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Heat transport across the Antarctic slope and its impact on ice shelf melting:

An idealized model study

Wilma Huneke [1], Andreas Klocker [1,2], Ben Galton-Fenzi [3,2]

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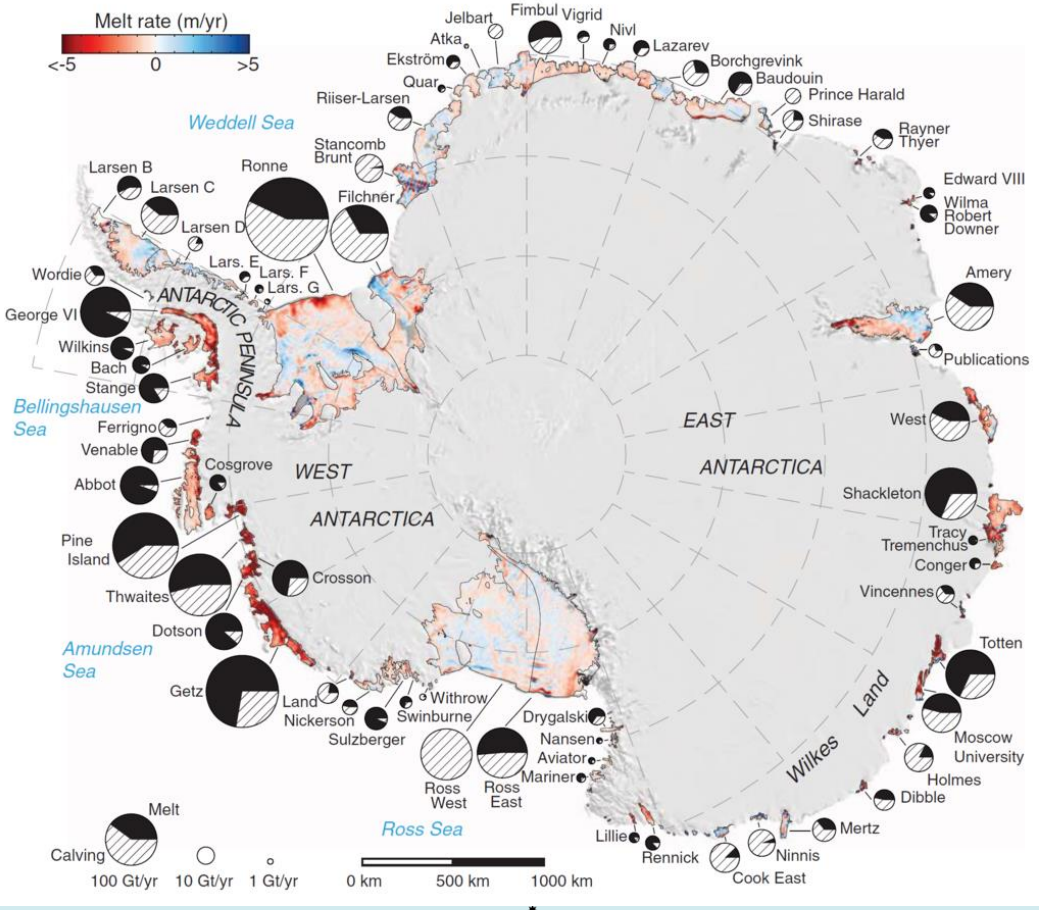
Antarctic ice shelves are thinning



Rignot et al., 2013

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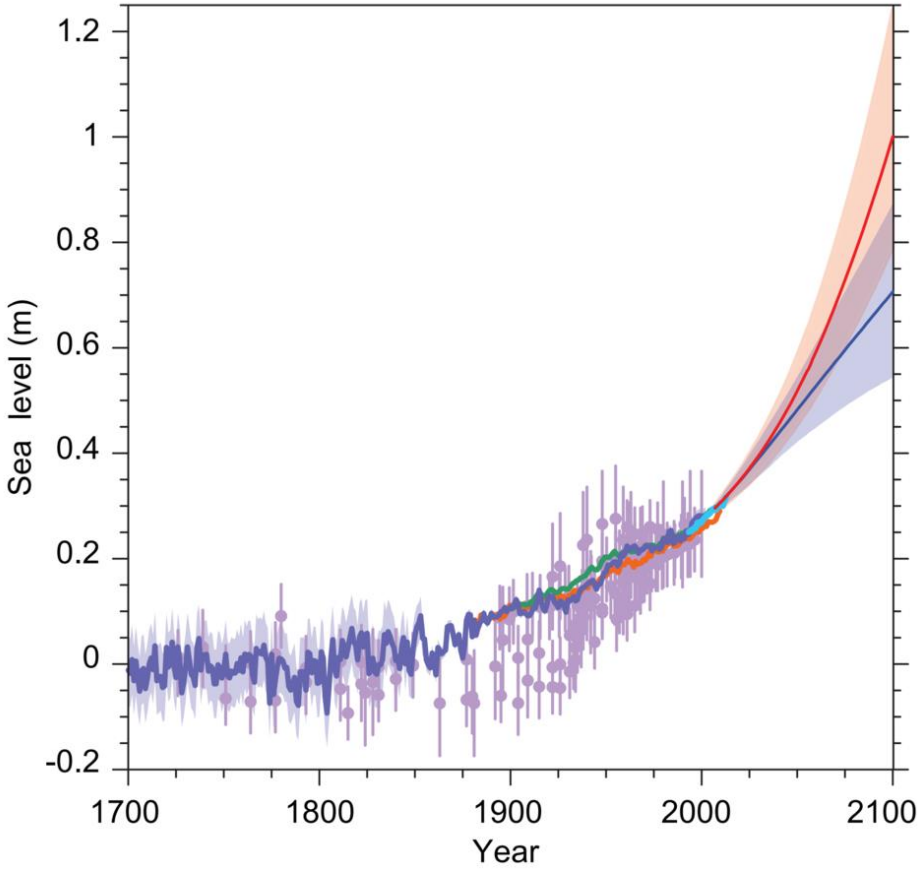
Antarctica: uncertainty for future sea level



IPCC (2013)

Snow accumulation

=

basal melting + calving

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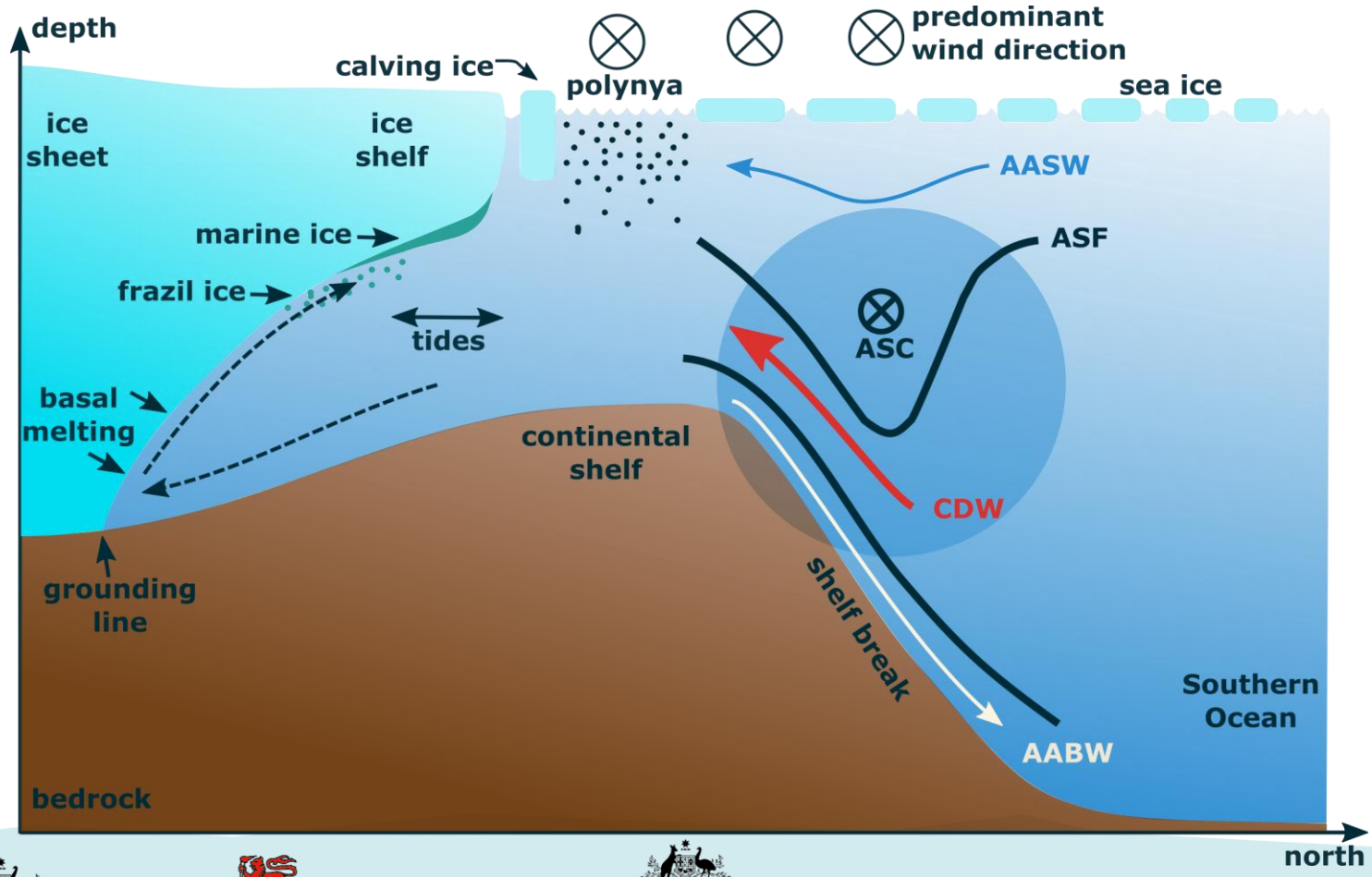
The physical system



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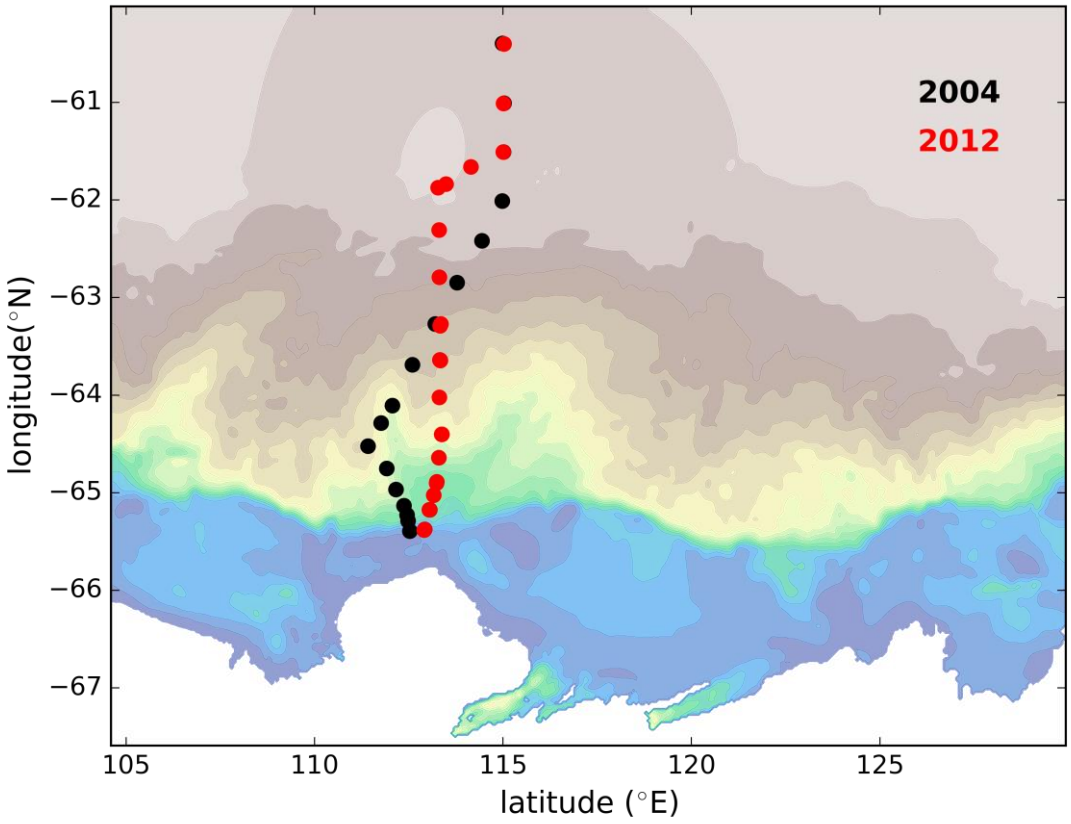
The Antarctic Slope Front (ASF)



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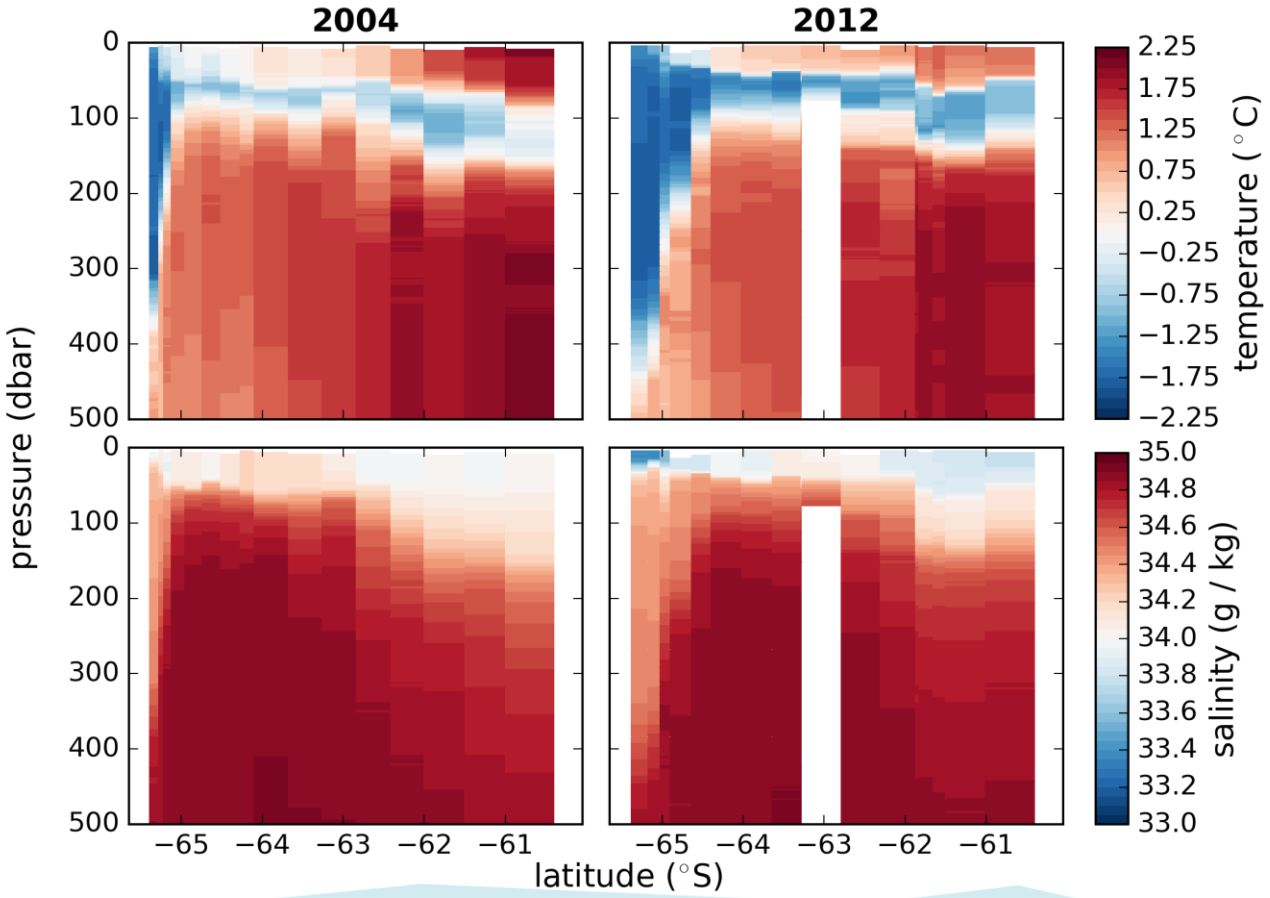

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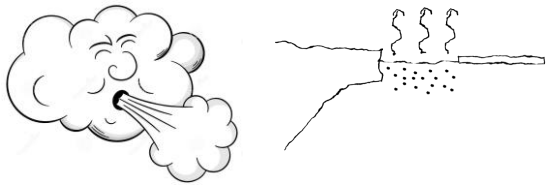
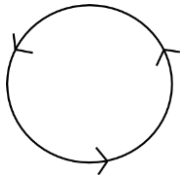
Mechanisms for cross-shelf transport



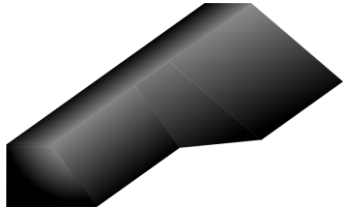
Atmospheric forcing

Hattermann et al. (2014)
Spence et al. (2014)



Eddy activity

Stewart and Thompson (2015)
Nost et al. (2011)



Bathymetric features

St-Laurent et al. (2013)

Aim: Identify processes for cross-slope transport

Regional Ocean Modeling System ROMS Research Community

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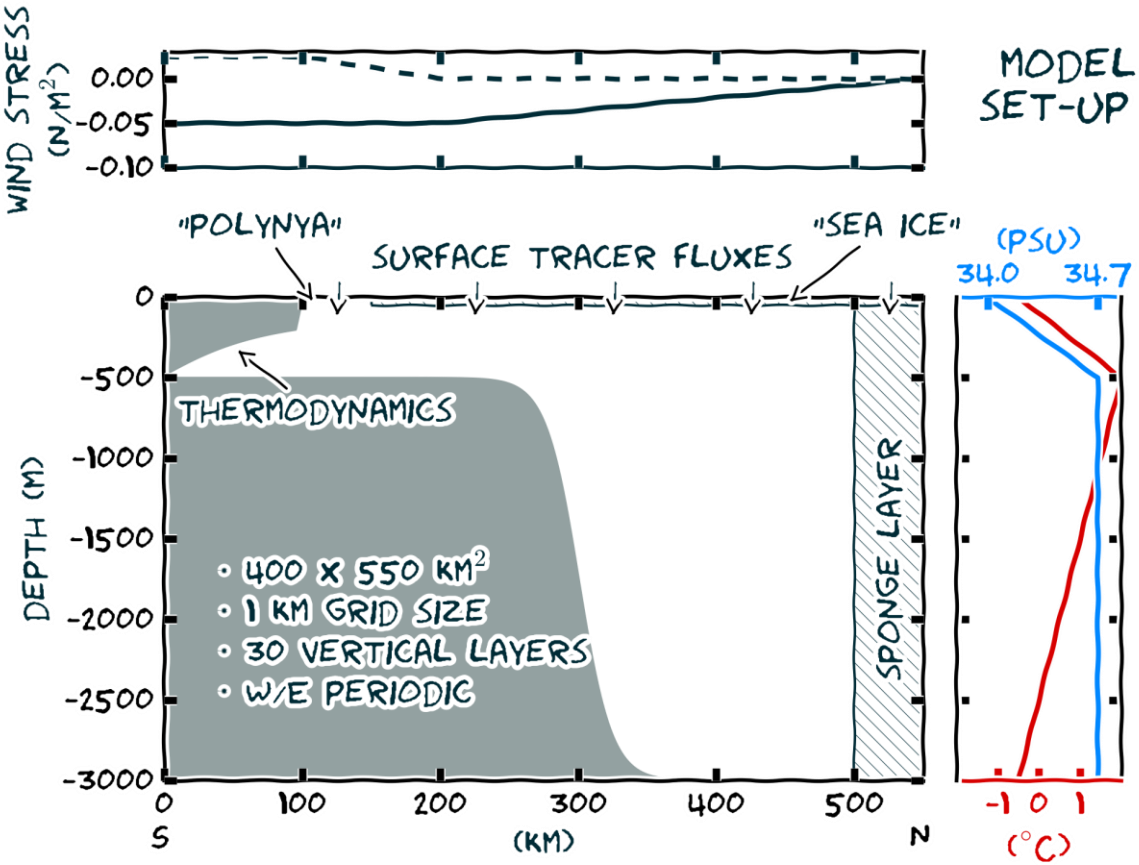
Idealized configuration of the shelf break



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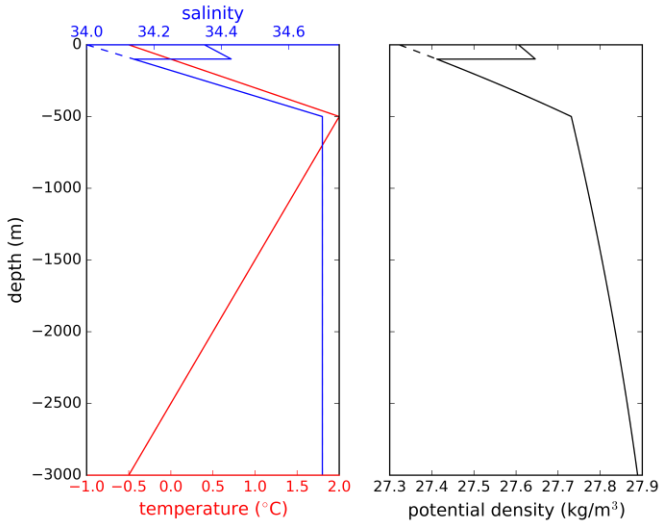
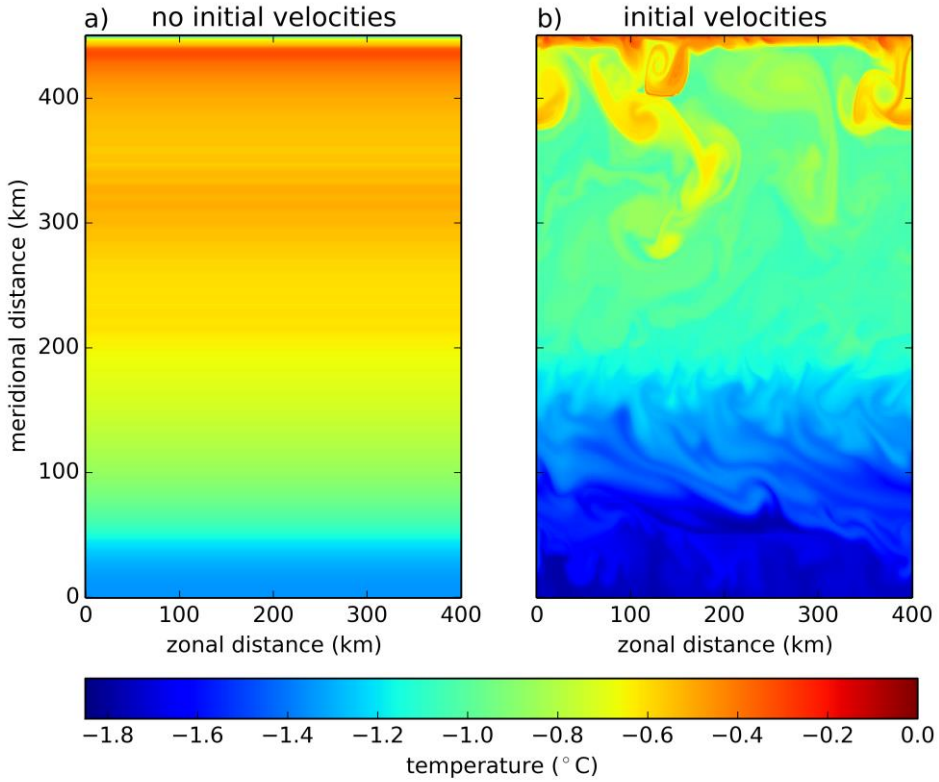
Unstable initial density field





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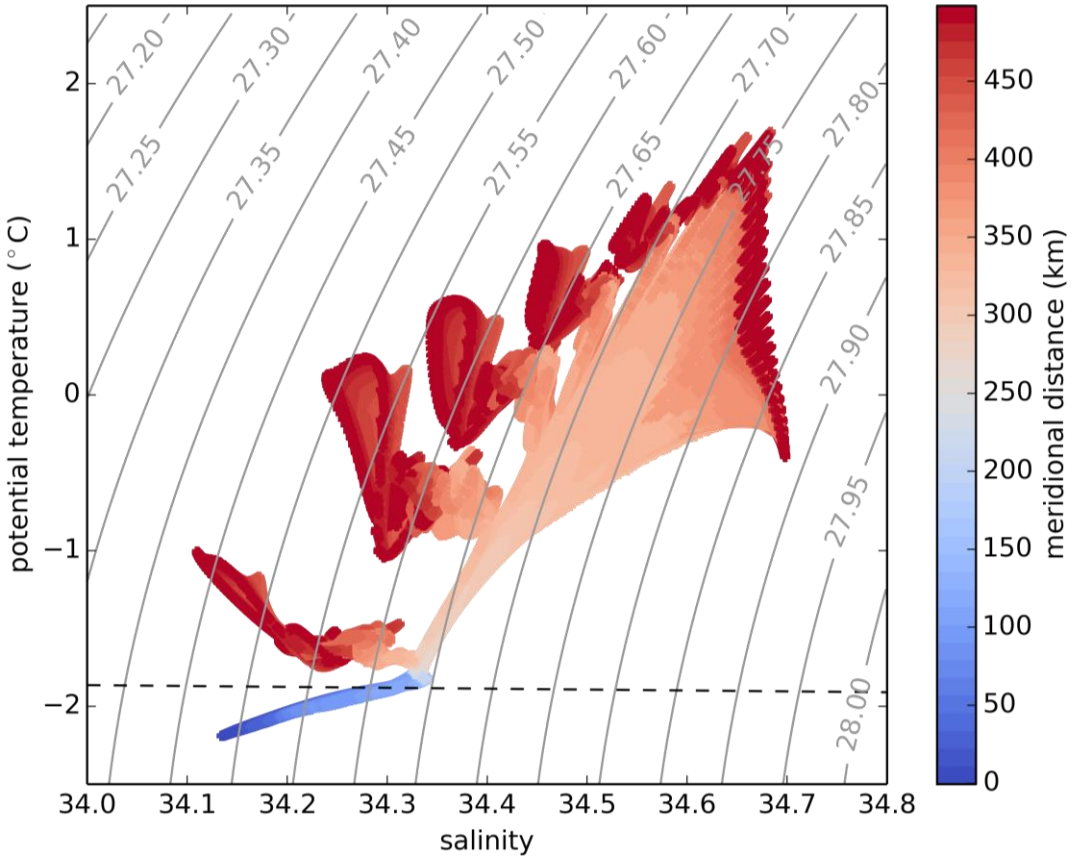
Results 1 – control run without polynya



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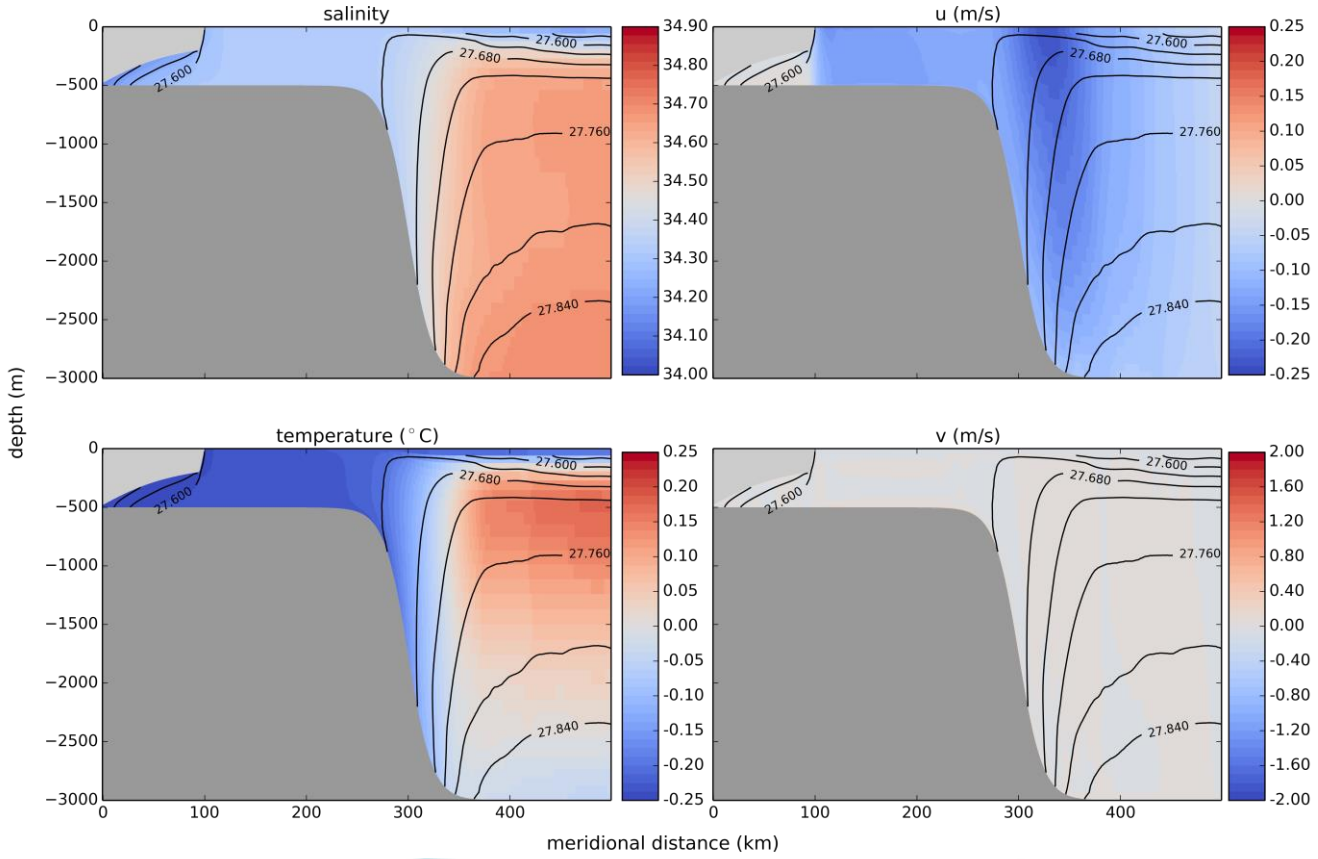
Results 1 – strong dynamical barrier



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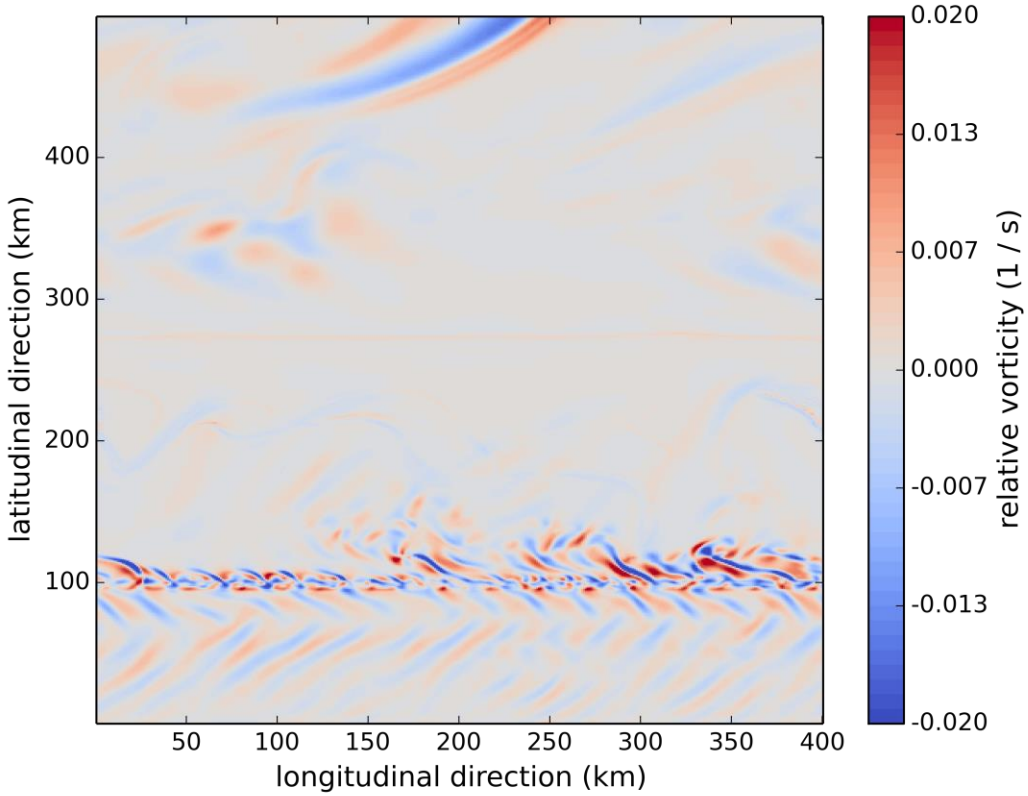
Results 1 – little eddy activity



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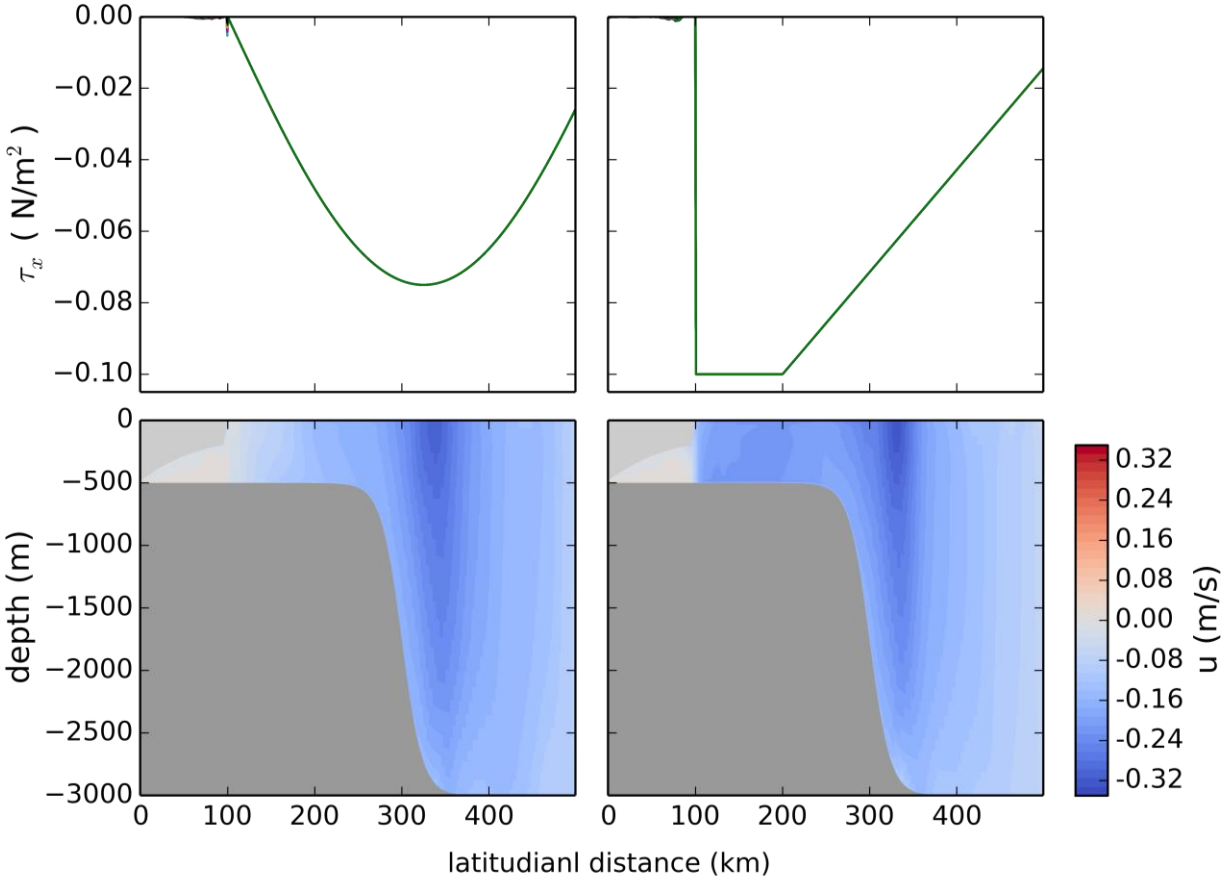
Results 2 – sensitivity to wind stress forcing



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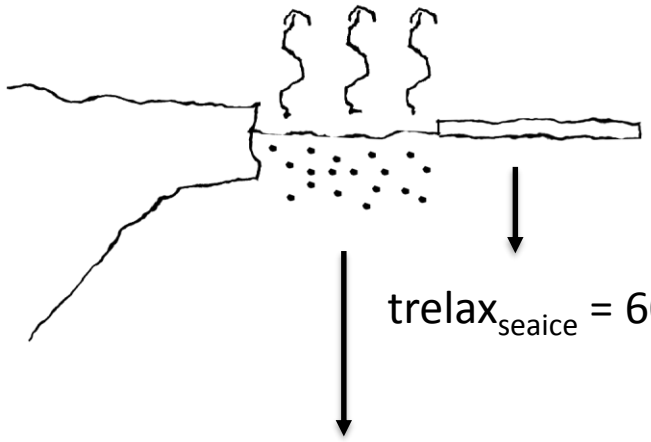
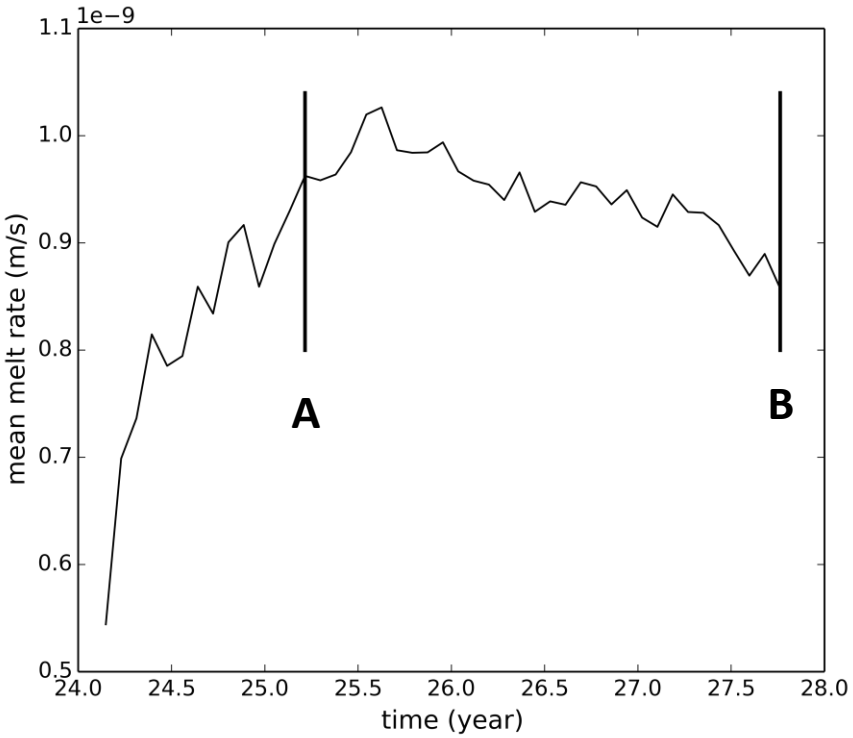
Results 3 – buoyancy forcing by strong polynya



$trelax_{seaice}$ = 60 days

$trelax_{polynya}$ = 3 days



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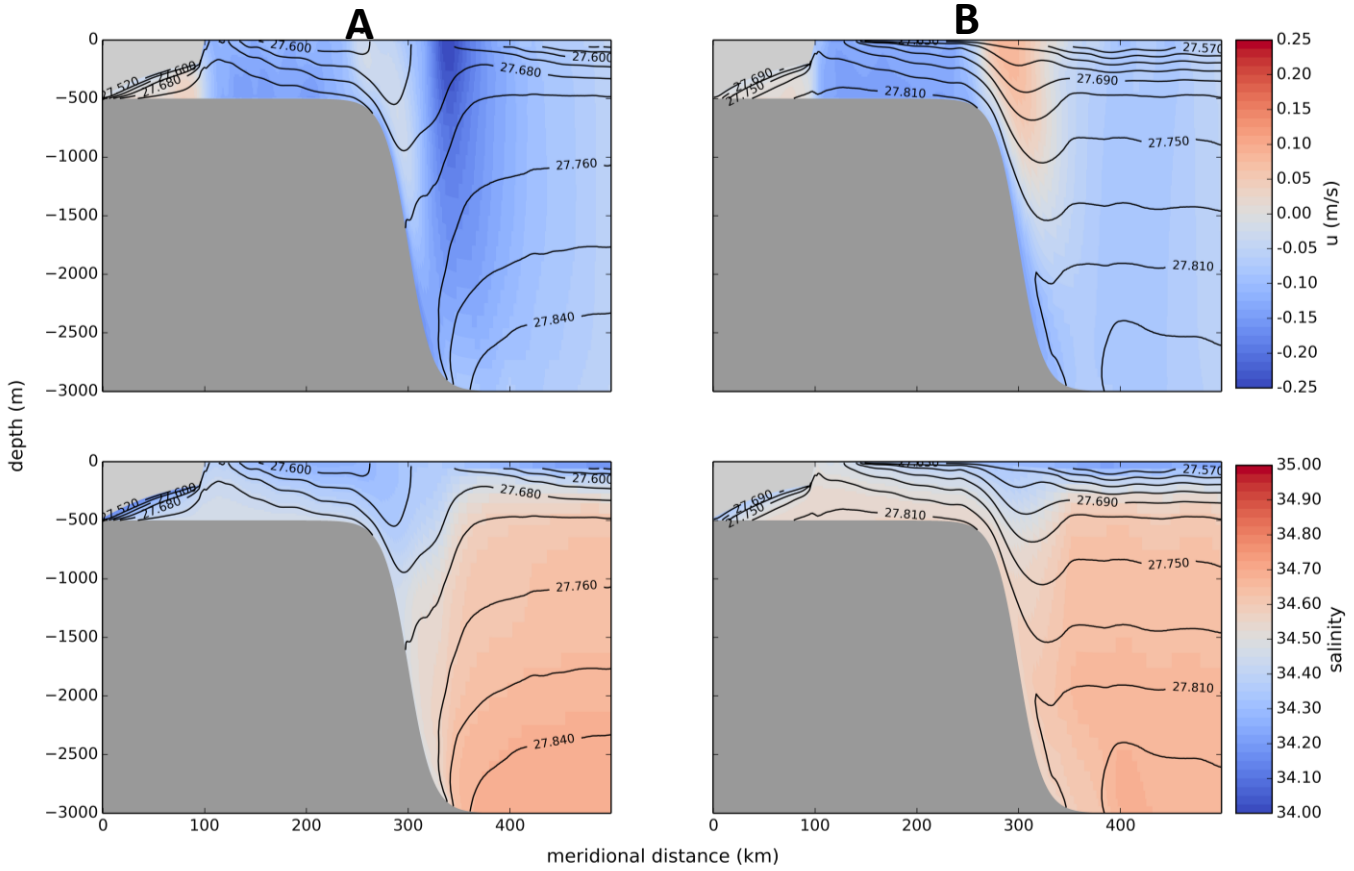

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Conclusion and future work

- ASF strong dynamical barrier
  - Ice shelf front poses a barrier as well
  - wind stress seems to be of minor importance
  - System sensitive to buoyancy forcing

- Future work:
  - Continue wind stress versus buoyancy forcing comparison
  - Seasonality of frontal system
  - Bathymetry: introduce non-symmetric features

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Thank you for listening!

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