# The ocean's carbon and oxygen cycles in future steady-state climate scenarios

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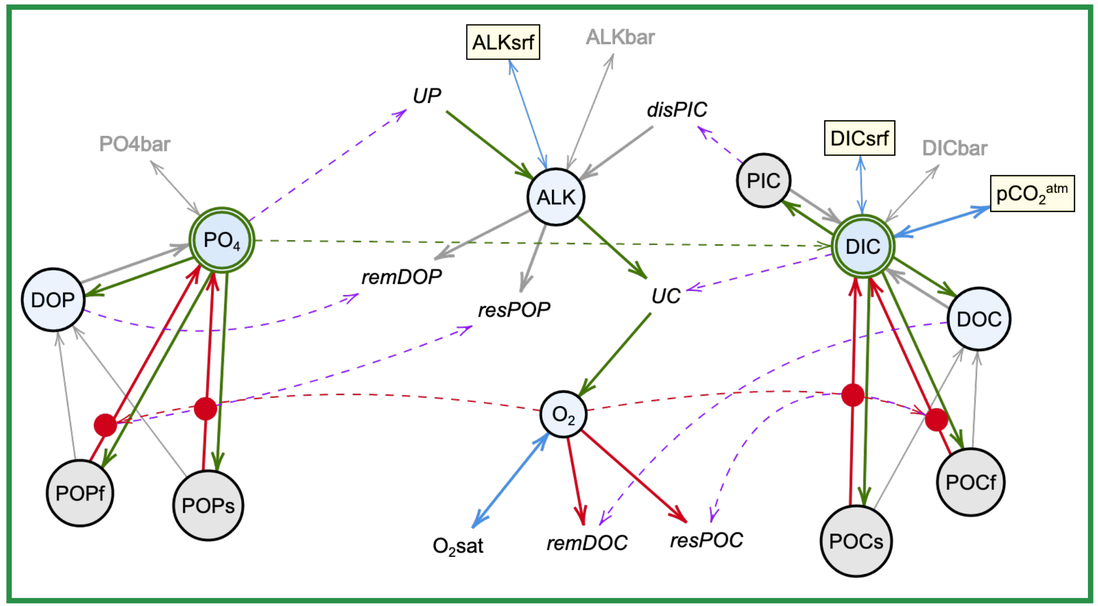
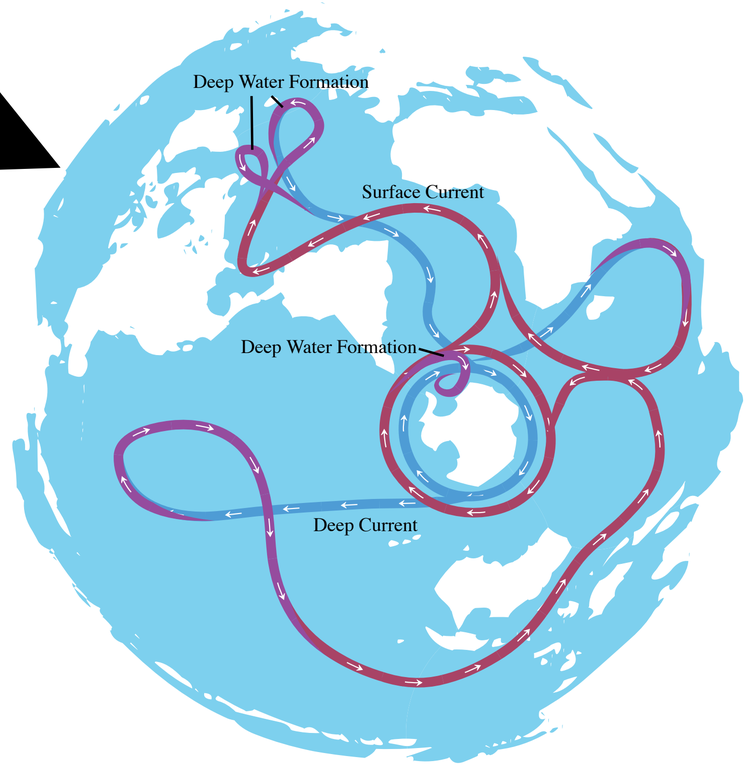
# PCO2
# biogeochemistry model

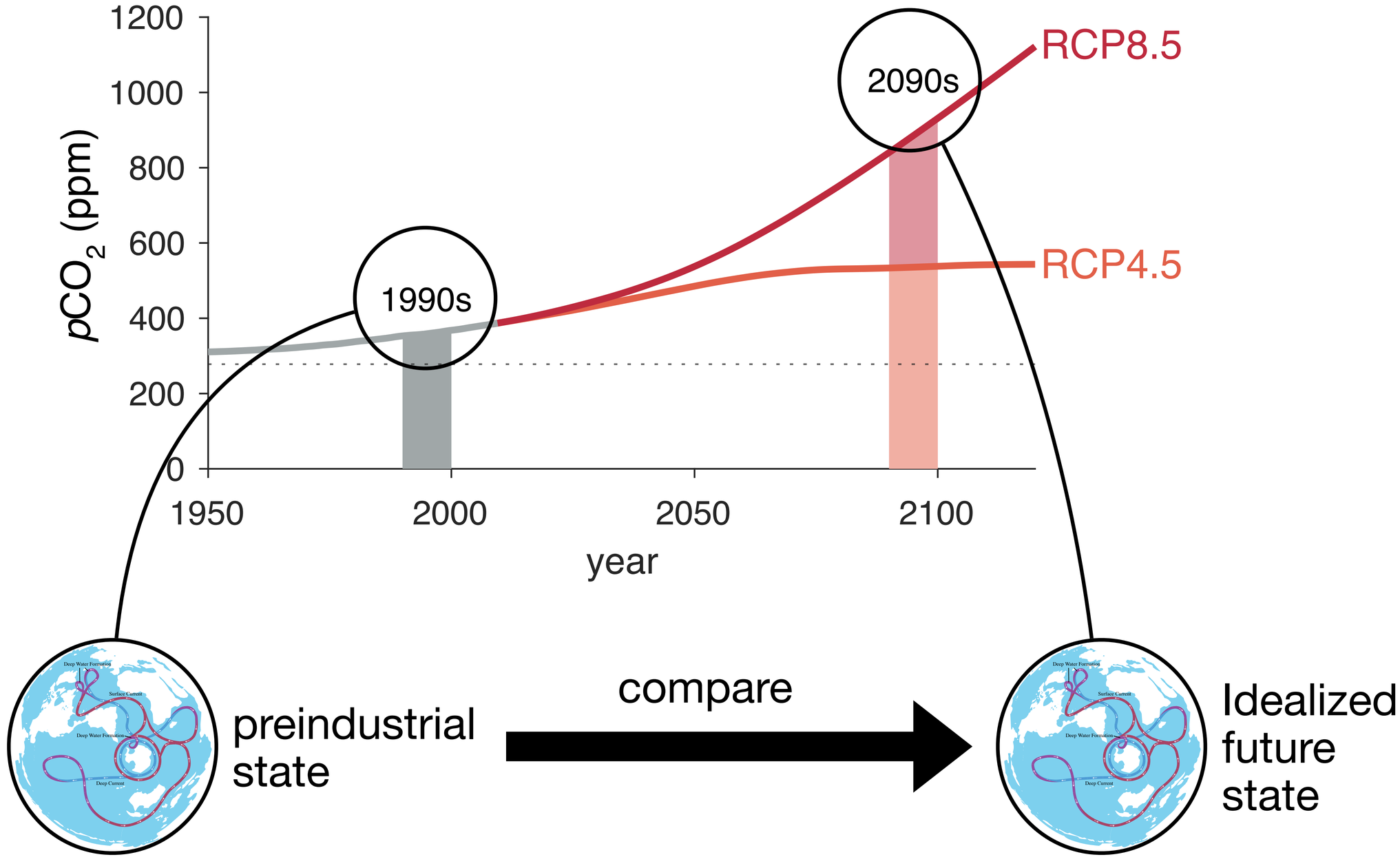



P, C, $O_2$ cycles

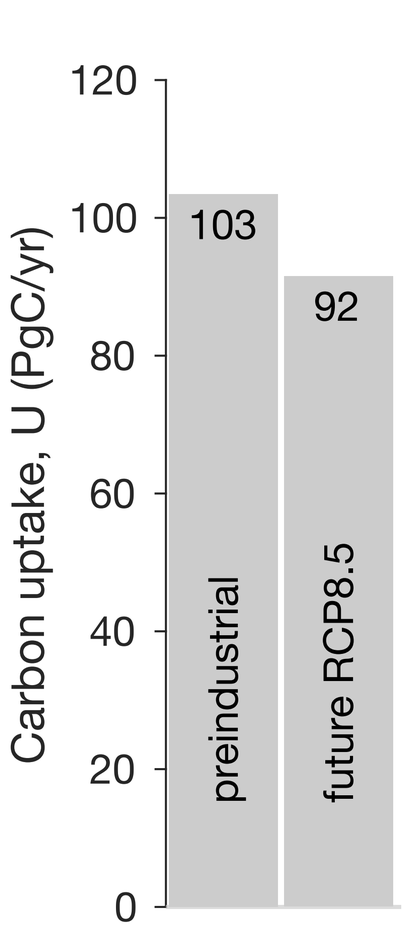
# ACCESS-M
# steady ocean circulation model




No time stepping! No spinup!


1200
1000
800
600
400
200
0
$pCO_2$ (ppm)
1990s
2090s
RCP8.5
RCP4.5
1950
2000
2050
2100
year
Deep Water Formation
Surface Current
Deep Water Formation
Deep Current
preindustrial state
compare
Deep Water Formation
Surface Current
Deep Water Formation
Deep Current
Idealized future state

# Biological C uptake: –10%



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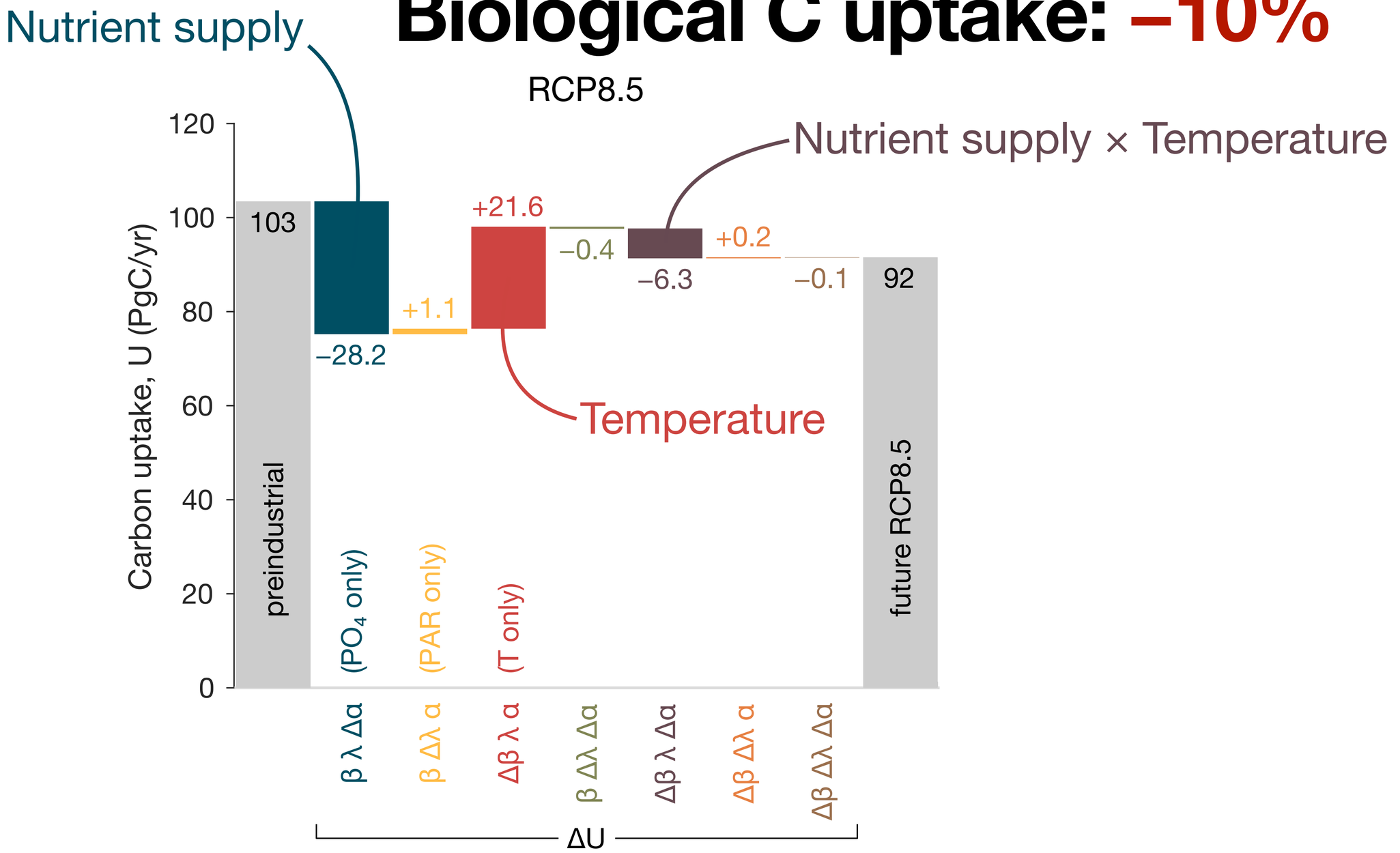
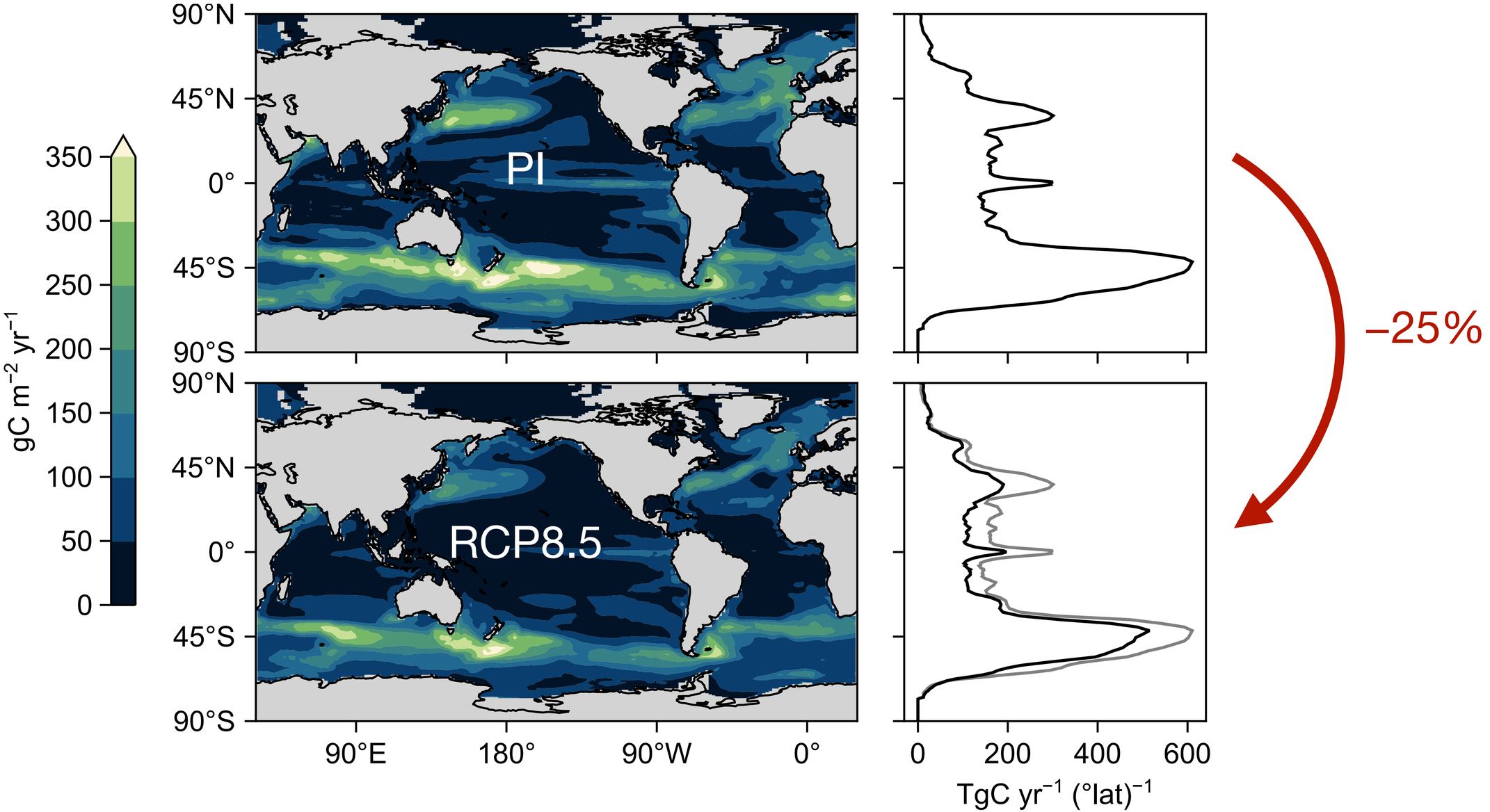
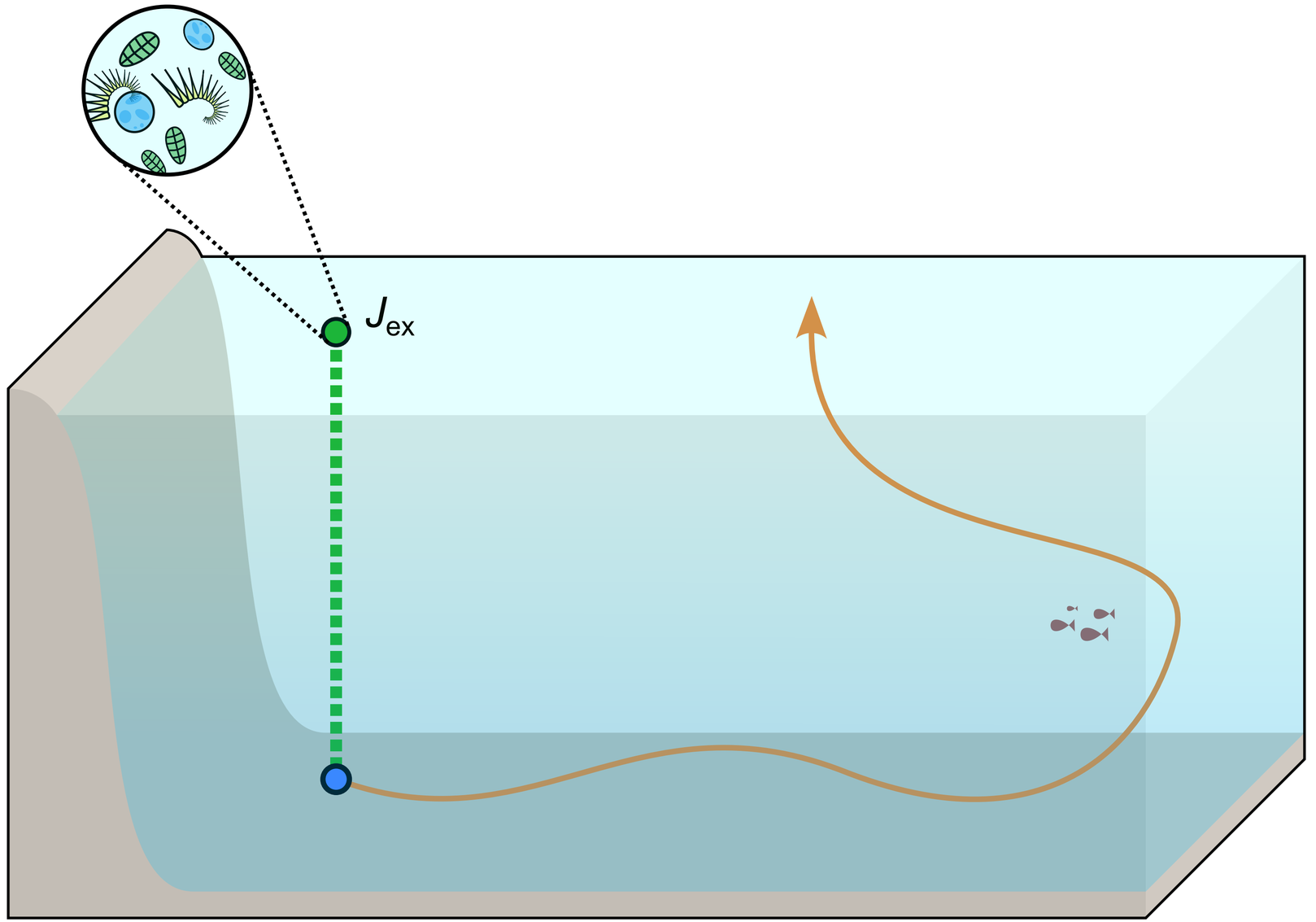


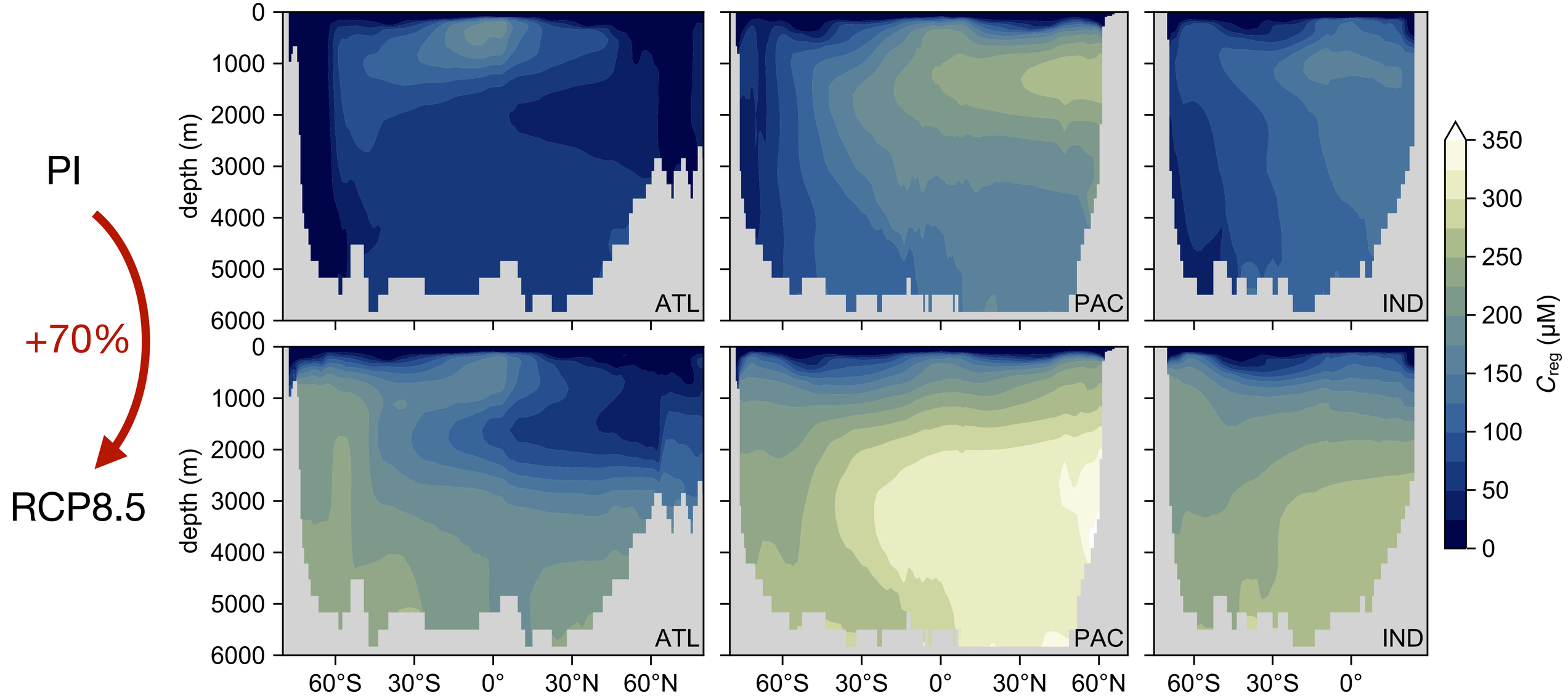
# C export production: –25%



# Regenerated C



# Regenerated C: +70%!



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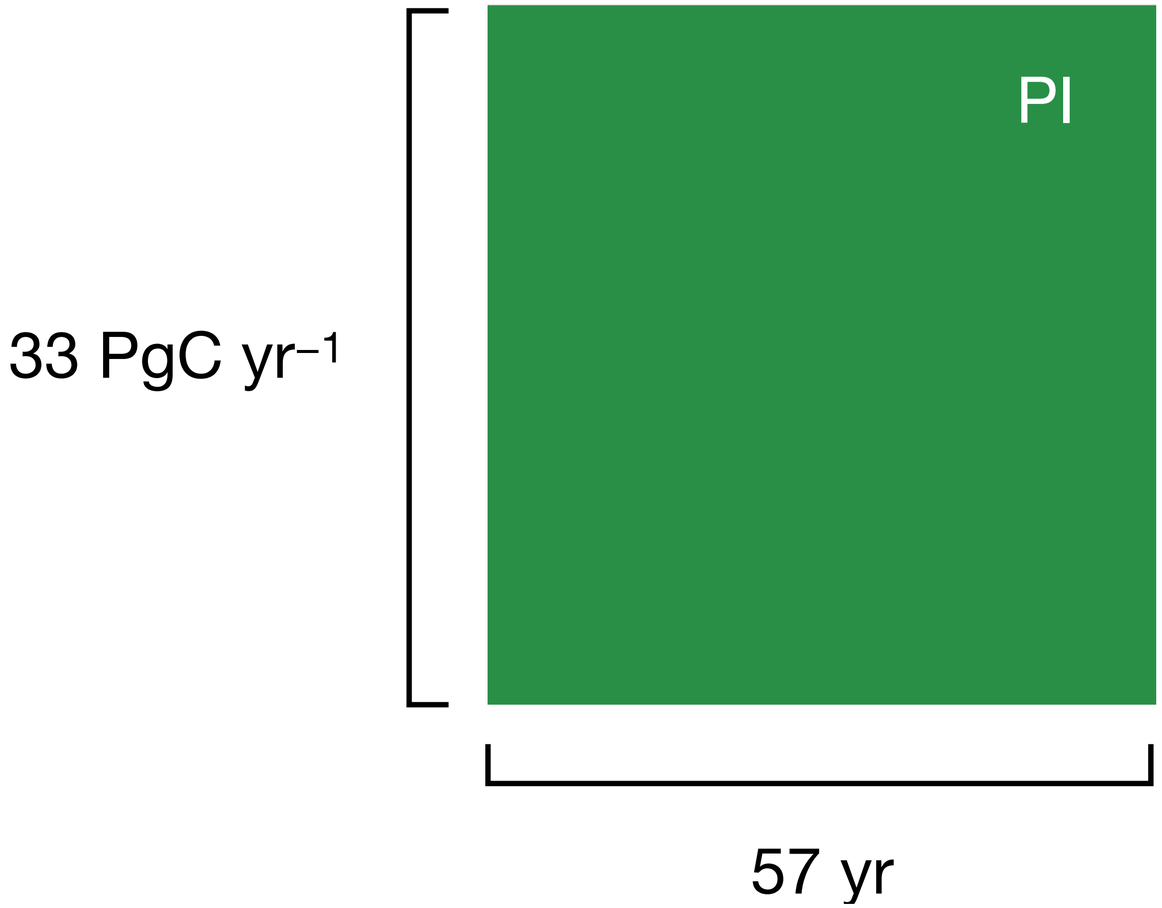
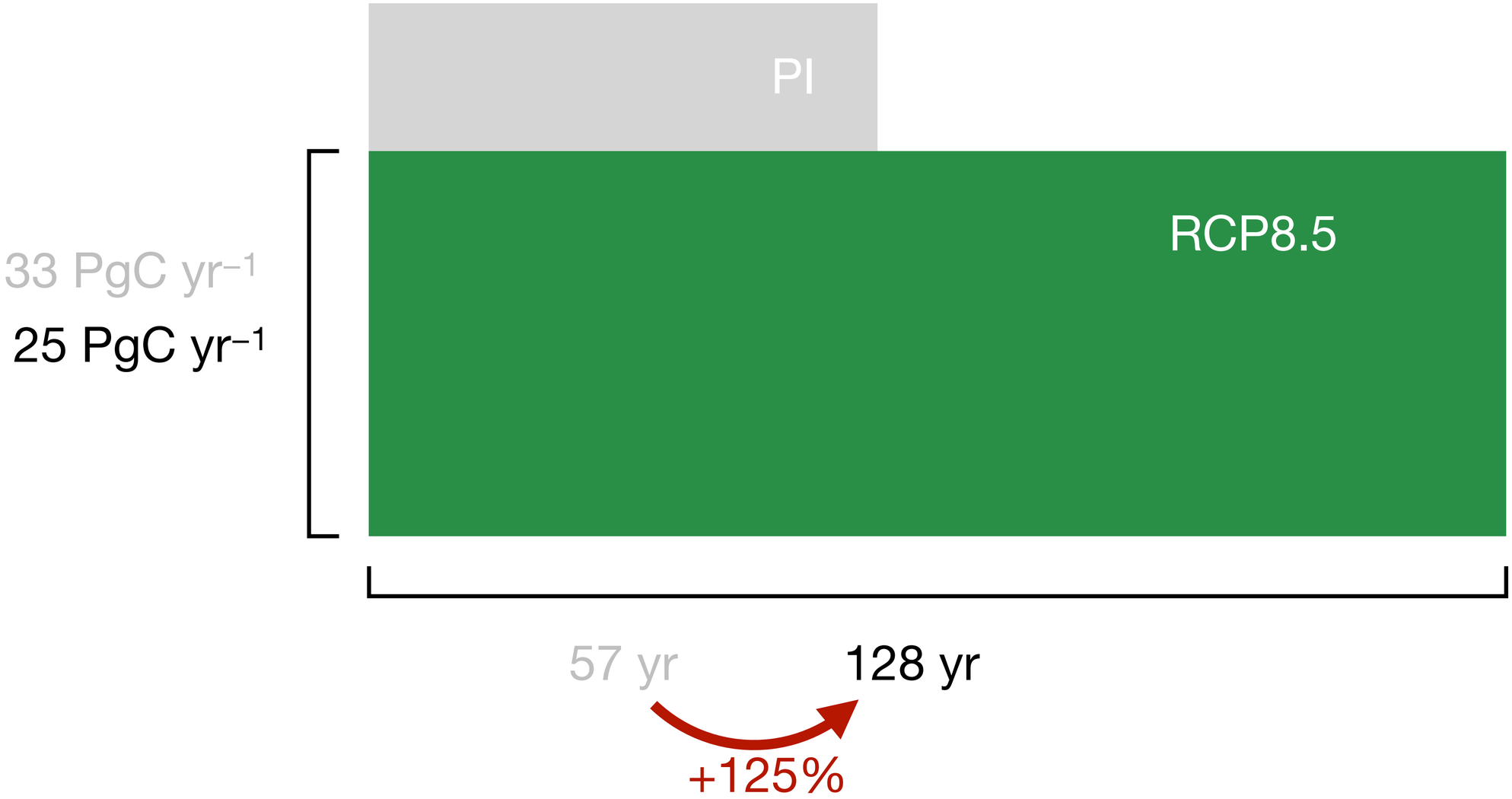


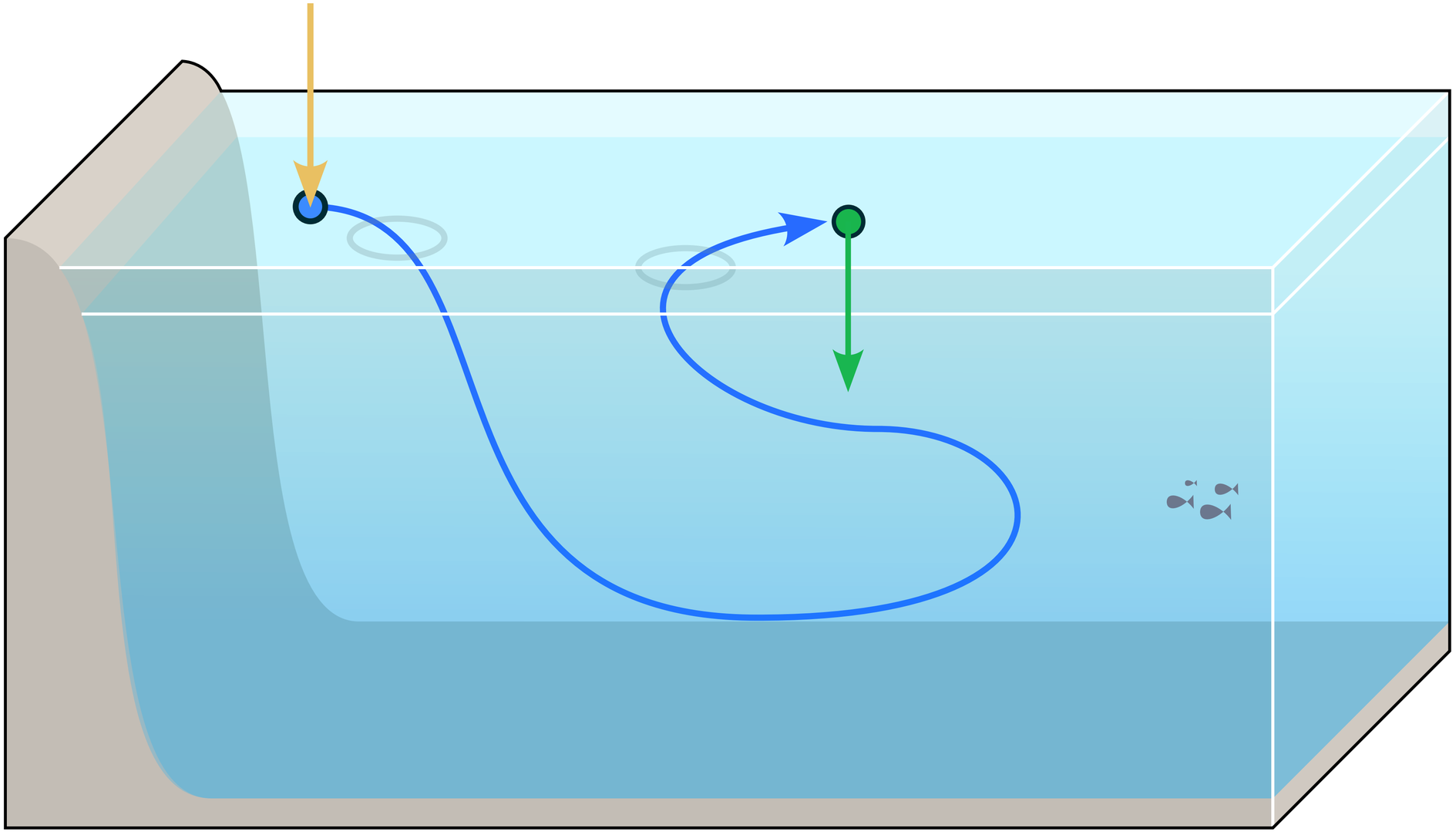
# Regenerated C: +70%!

Slower circulation ⟹ longer residence time



# Tracking preformed C

Novel concept of a
Preformed C tracer!



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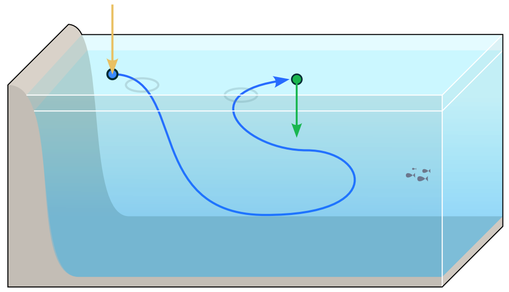
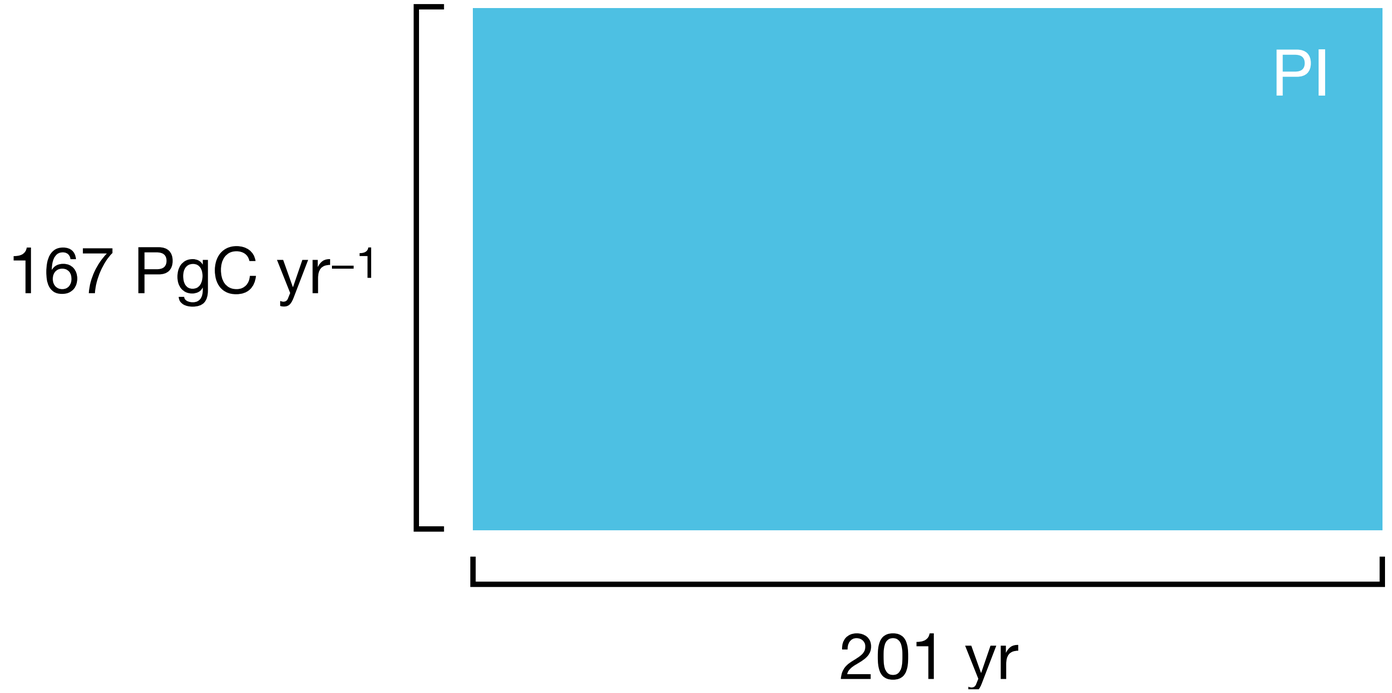
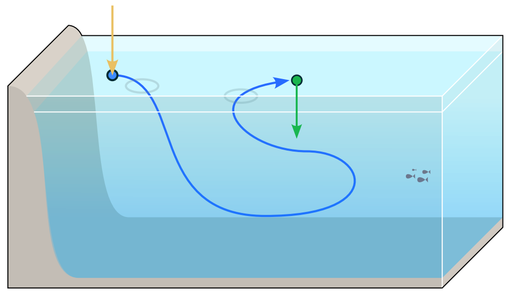




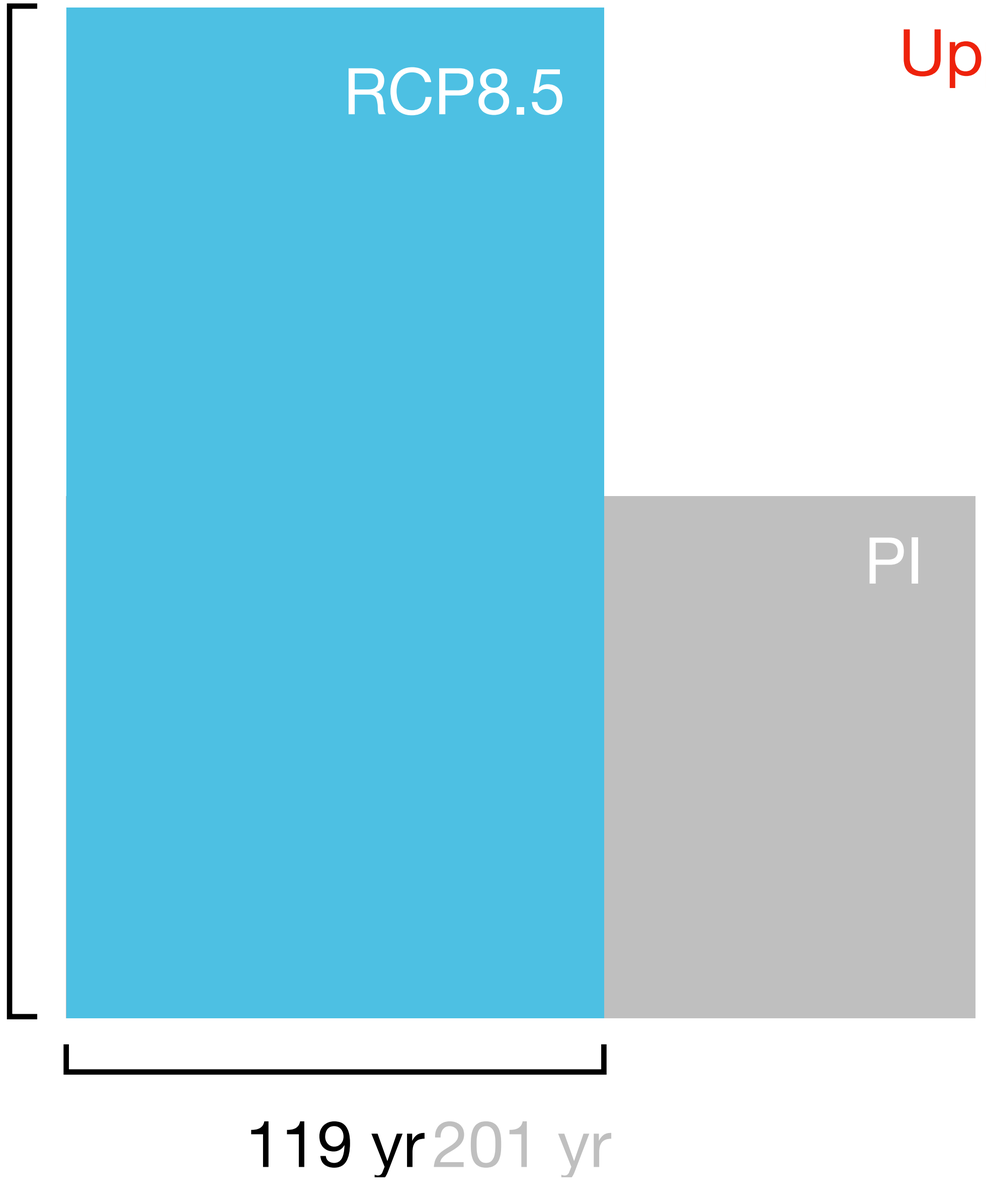
# Tracking preformed C: shorter residence times!?

Novel concept of a
Preformed C tracer!



295 PgC yr$^{-1}$

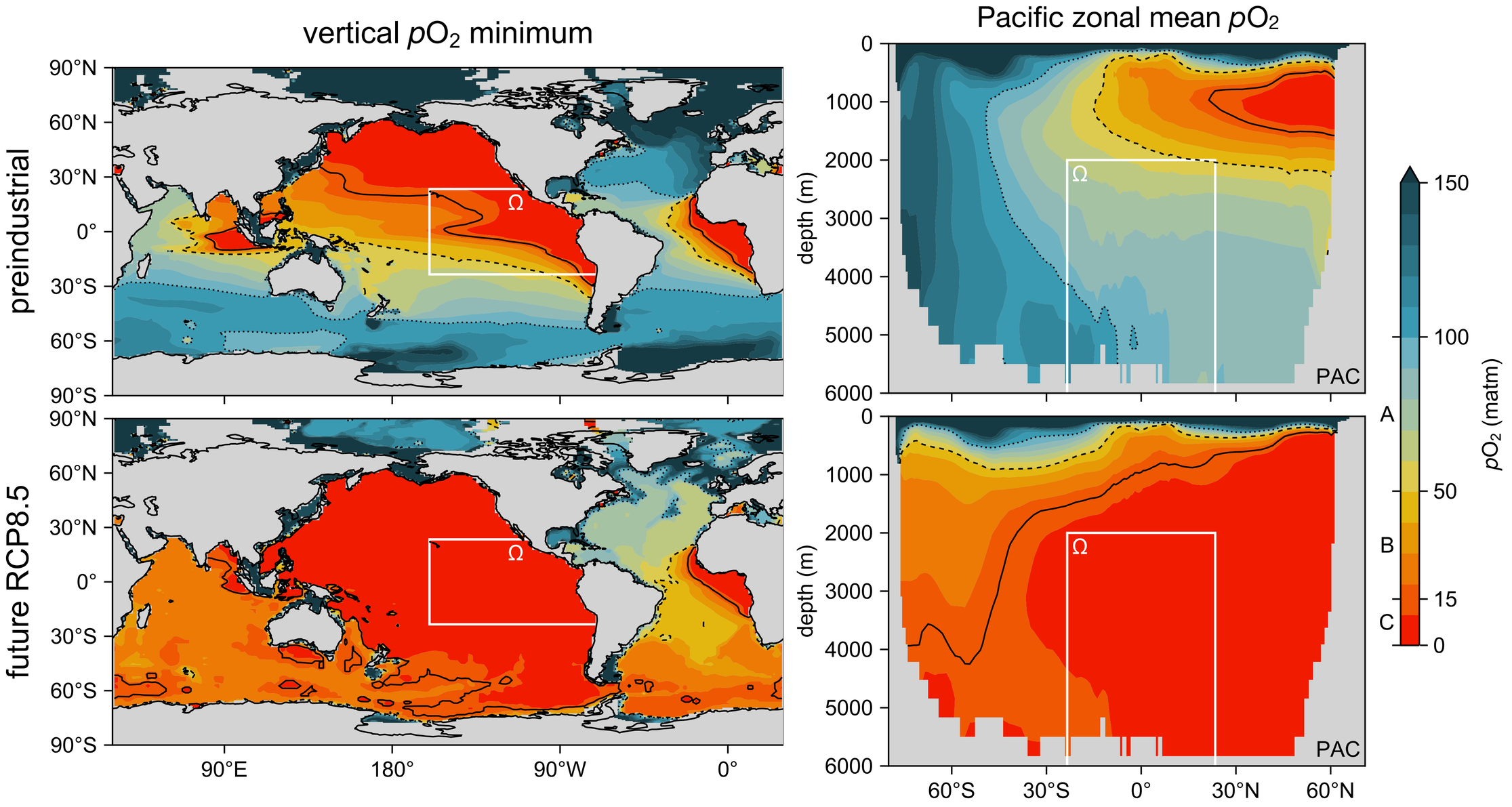
167 PgC yr$^{-1}$



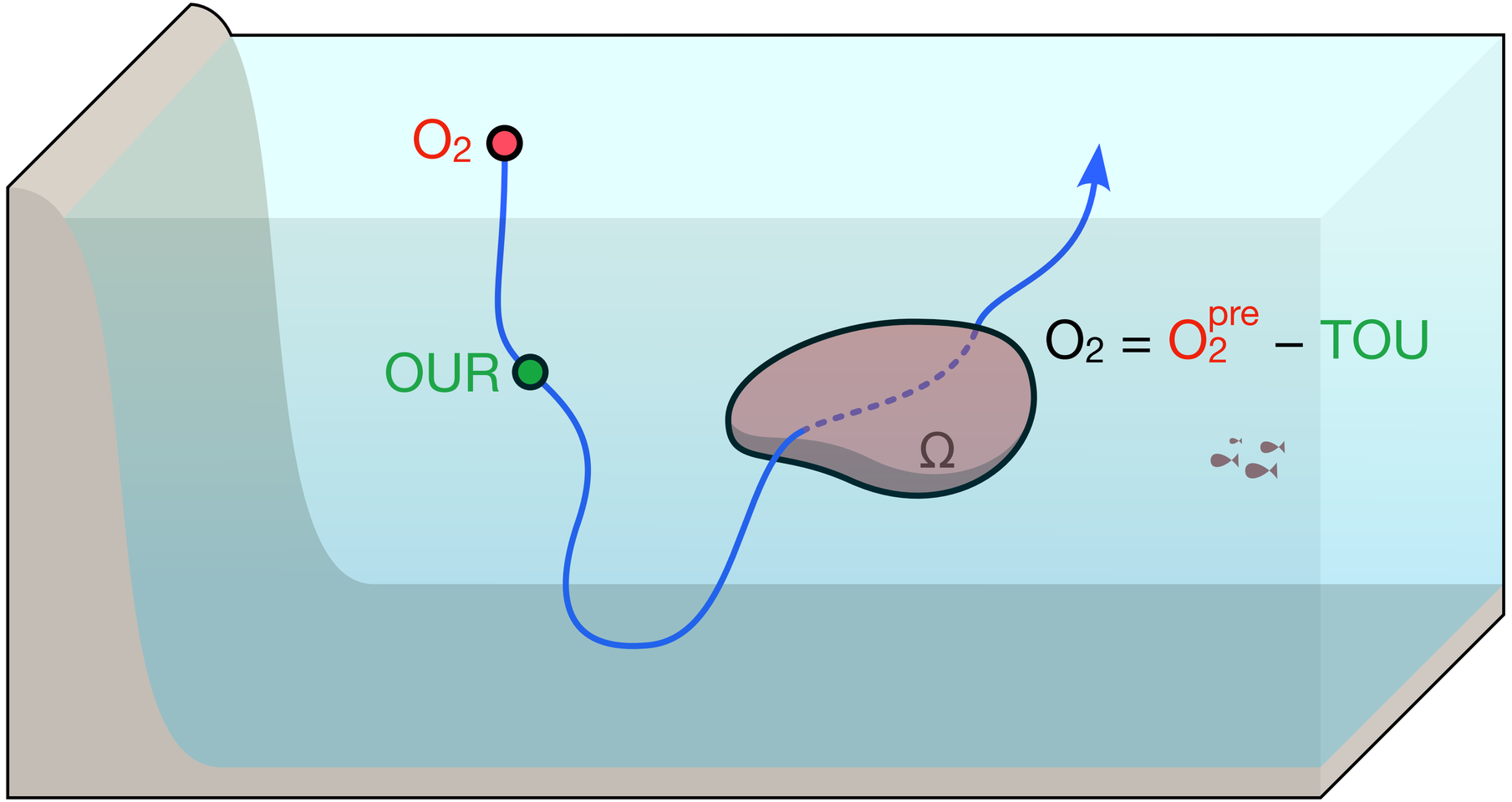

Upper/deep ocean isolated

shoaled pathways
shorter residence

# Strong deoxygenation



# Deoxygenation drivers: solubility, respiration, and circulation



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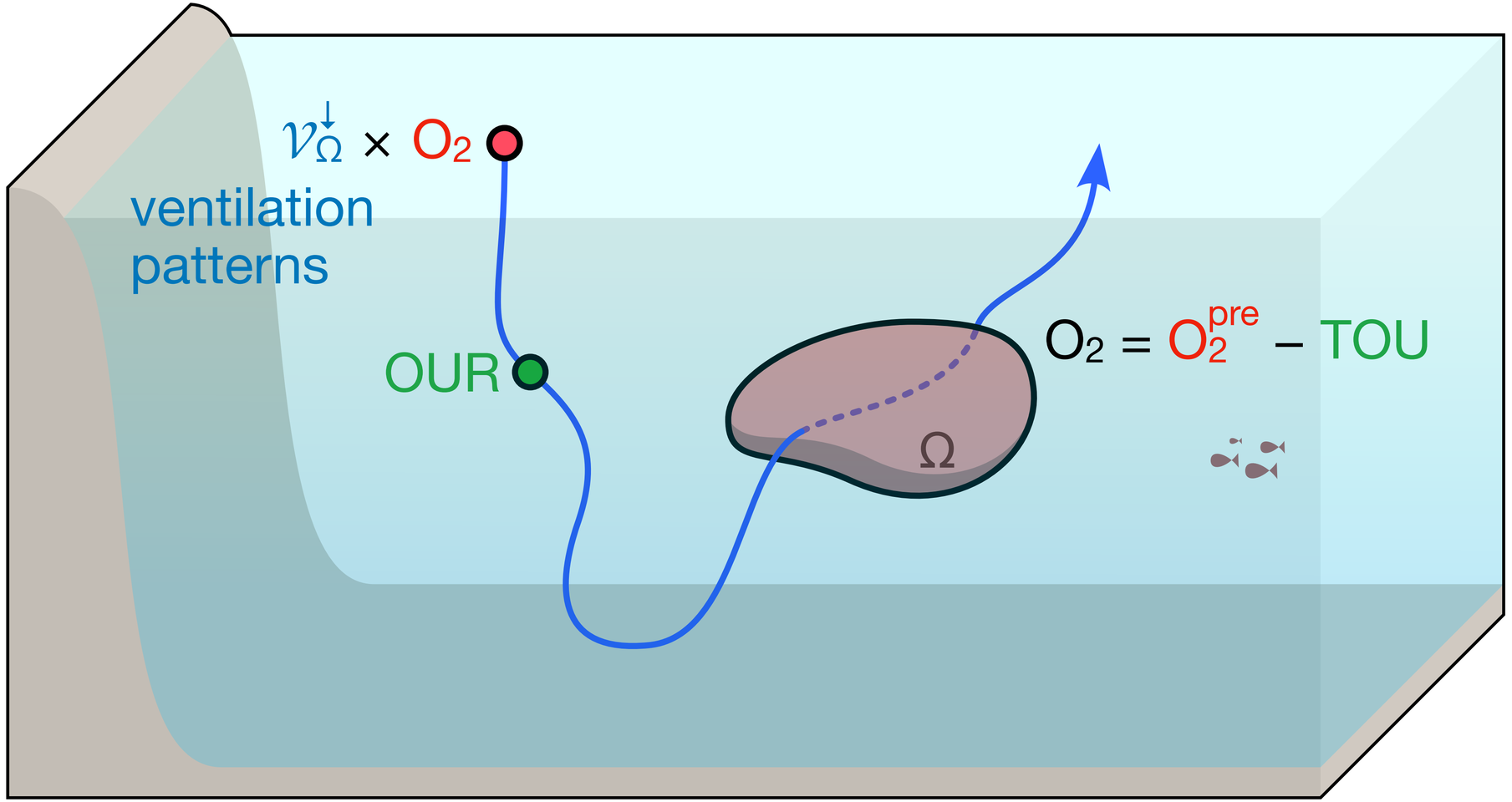

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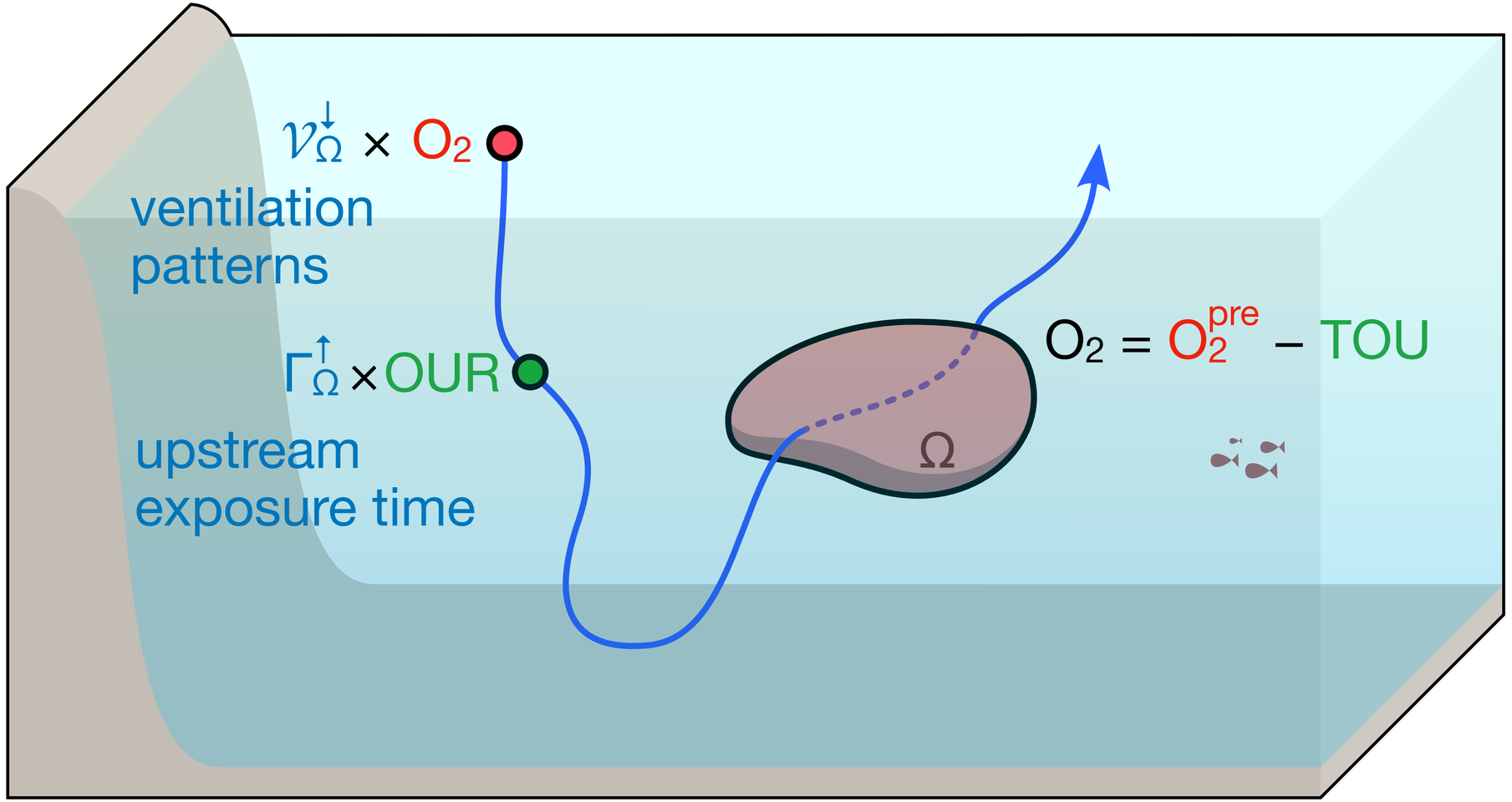

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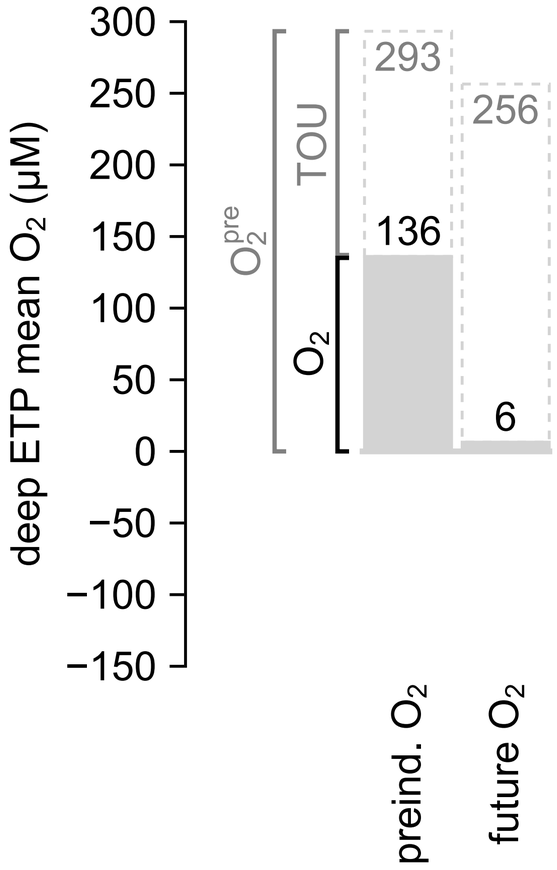

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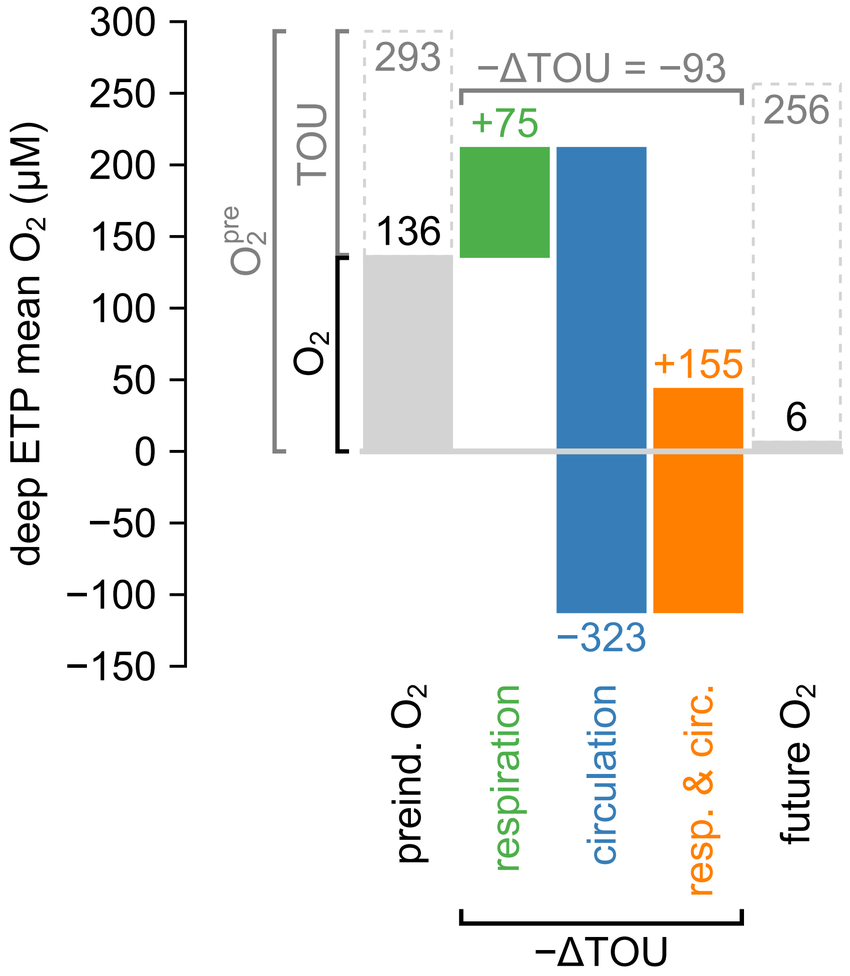

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