

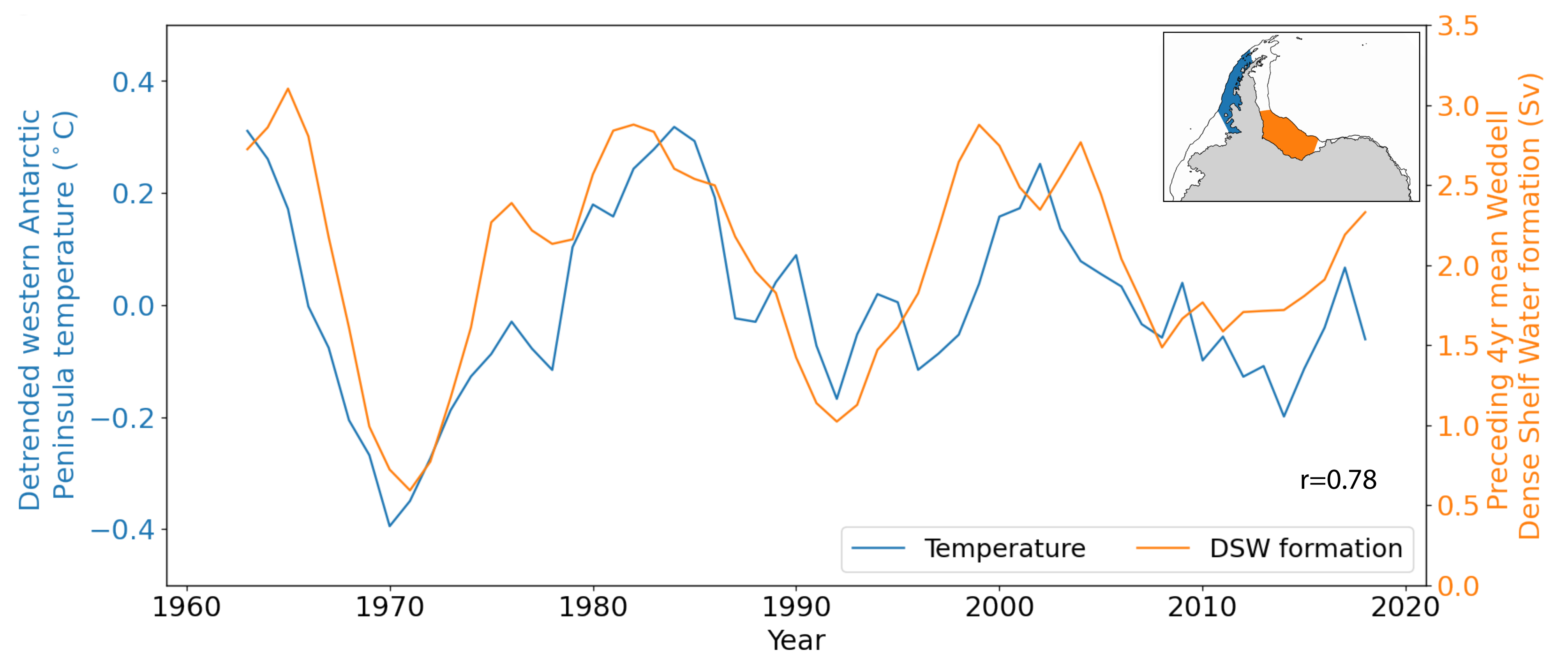
Weddell Sea control of ocean temperature variability on the western Antarctic Peninsula

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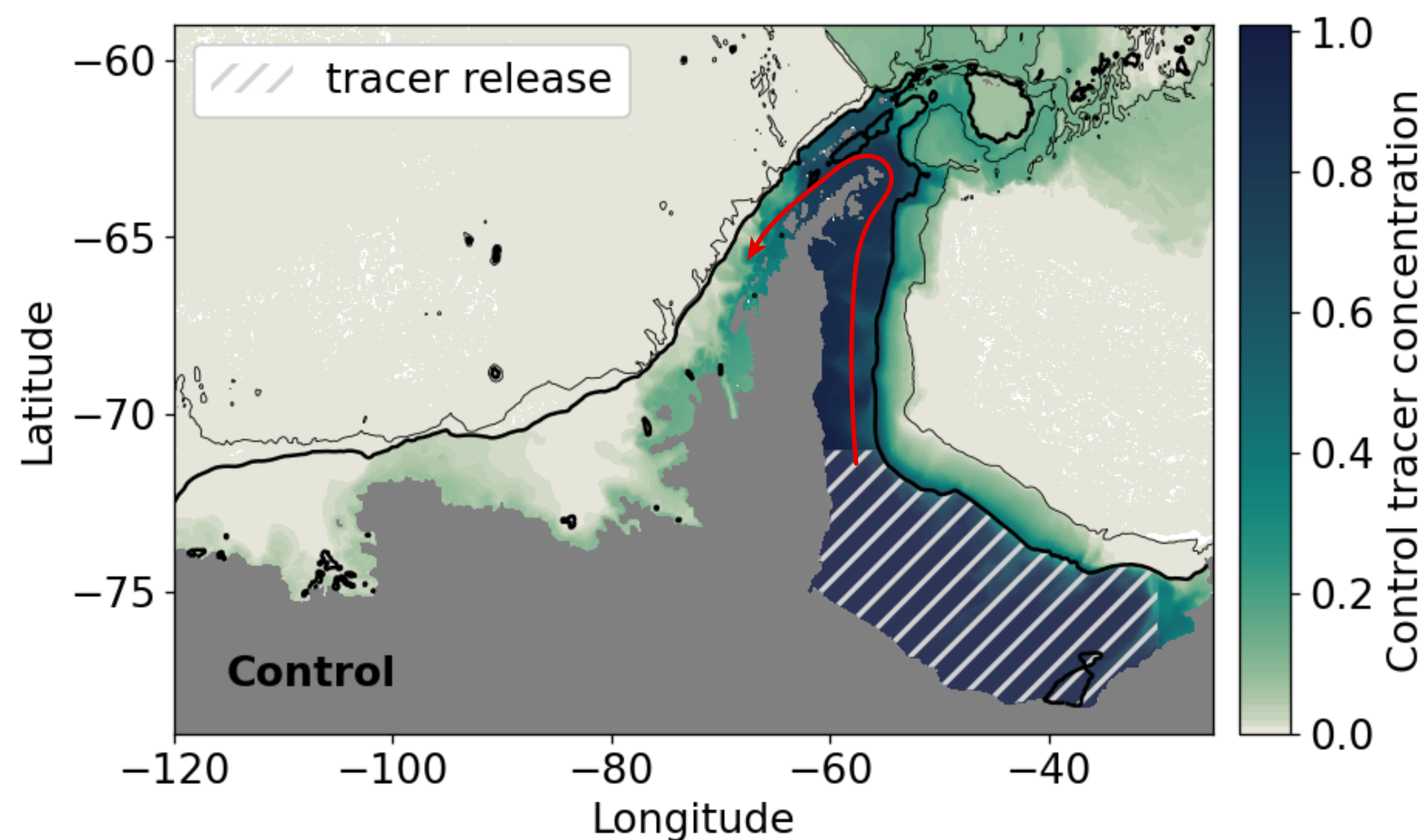


Simulated western Antarctic Peninsula temperature (blue) covaries with Weddell Sea dense water formation (orange) in the ACCESS-OM2-01 ocean-sea ice model.

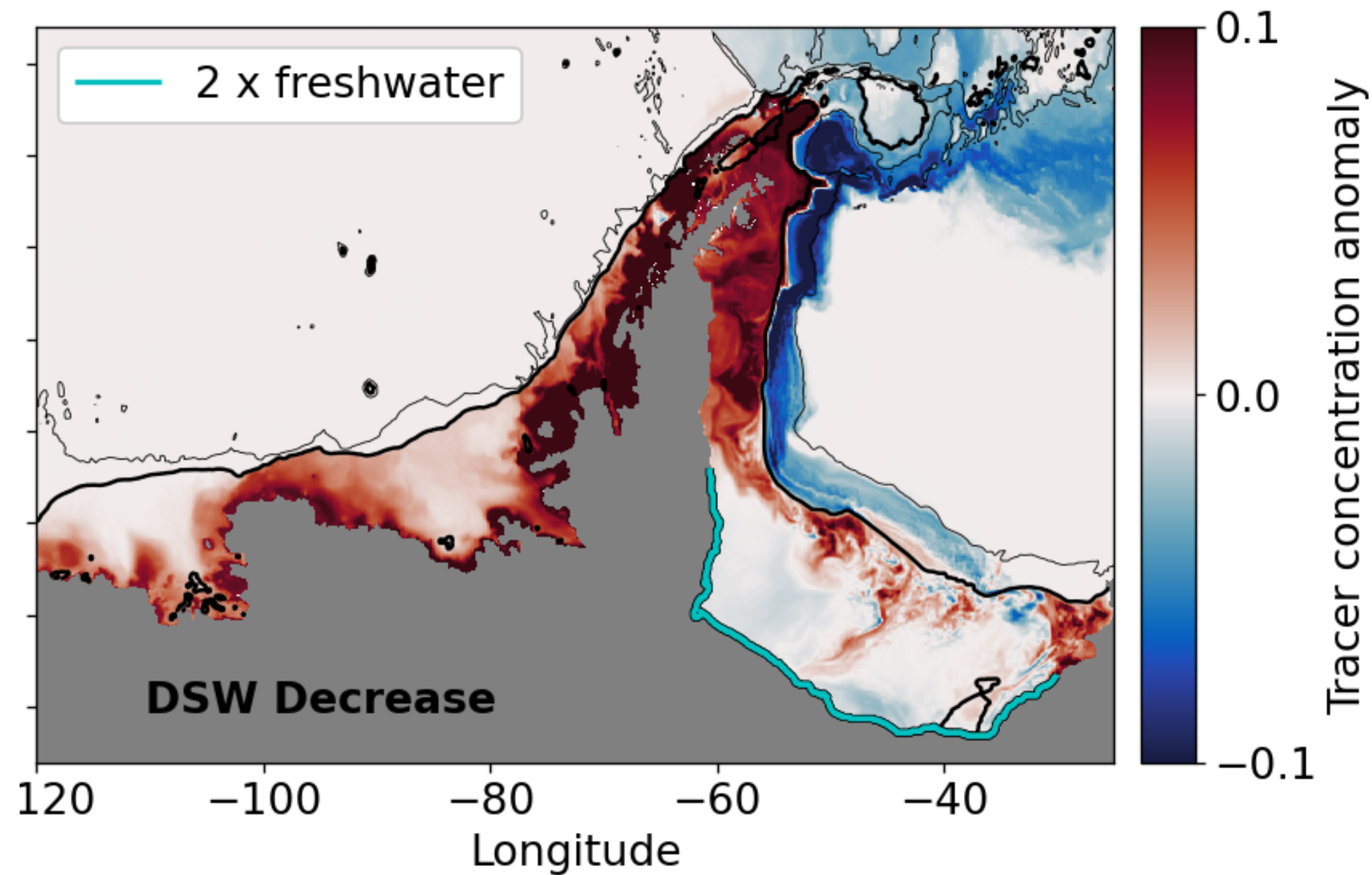
This is surprising, because from observations we don't know if there is connectivity between these two regions.



A passive tracer released in the Weddell Sea reveals westward connectivity from the Weddell Sea to the western Antarctic Peninsula.

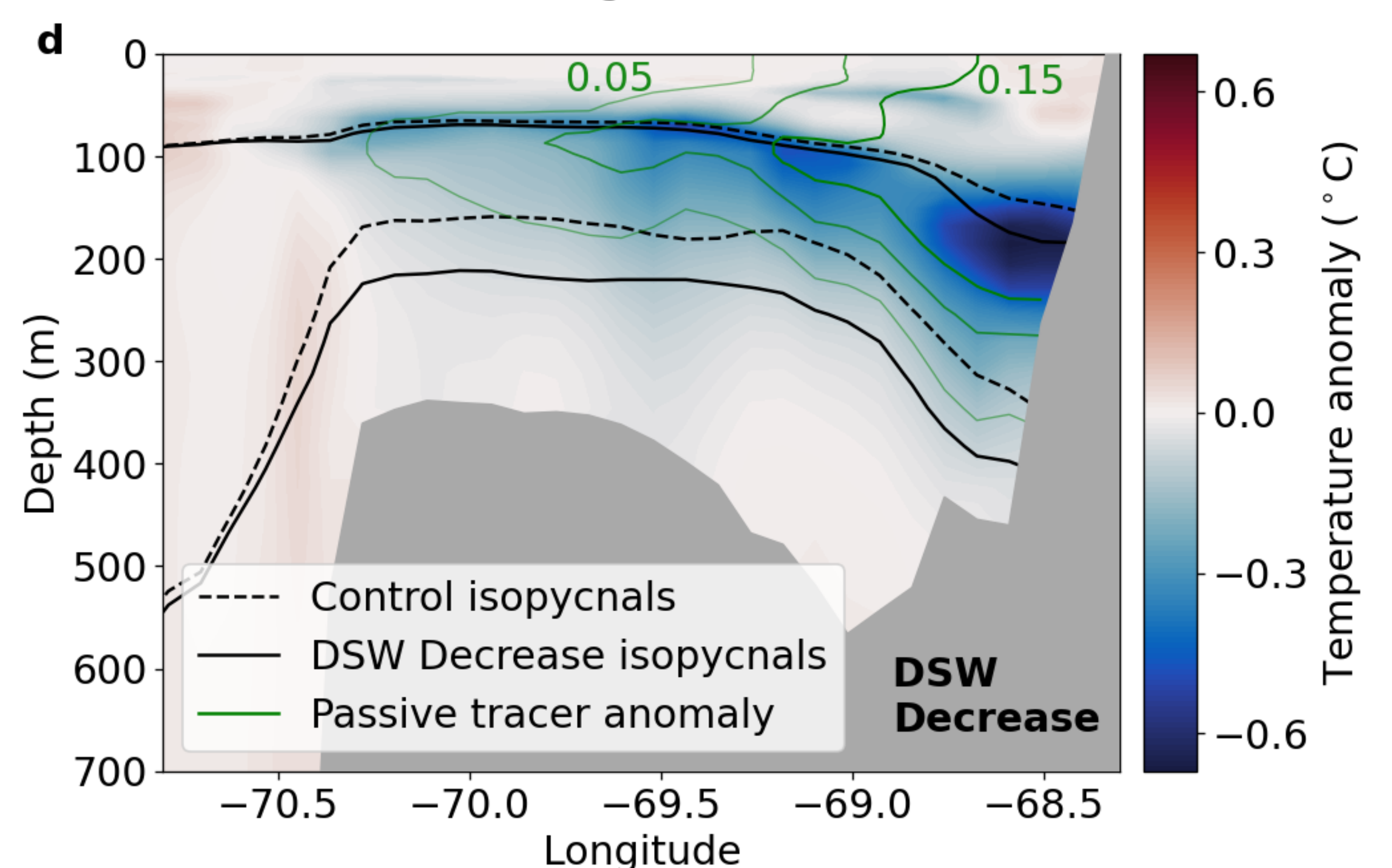
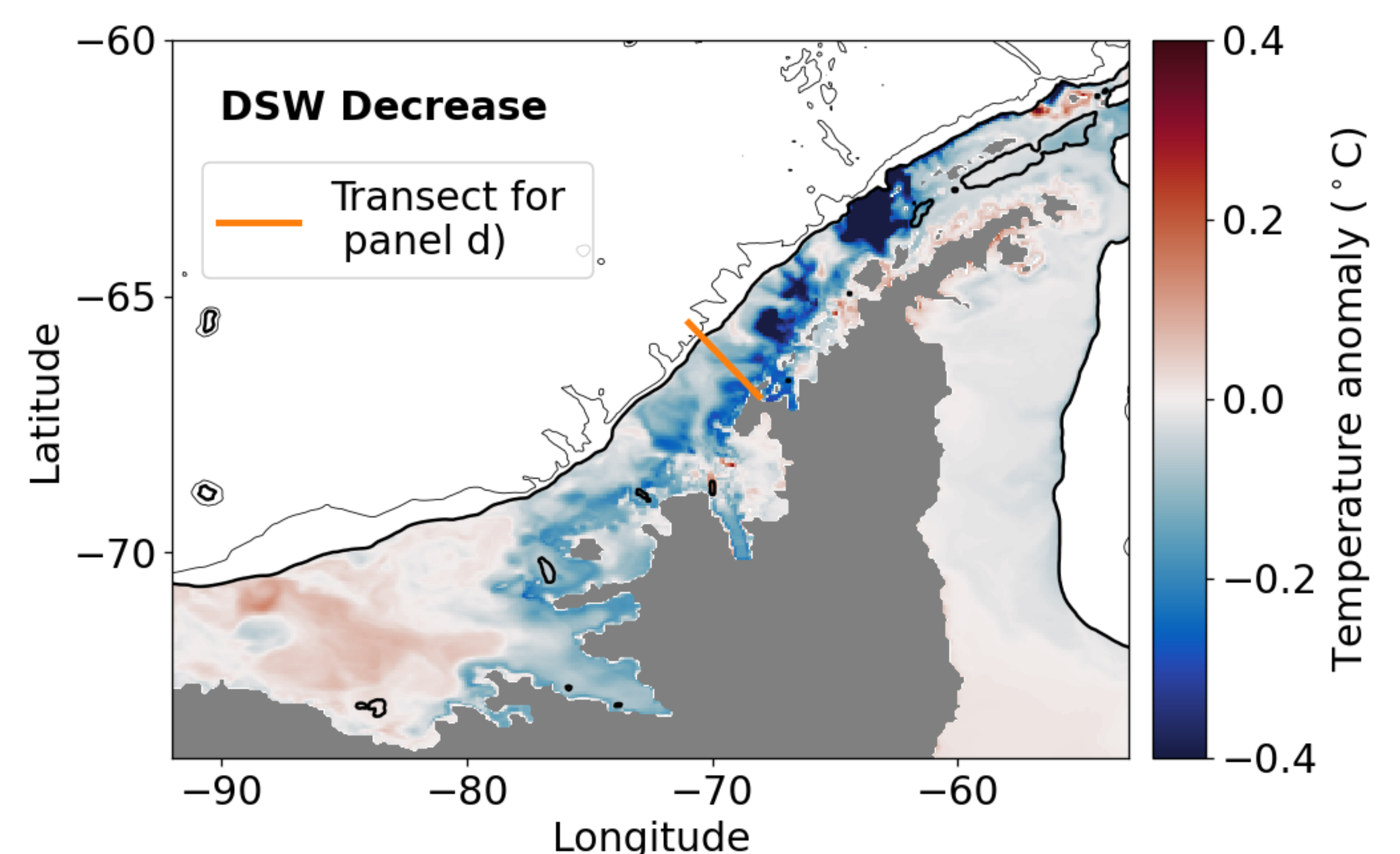


Unexpectedly, this connectivity depends on the dense water formation in the Weddell Sea. This figure shows the change in passive tracer when we decrease the dense water formation (by locally adding freshwater).



Less dense water formation reduces dense water export to the abyss (blue), but increases transport westward along the shelf (red).

The increase in along-shelf transport advects more cold, fresh Weddell Sea waters along the western Antarctic Peninsula, causing widespread cooling that is aligned with the coastal current.



Implication:
Future localised transient cooling may occur downstream of decreasing dense water formation sites.

Don't care about details? Just look at the schematic!

Weakened Weddell dense water formation (right panel) increases the transport between the Weddell Sea and the western Antarctic Peninsula, and advects more cool, fresh Weddell Sea waters onto the western Antarctic Peninsula shelf.

