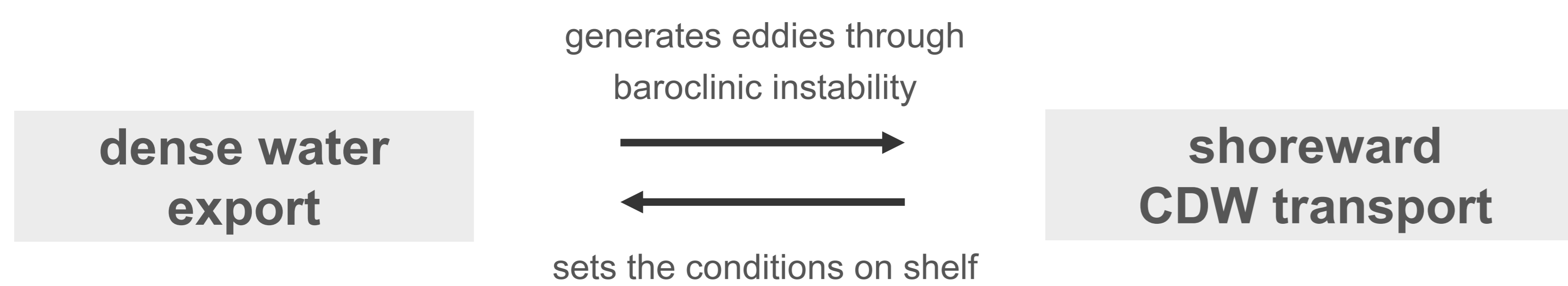


Robustness of the Weddell Sea eddy feedback

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Introduction: What is the Weddell Sea eddy feedback?

- On the shelves of the Weddell Sea, **dense water** is formed and descends to the deep ocean where it becomes a constituent of the Antarctic Bottom Water.
- A rich field of **mesoscale eddies** mediates the transport of warm and salty **Circumpolar Deep Water** onto the shelf, requiring high horizontal resolution¹.



¹ Stewart and Thompson (2016), Journal of Physical Oceanography

Methods: An idealized model of the Weddell Sea continental slope

We use **MITgcm** in a setup (450km x 400km x 3000m) with 1km horizontal resolution, 77 vertical levels and meridionally symmetric topography, wind and salt forcing.

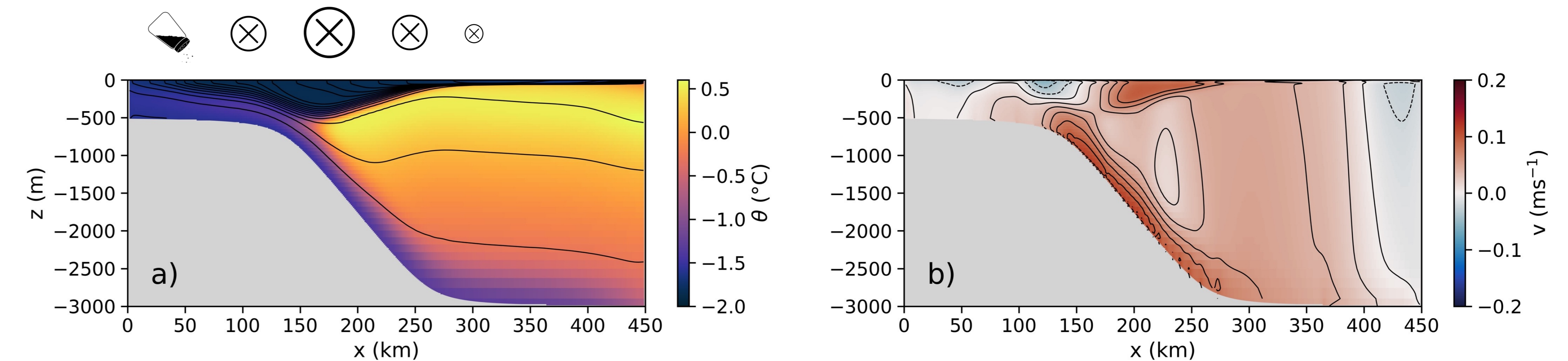


Figure 1: Along-slope averaged pot. Temperature (a) and along-slope velocity (b).

Results: Impact of horizontal resolution

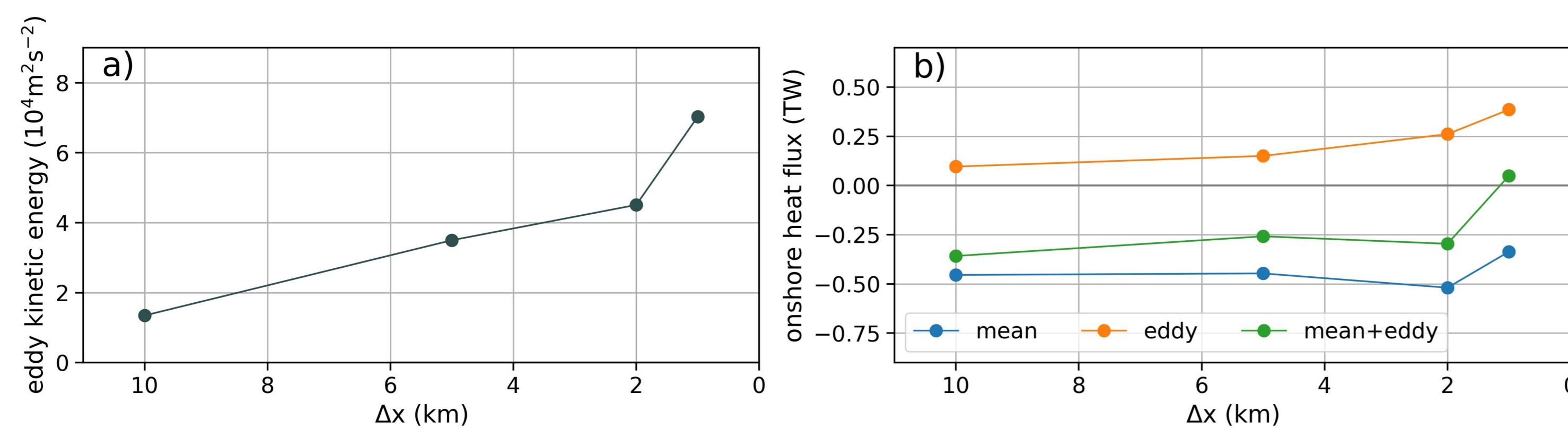
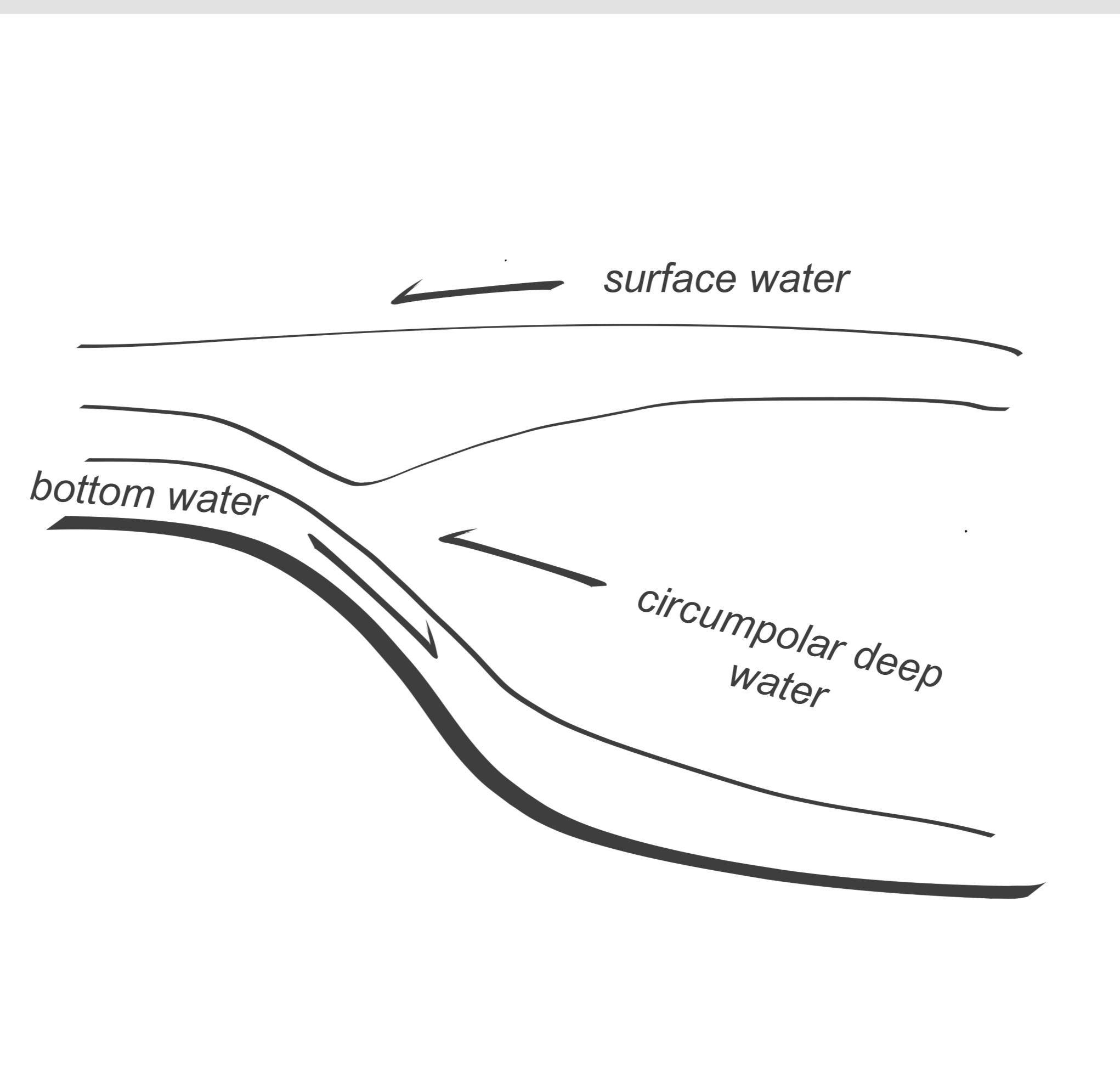


Figure 3: Eddy kinetic energy (a) and onshore heat fluxes (b) averaged over the continental slope as function of horizontal resolution.

→ A horizontal resolution of the order of 1km is necessary to produce strong eddy-mediated CDW transport towards the shelf.



Results: Impact of bottom drag strength

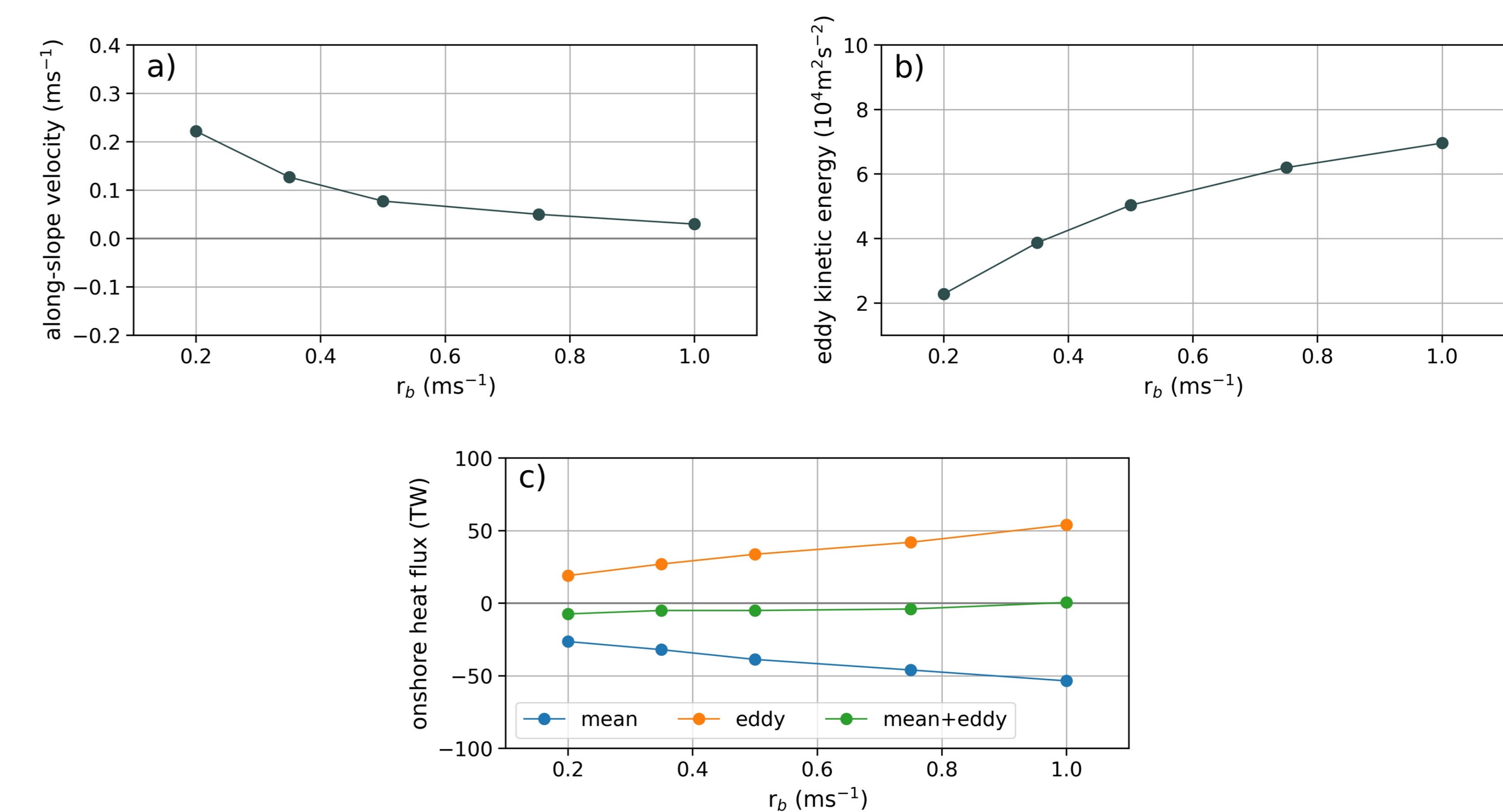


Figure 2: Along-slope velocity (a), eddy kinetic energy (b) and onshore heat fluxes (c) averaged over the continental slope as function of linear bottom drag coefficient r_b .

→ Stronger bottom drag produces more moderate along-slope mean flow, allowing for enhanced eddy heat flux towards the shelf.

Outlook:

Currently, we are exploring the sensitivity of the eddy feedback to:

- barotropic tides
- tidally generated internal gravity waves equator- and poleward of the critical latitude for M2 tidal forcing
- variable topography

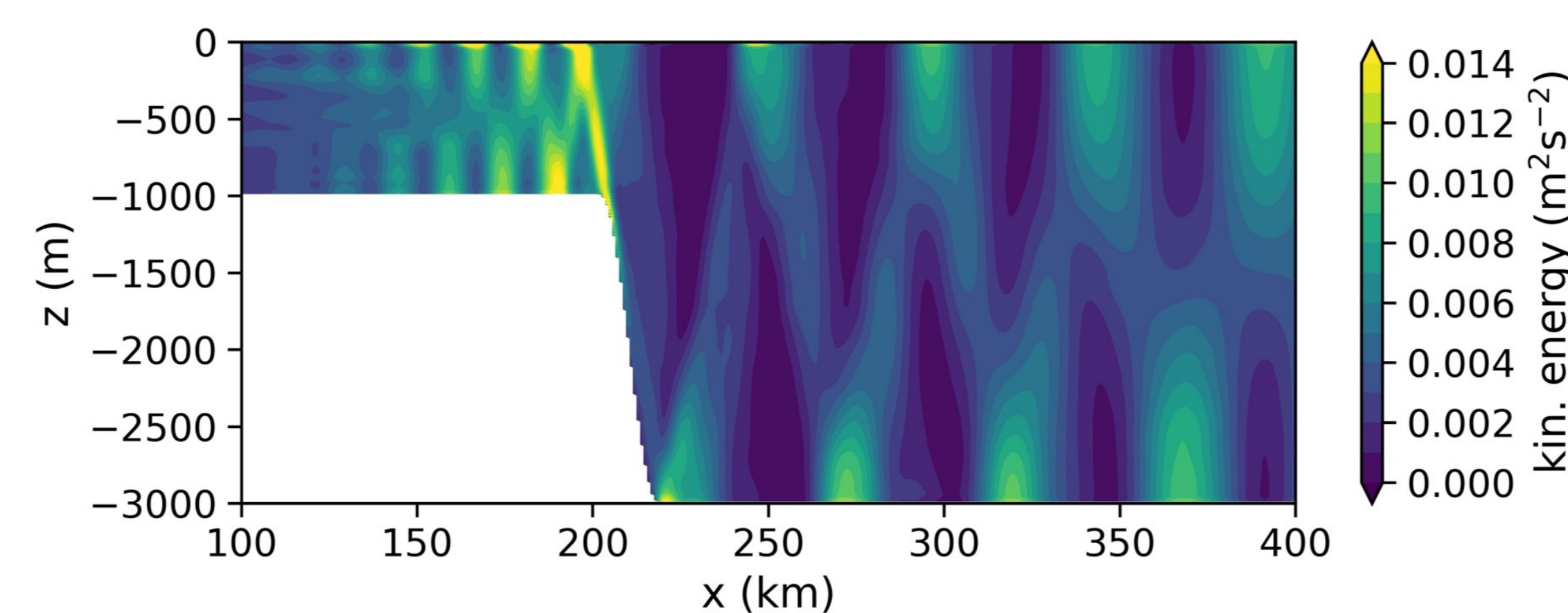


Figure 4: Internal waves generated at a continental slope in a simple numerical setup.



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