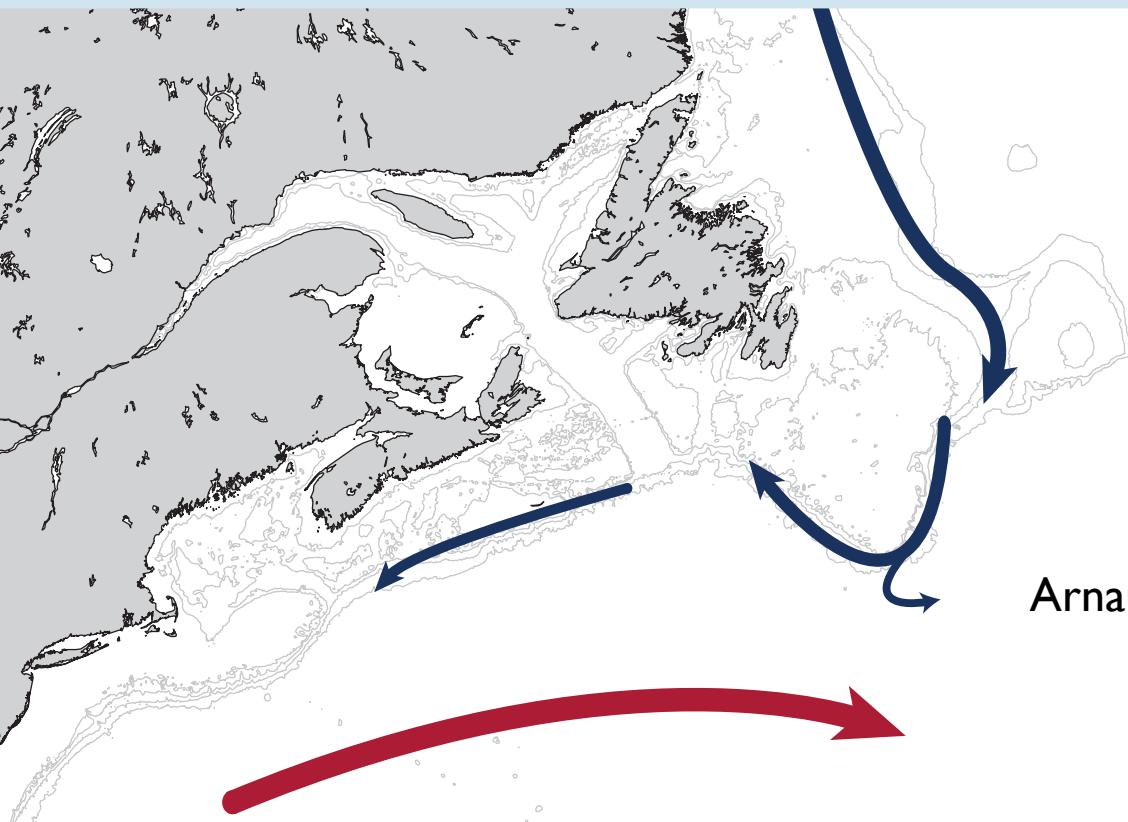
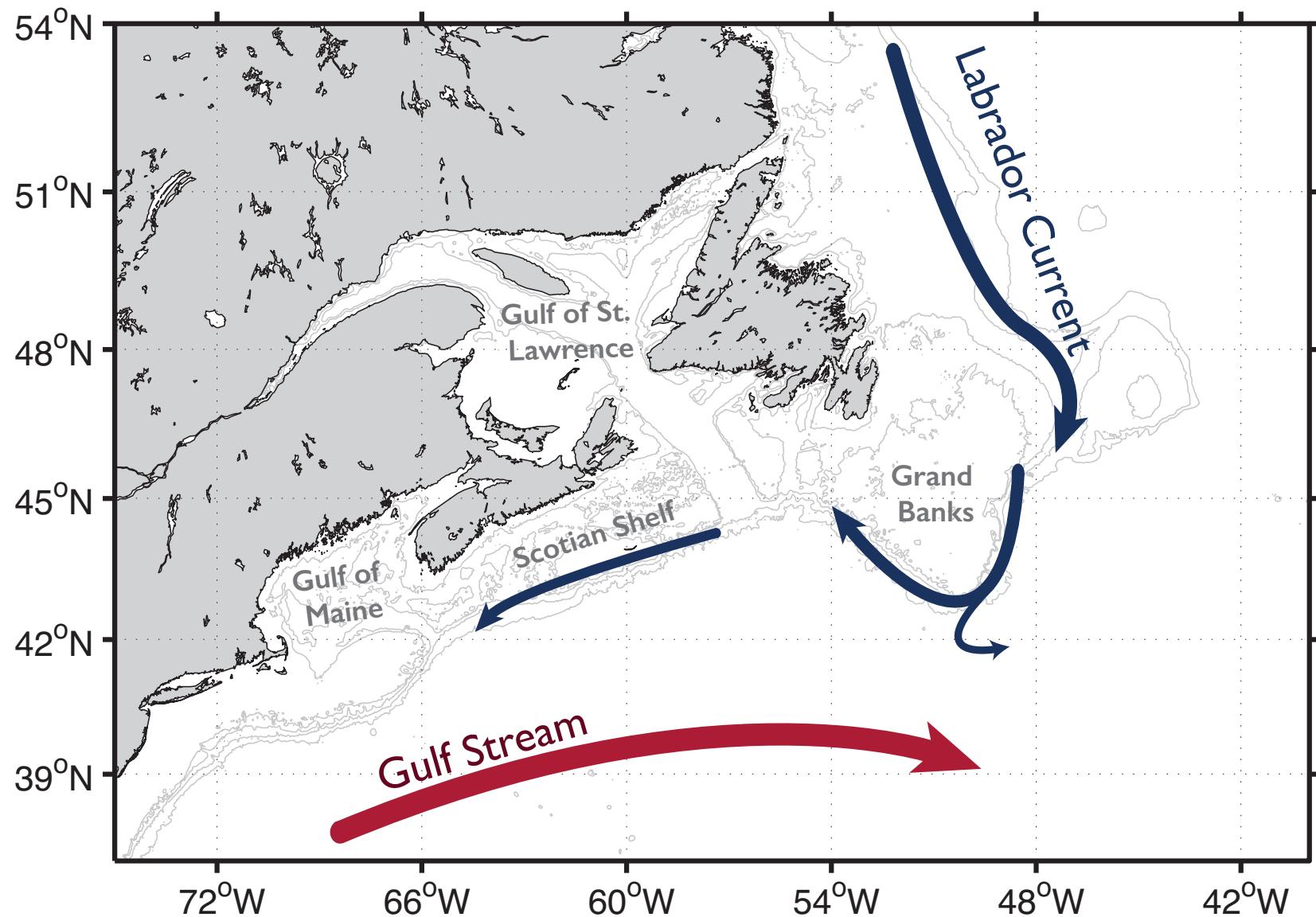
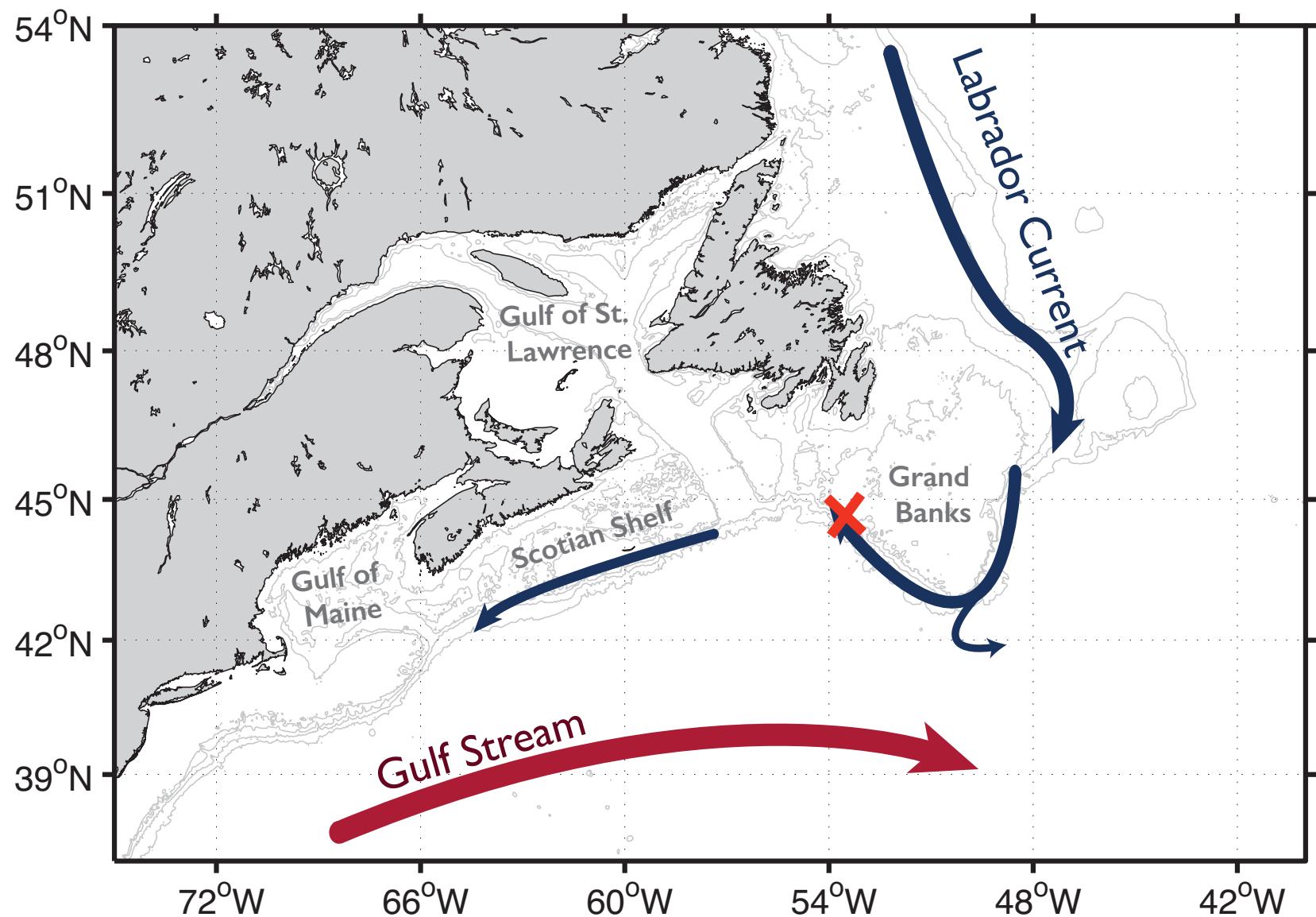


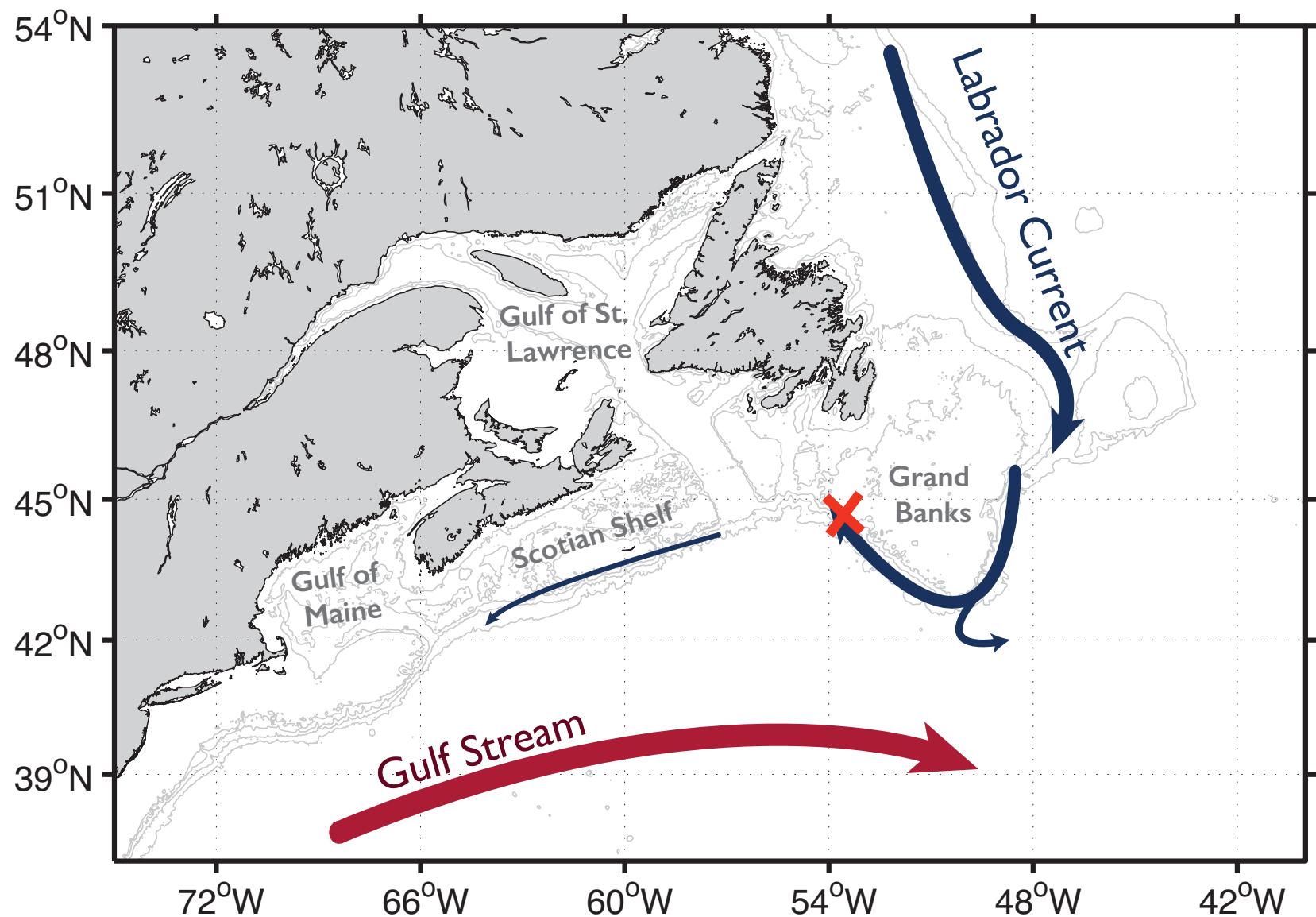
Shifting circulation under a changing climate: *Biogeochemical impacts in the northwest North Atlantic*

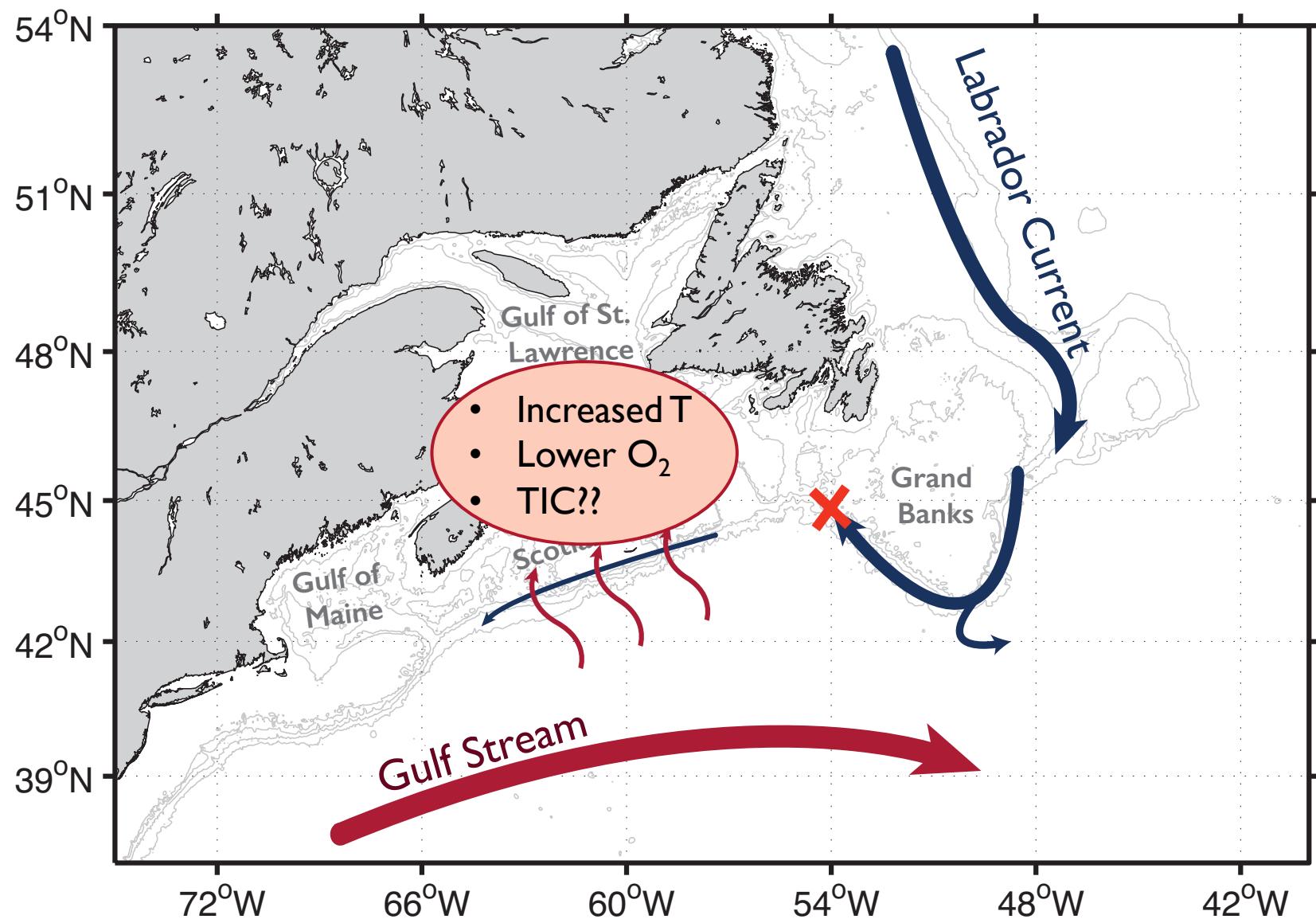


Krysten Rutherford, Katja Fennel,
Arnaud Laurent, David Brickman, Jasmin John

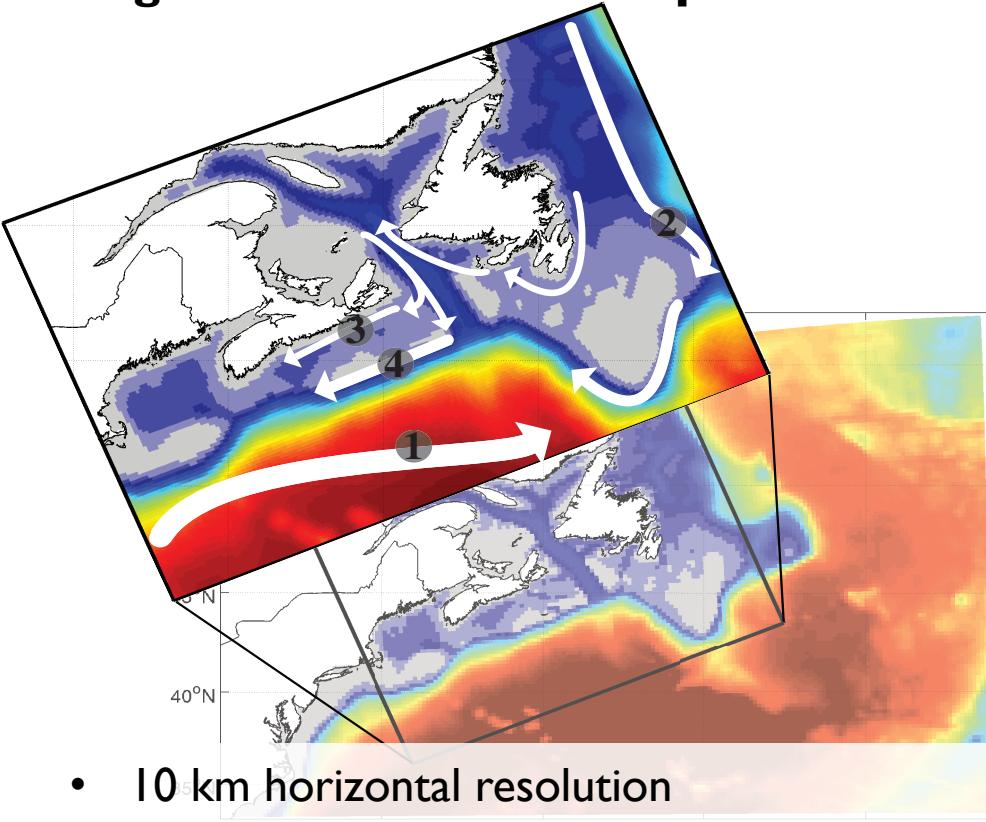








Biogeochemical ROMS implementation for Atlantic Canada



- 10 km horizontal resolution
- 30 vertical layers
- Physical B.C. from Urrego-Blanco & Sheng (2012)
- Biochemical B.C. from observations
- 3-hourly ECMWF ERA-Interim atmospheric forcing
- 12 major rivers
- Tides
- No ice
- HSIMT advection scheme

2 different future projection models are downscaled to our regional model:
DFO and **GFDL**

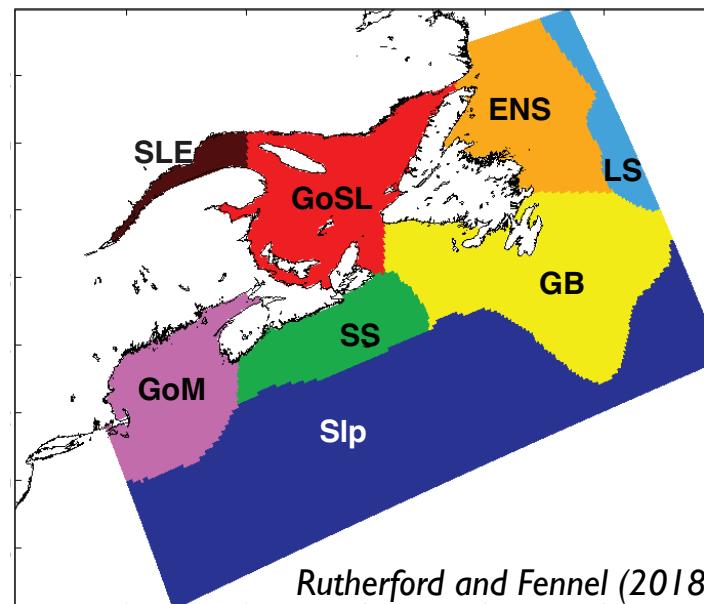
DELTA METHOD: physics (u,v,T,S), biology (O₂,NO₃,TIC,TA)

Future Simulation	with GFDL Boundary Condition (B.C.)	Atm. carbon and TIC B.C. increased to year ~2060 RCP 8.5 values
	with DFO B.C.	

DELTA METHOD: physics (u, v, T, S), biology (O_2, NO_3, TIC, TA)

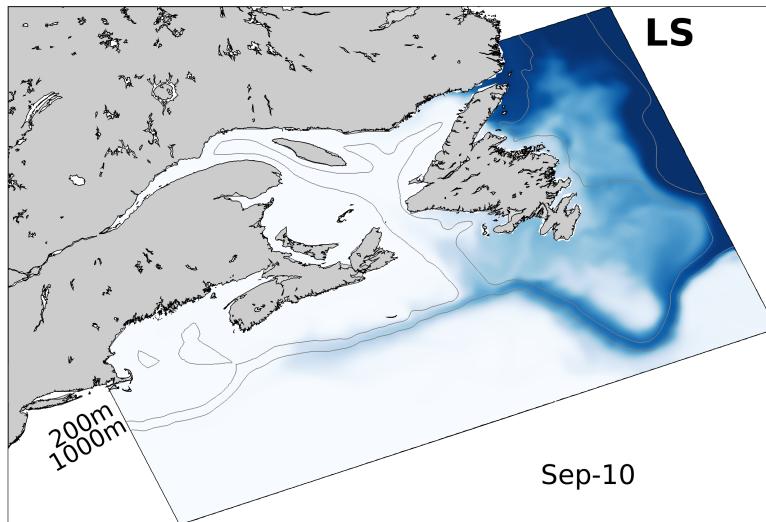
Future Simulation	with GFDL Boundary Condition (B.C.)	Atm. carbon and TIC B.C. increased to year ~2060 RCP 8.5 values
	with DFO B.C.	
Circulation Simulation	with GFDL B.C.	Atm. carbon and TIC/TA B.C. @ present-day levels
	with DFO B.C.	

Dye Tracer Initialization

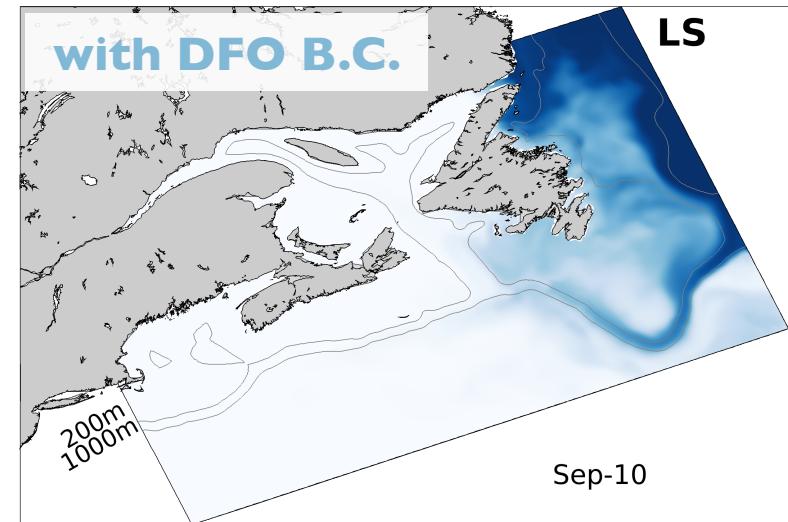


** vertical mean dye tracer concentrations

PRESENT

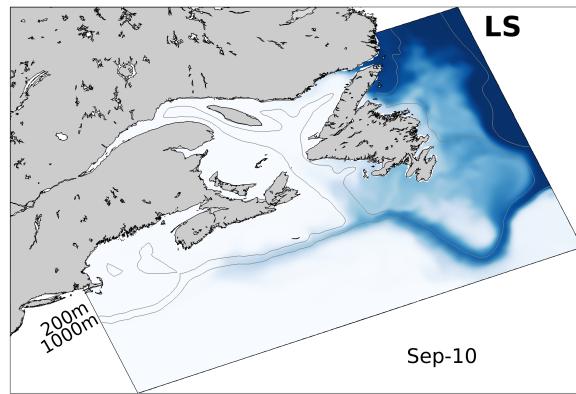


FUTURE

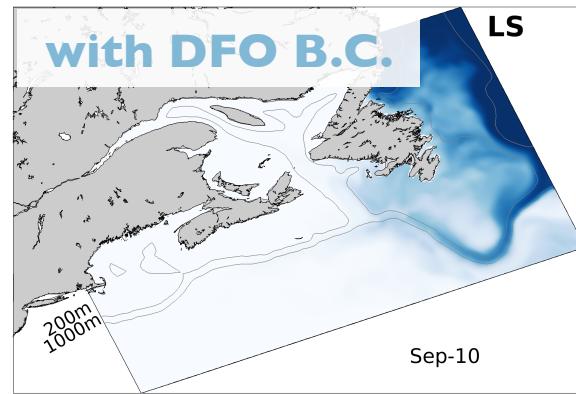


** vertical mean dye tracer concentrations

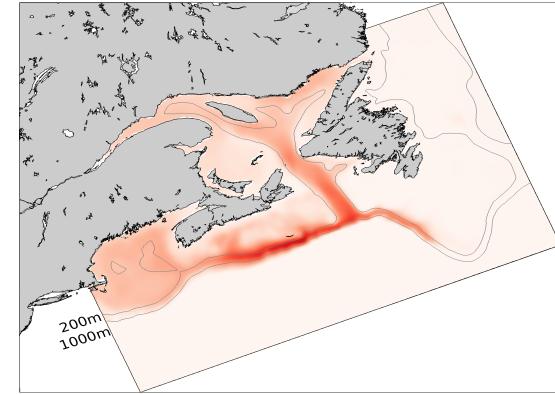
PRESENT



FUTURE

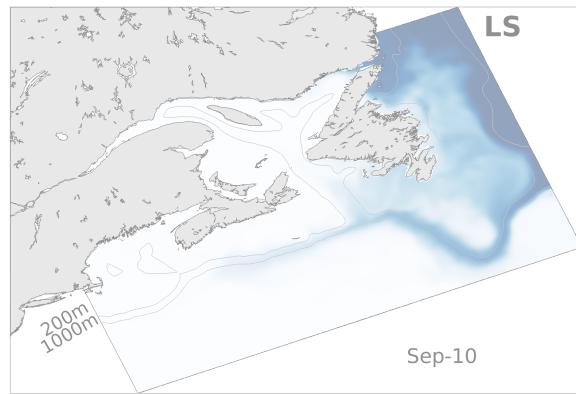


FUTURE DECREASE

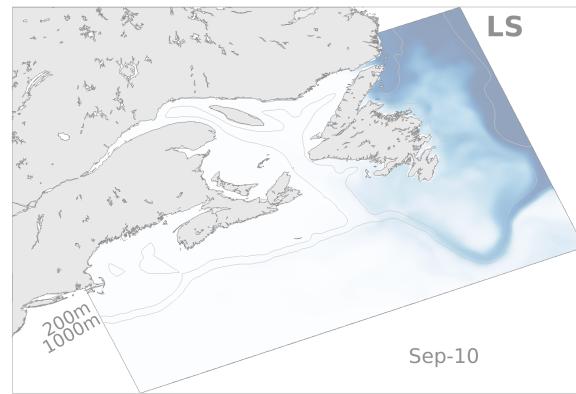


** vertical mean dye tracer concentrations

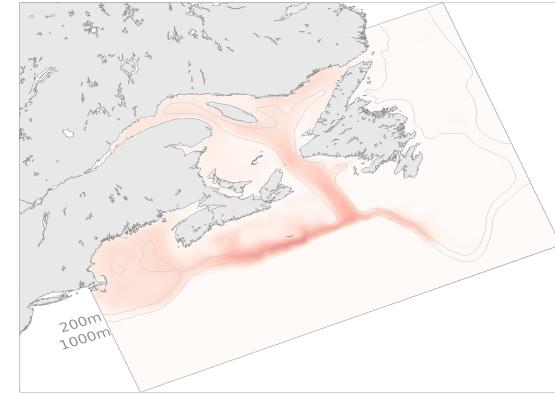
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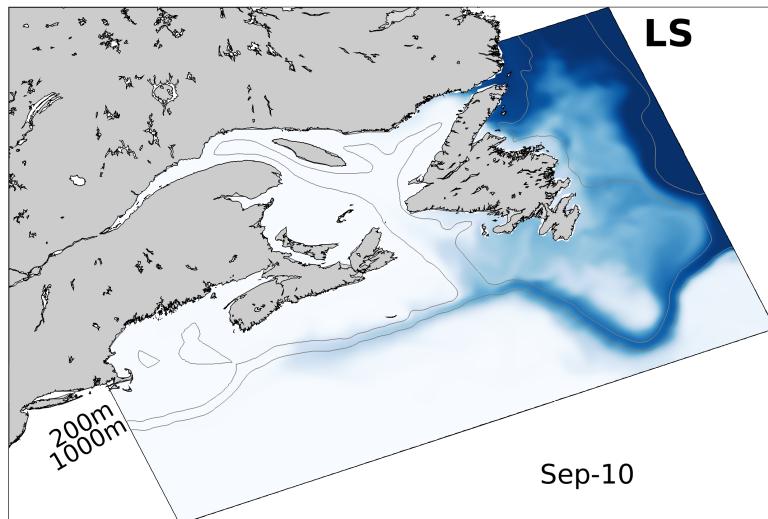
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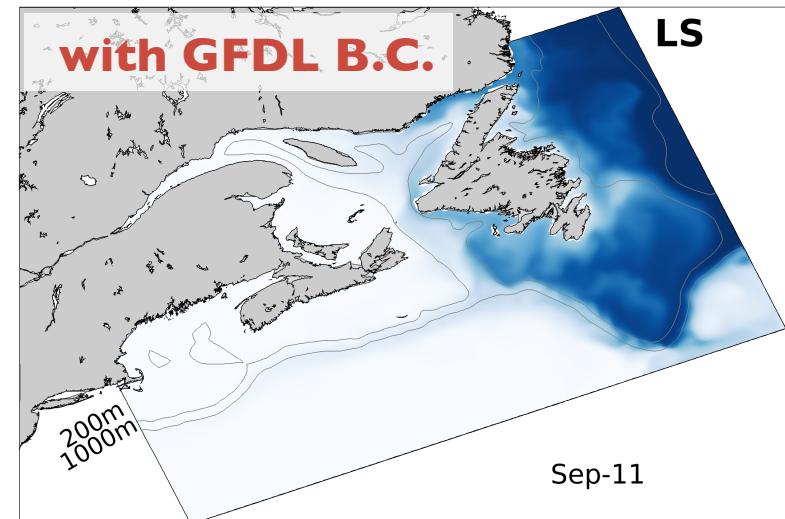
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PRESENT

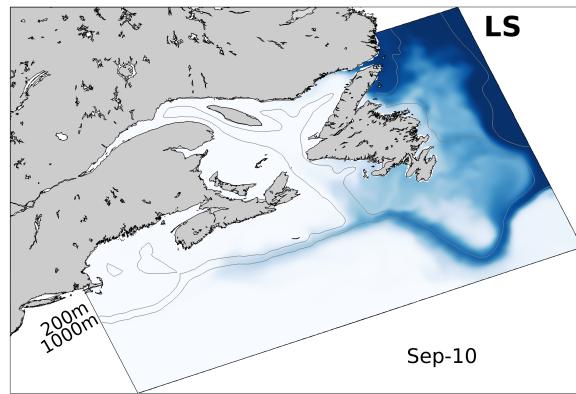


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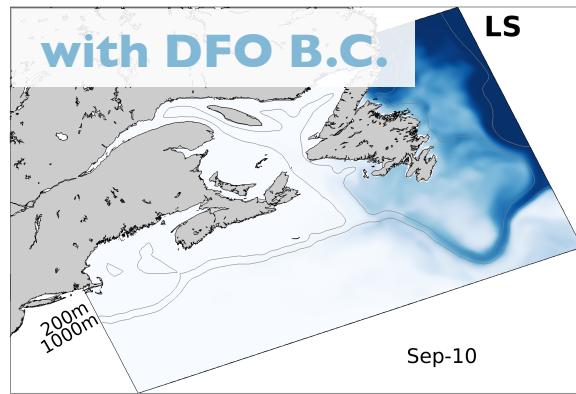


** vertical mean dye tracer concentrations

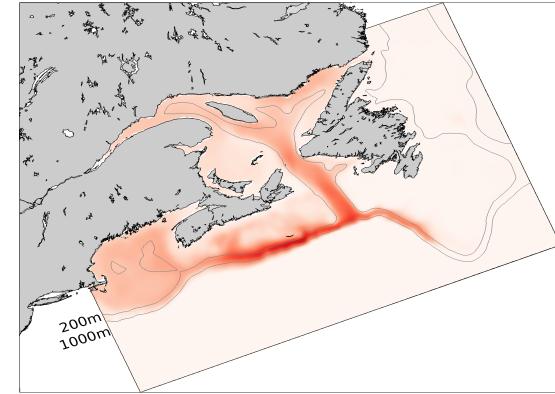
PRESENT



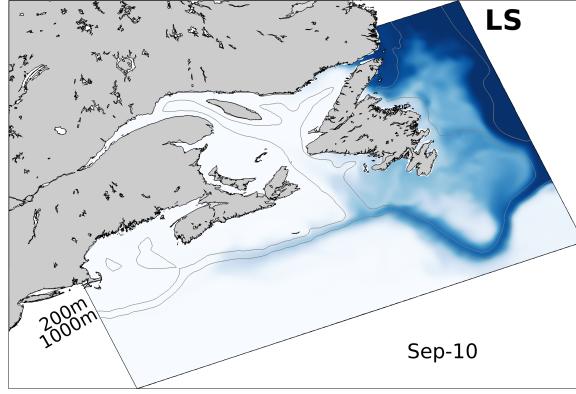
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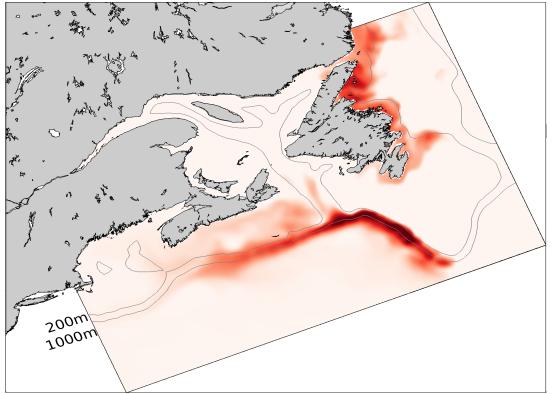
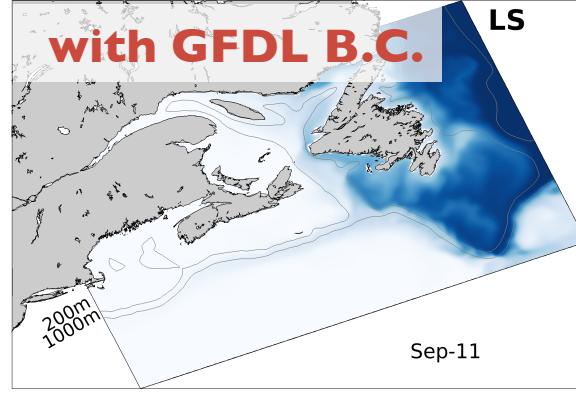
FUTURE DECREASE

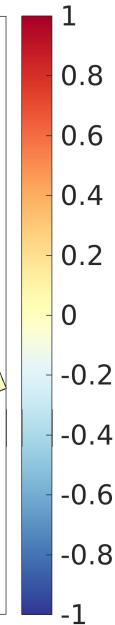
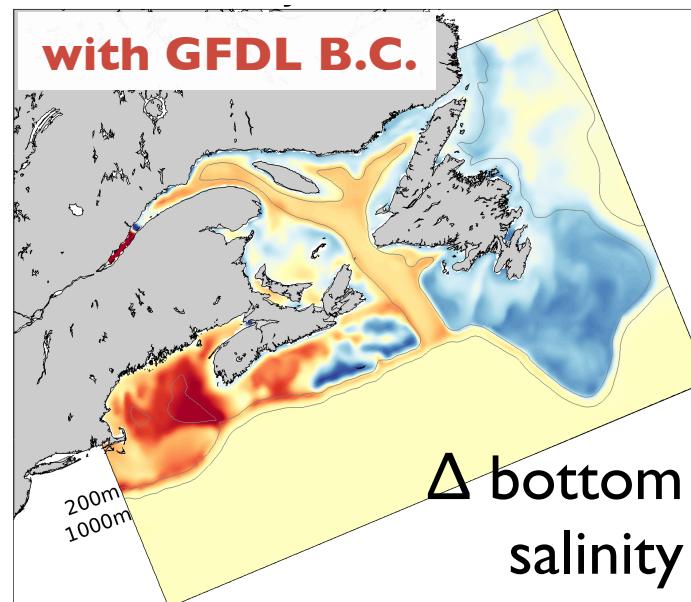
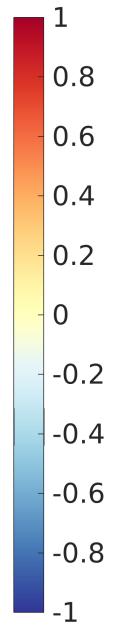
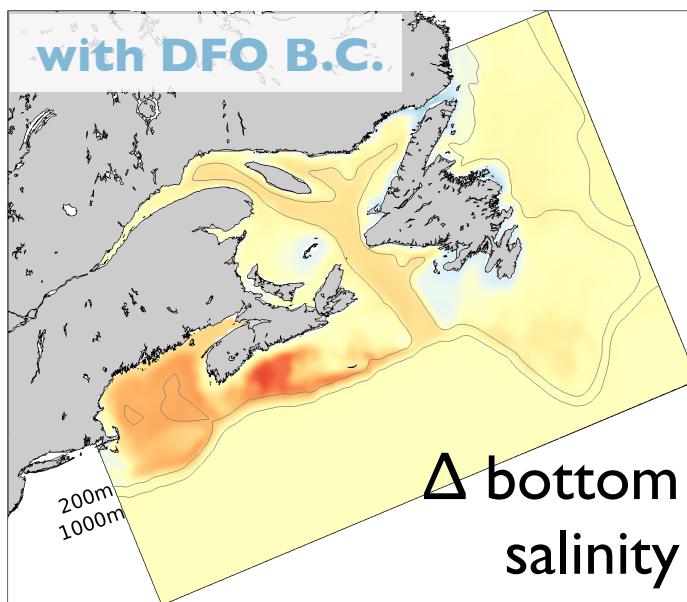
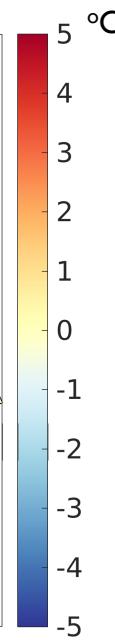
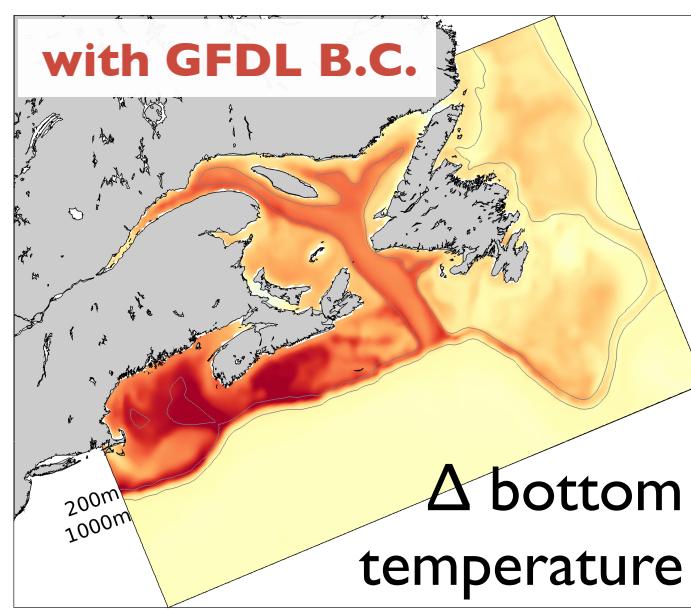
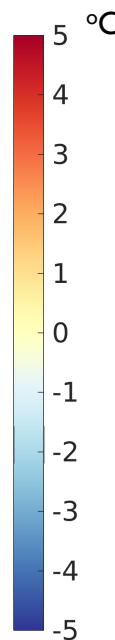
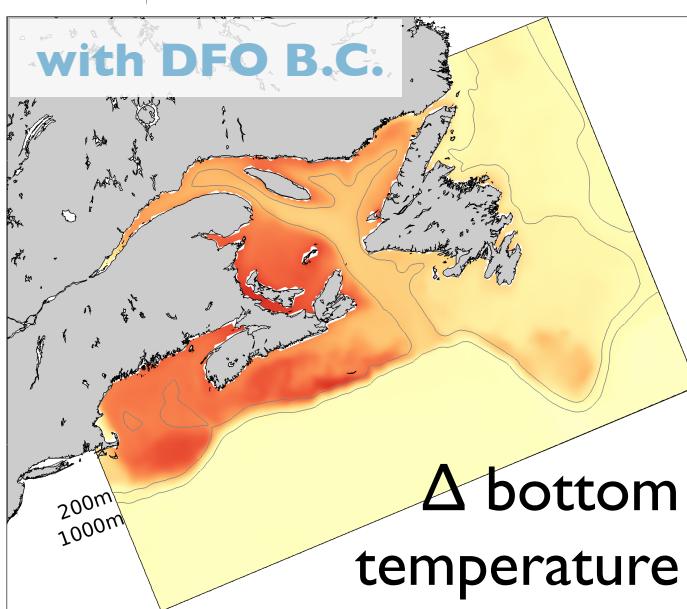


LS

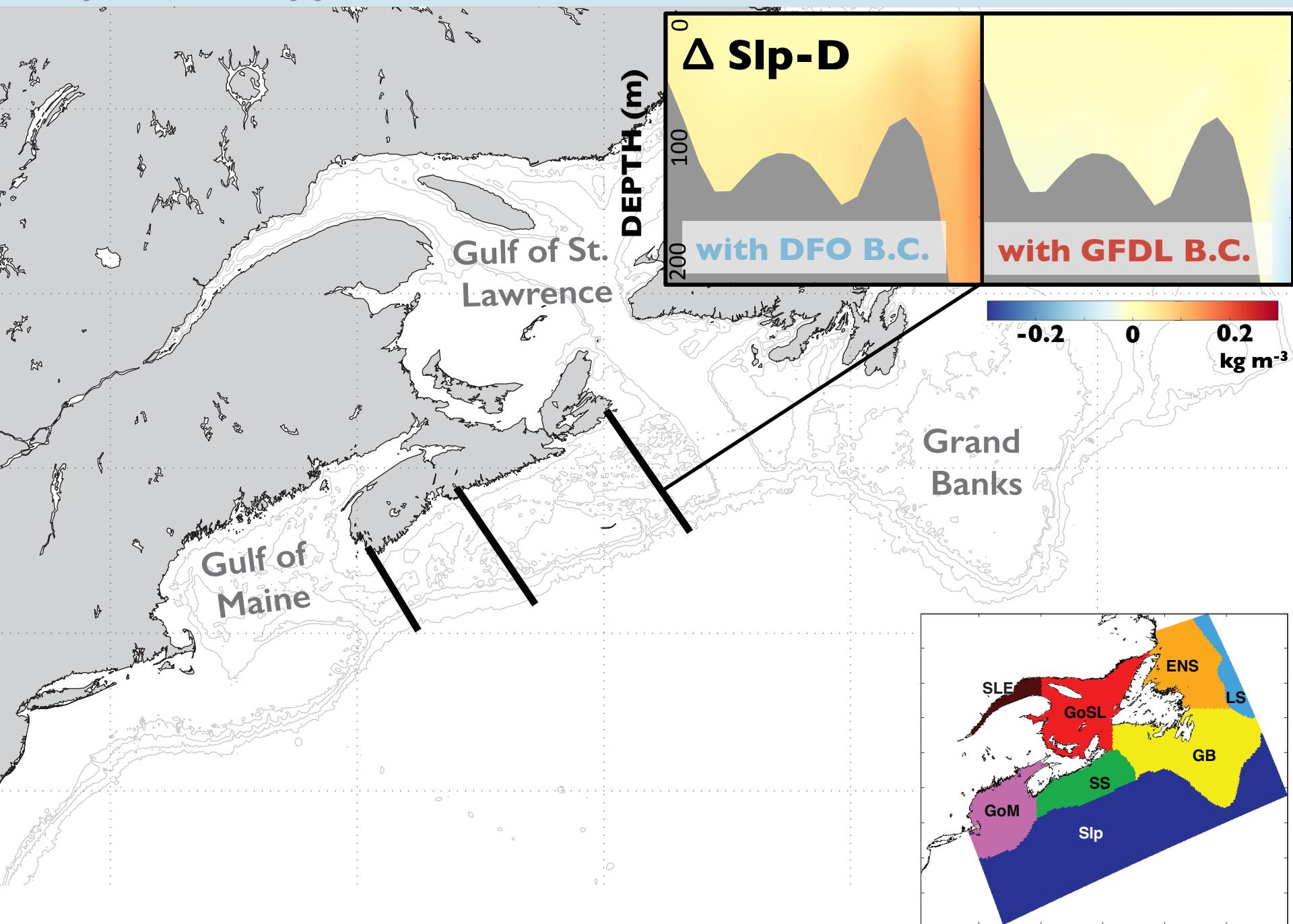


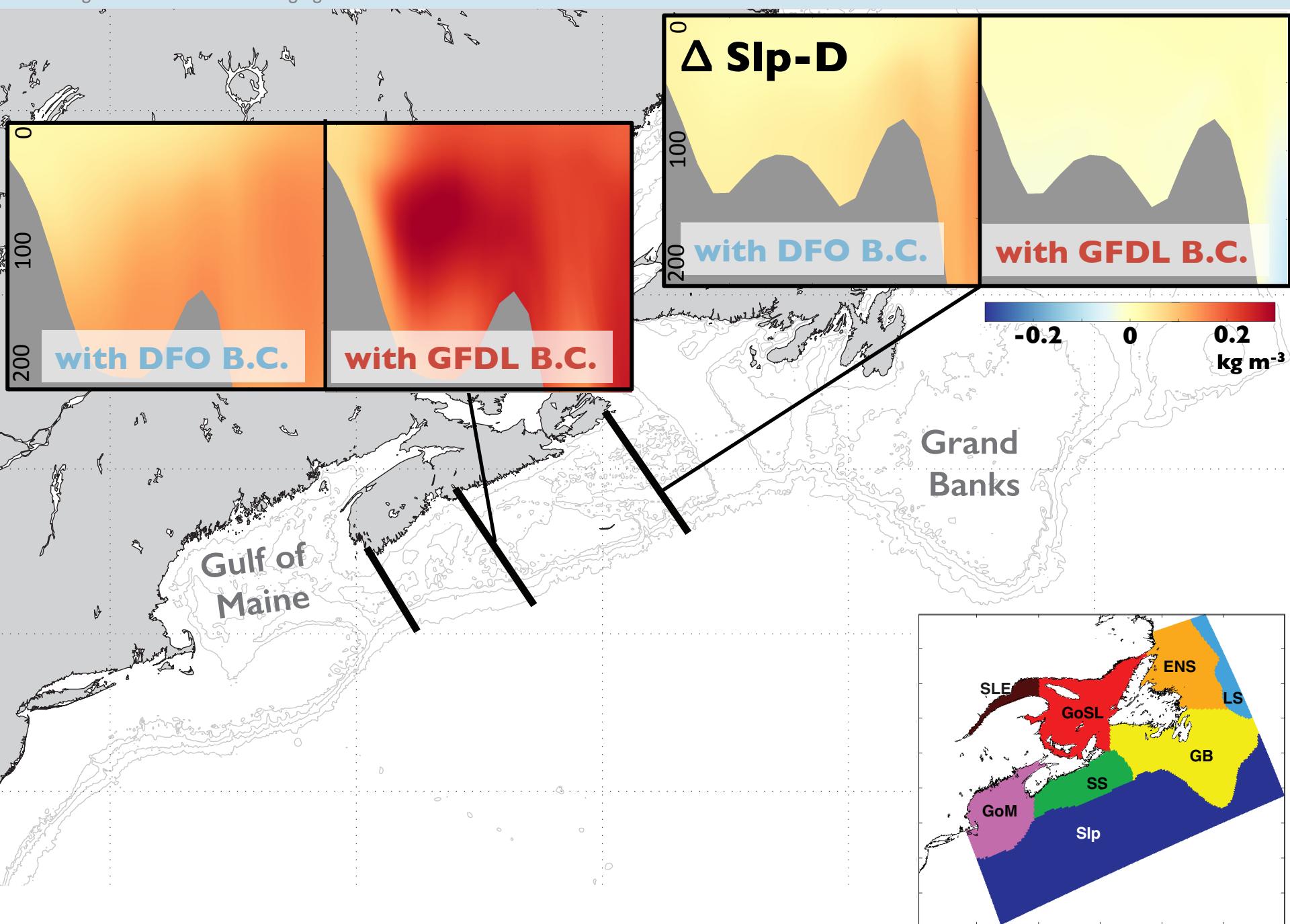
with GFDL B.C.
LS

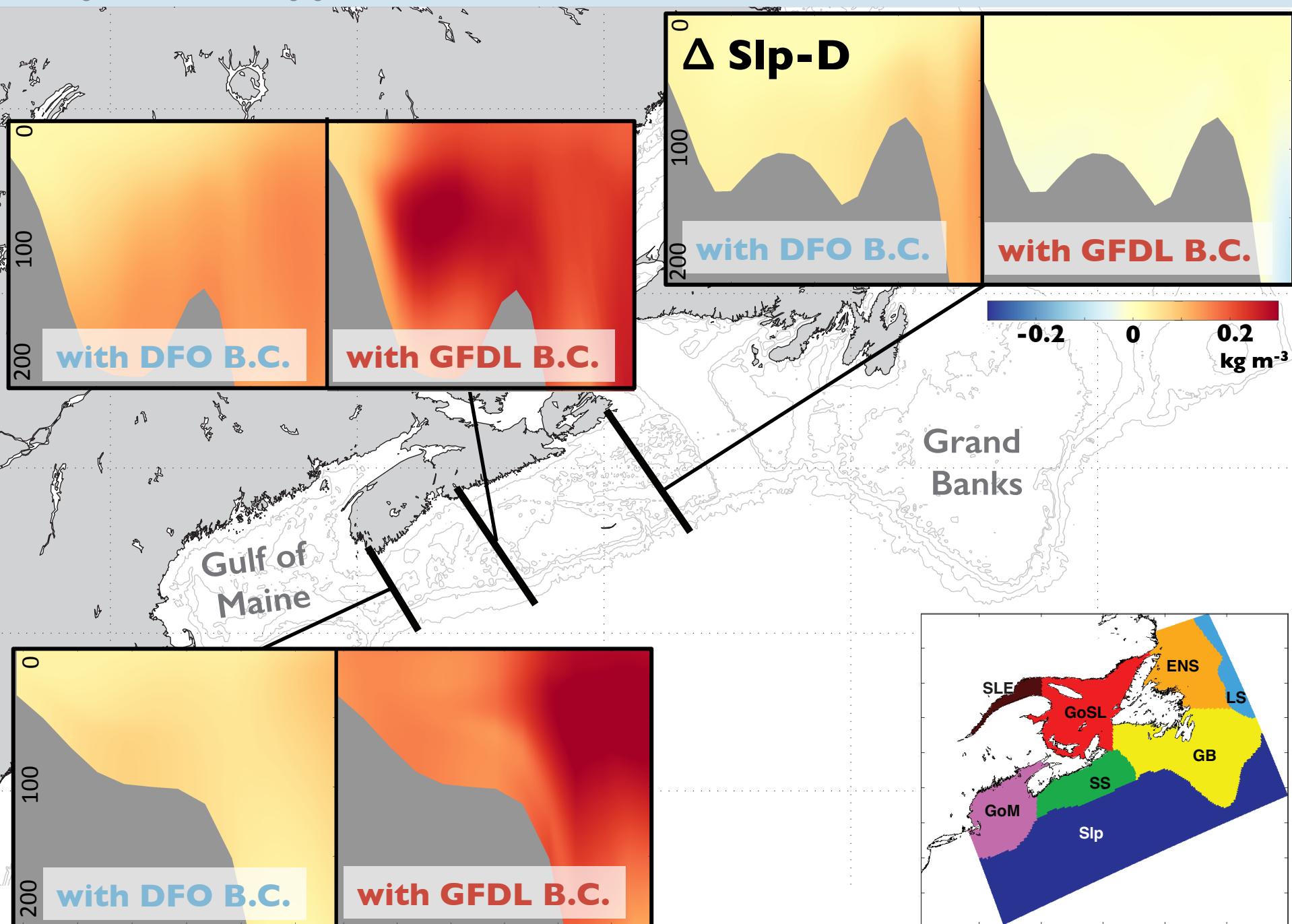


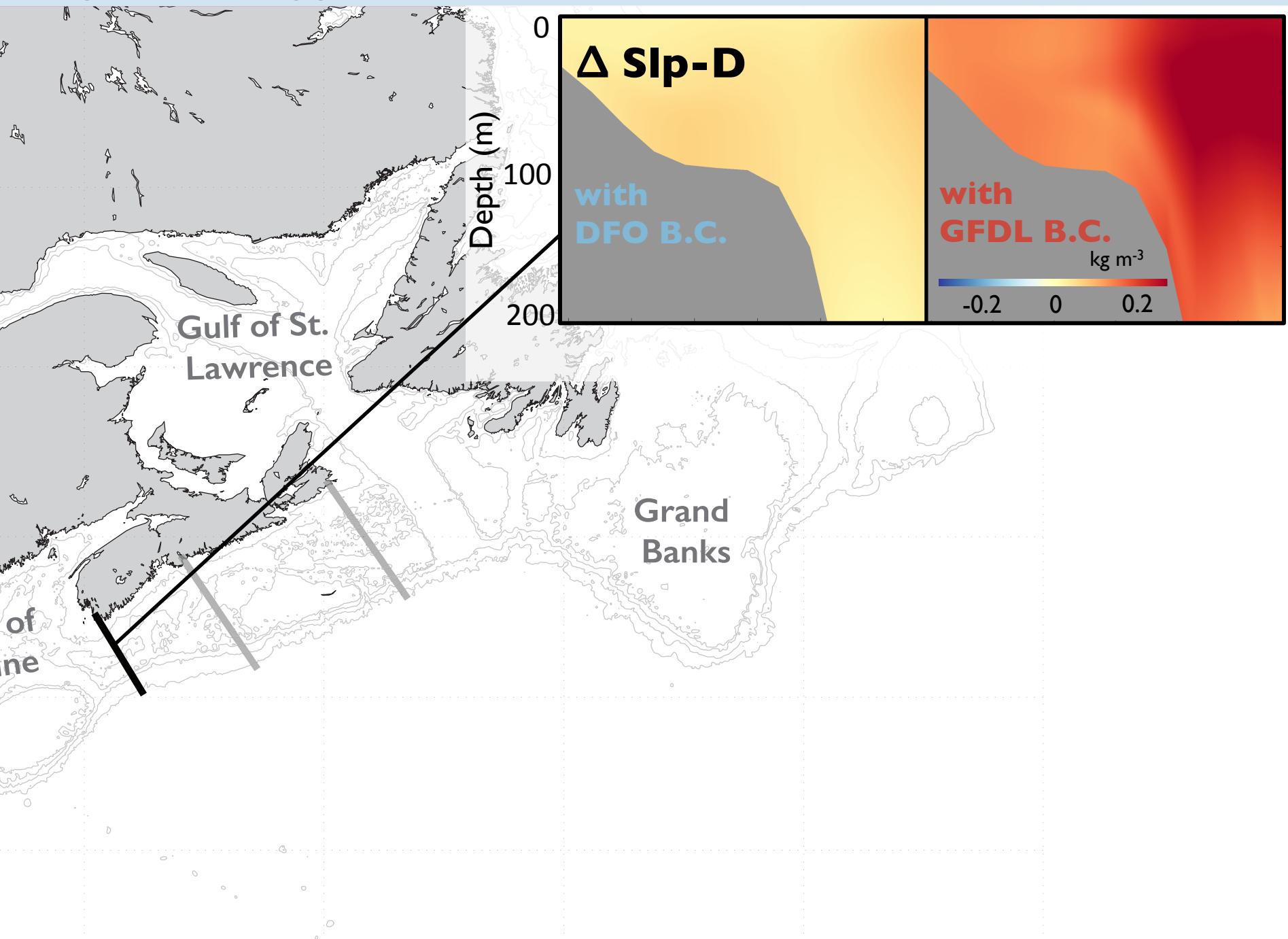


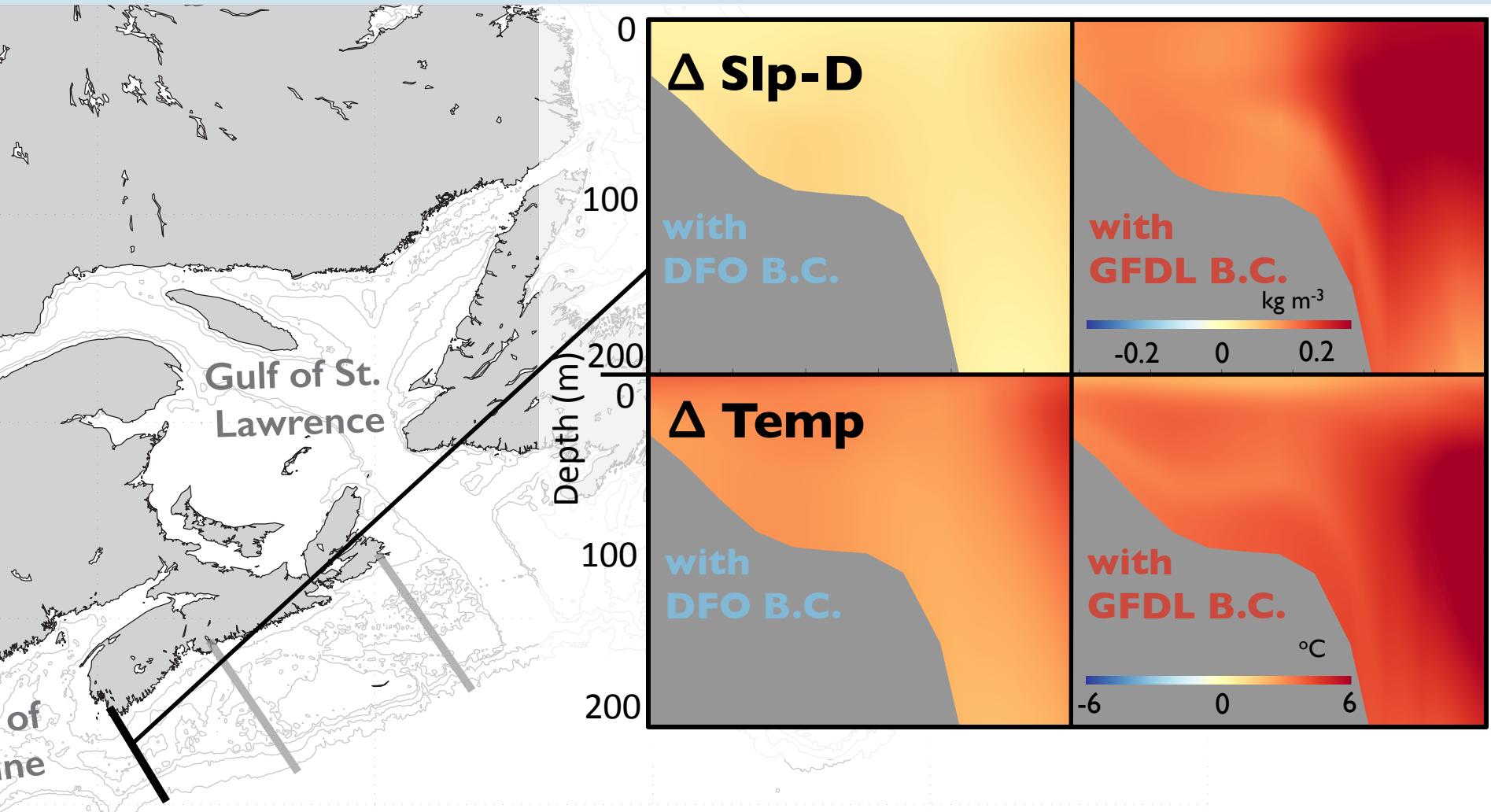


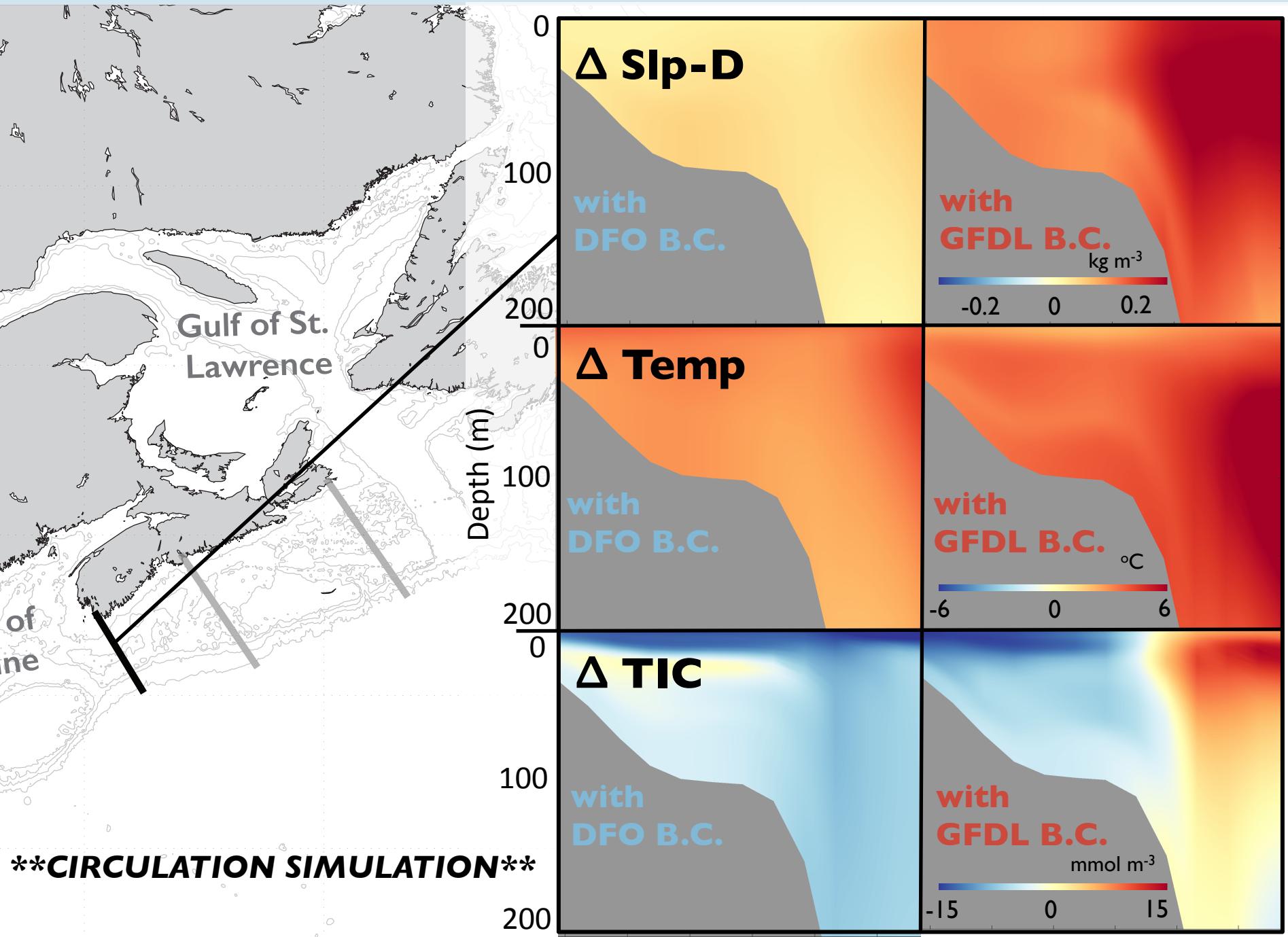


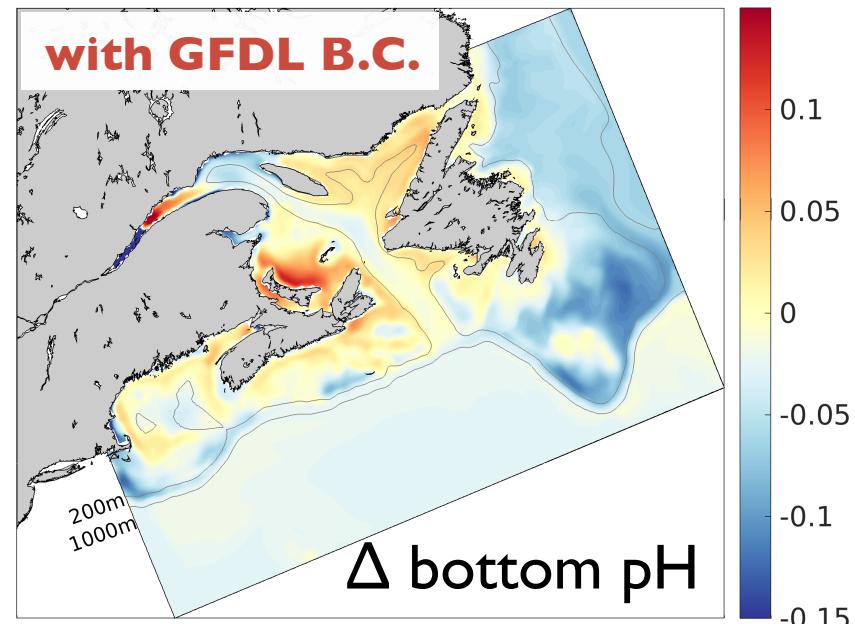
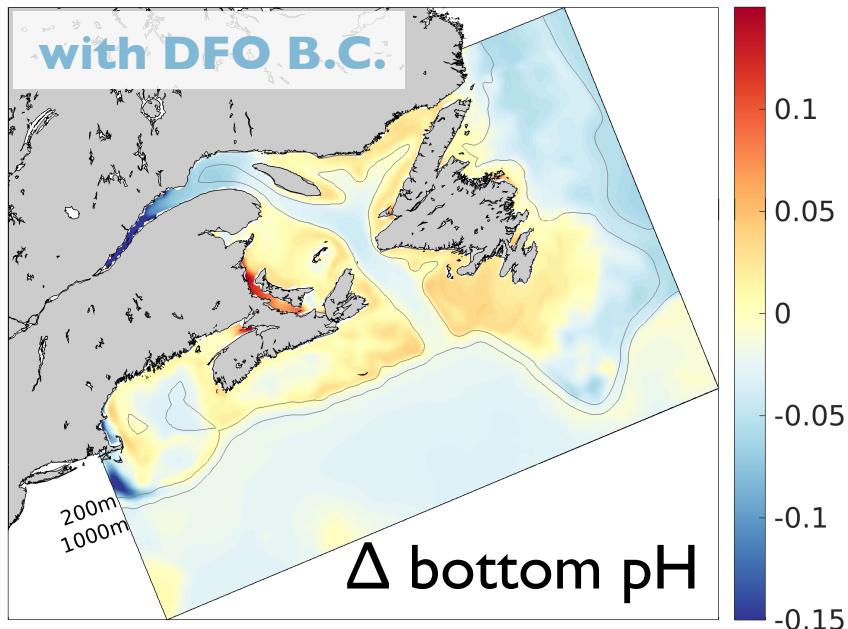










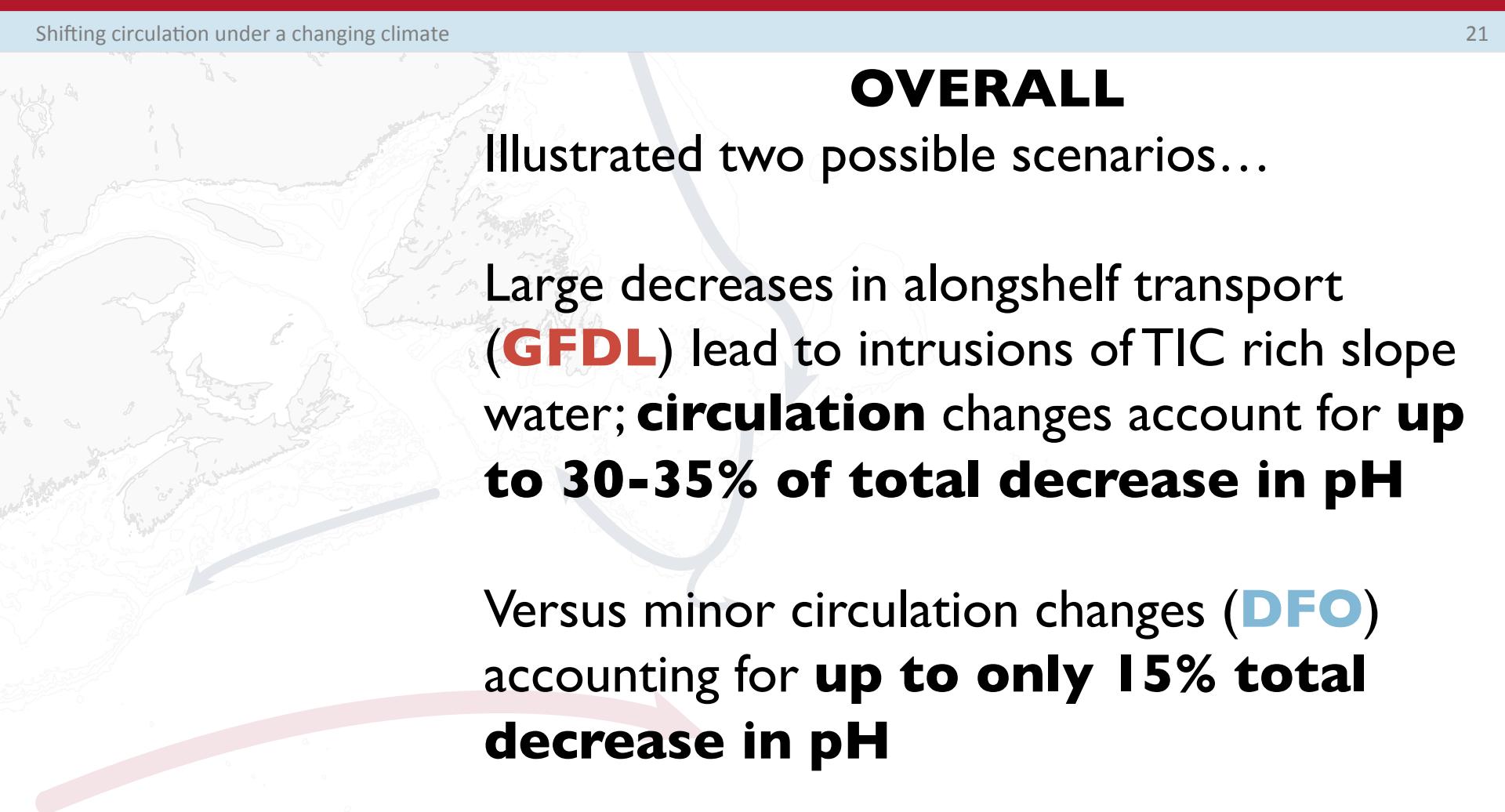
****CIRCULATION SIMULATION******Circulation effects account for:**

up to ~15% of total decrease in pH

up to 30-35% of total decrease in pH

OVERALL

Illustrated two possible scenarios...



Large decreases in alongshelf transport (**GFDL**) lead to intrusions of TIC rich slope water; **circulation** changes account for **up to 30-35% of total decrease in pH**

Versus minor circulation changes (**DFO**) accounting for **up to only 15% total decrease in pH**

Circulation changes alone can lead to large changes in shelf-wide pH, compounding the effects of increasing atm pCO₂