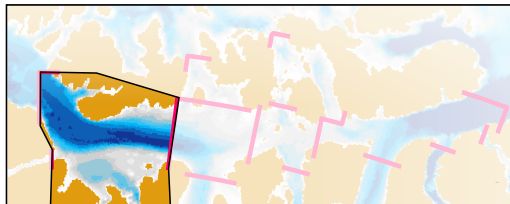
**Simulated flow**

Inverse method

**Budget**

Tides?

Conclusions



Rationale

Approach

Processes

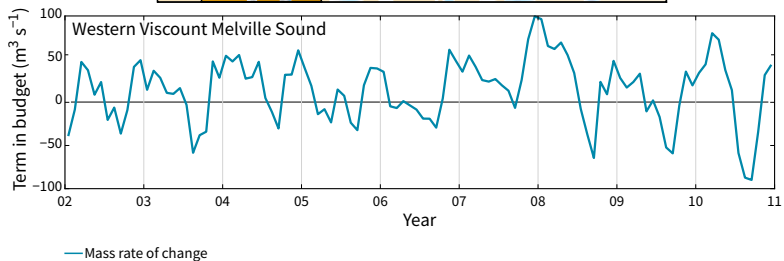
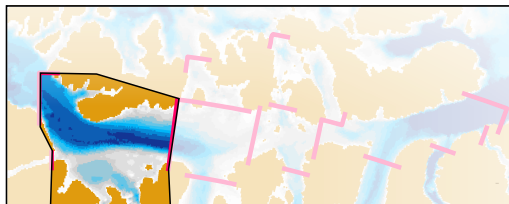
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Inverse method

Budget

Tides?

Conclusions



Rationale

Approach

Processes

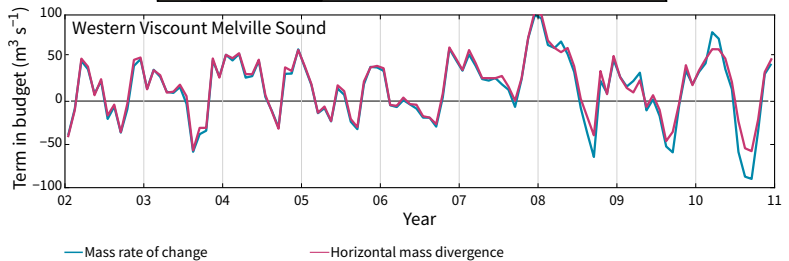
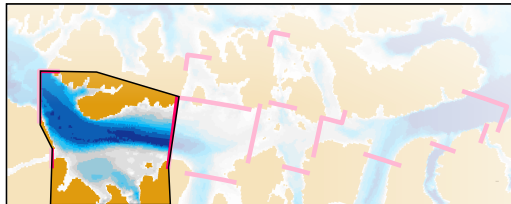
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Inverse method

Budget

Tides?

Conclusions



Rationale

Approach

Processes

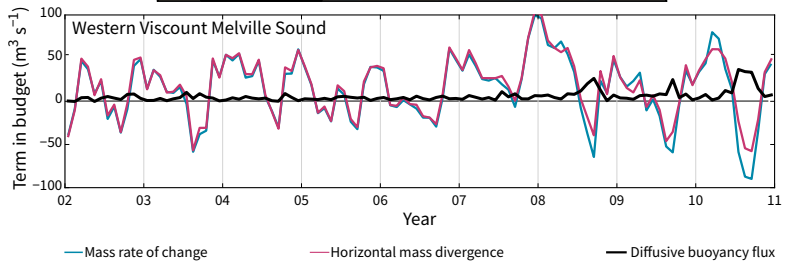
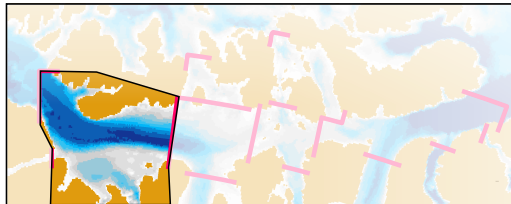
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Inverse method

Budget

Tides?

Conclusions



Rationale

Approach

Processes

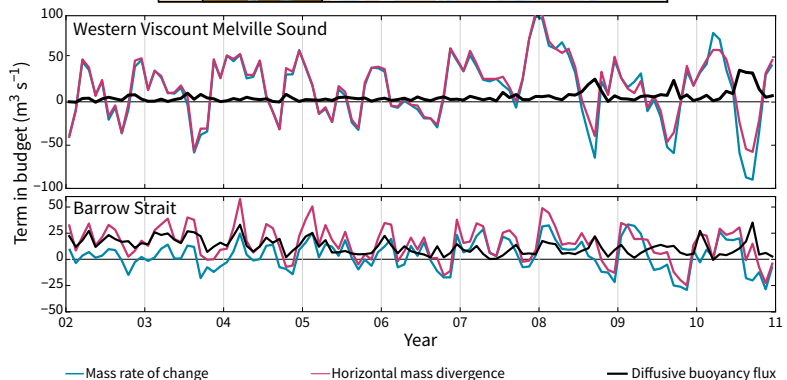
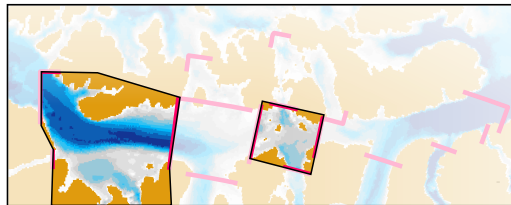
Simulated flow

Inverse method

Budget

Tides?

Conclusions



# Diapycnal mixing in the Archipelago

Rationale

Approach

Processes

Simulated flow

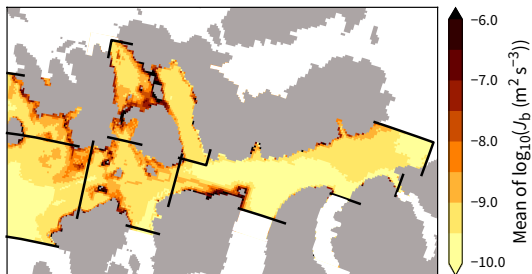
Inverse method

Budget

Tides?

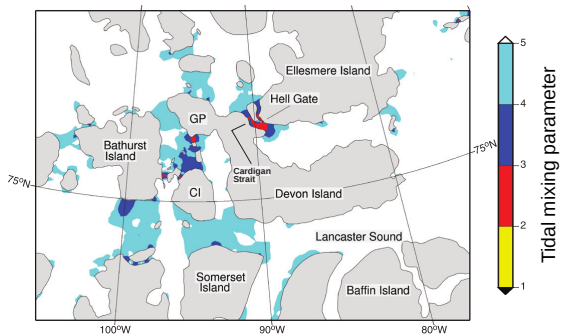
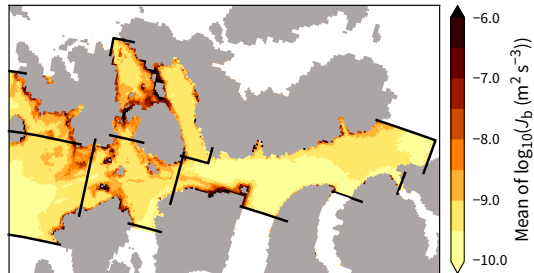
Conclusions

## What about tides?





# What about tides?



Rationale

Approach

Processes

Simulated flow

Inverse method

Budget

Tides?

Conclusions

- Use a large-scale simulation to quantify
  - Mixing metrics
  - Terms in the mass budget
- Mixing is localised
- Central sills have dual role

Rationale

Approach

Processes

Simulated flow

Inverse method

Budget

Tides?

Conclusions

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Rationale

Approach

Processes

Simulated flow

Inverse method

Budget

Tides?

Conclusions

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Rationale

Approach

Processes

Simulated flow

Inverse method

Budget

Tides?

Conclusions



## Journal of Geophysical Research: Oceans

### RESEARCH ARTICLE

10.1002/2016JC01223

## Water Mass Modification and Mixing Rates in a $1/12^\circ$ Simulation of the Canadian Arctic Archipelago

Kenneth G. Hughes<sup>1</sup>, Jody M. Klymak<sup>1</sup>, Xianmin Hu<sup>2</sup>, Paul G. Myers<sup>2</sup>

<sup>1</sup>School of Earth and Ocean Science, University of Victoria, Victoria, BC, Canada <sup>2</sup>Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB, Canada