



Supplement of

Optimal parameters for the ocean’s nutrient, carbon, and oxygen cycles compensate for circulation biases but replumb the biological pump

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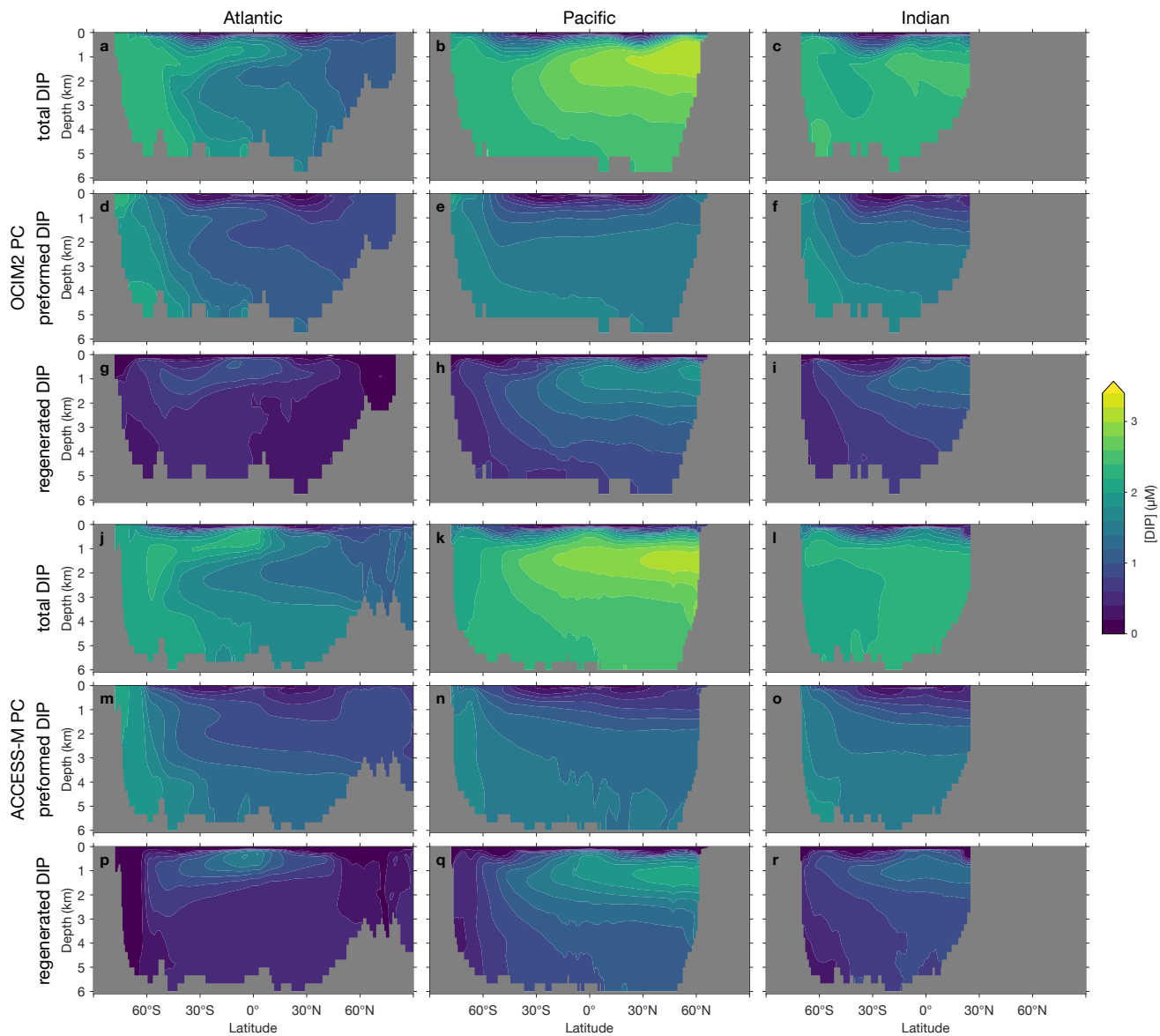


Figure S1. (a–c) Basin zonal means of total DIP from the PC model embedded in OCIM2 for the Atlantic (a, left), Pacific (b, center), and Indian Ocean (c, right). (d–f) As (a–c) but for preformed DIP. (g–i) As (a–c) but for regenerated DIP. (j–r) As (a–i) but for ACCESS-M.

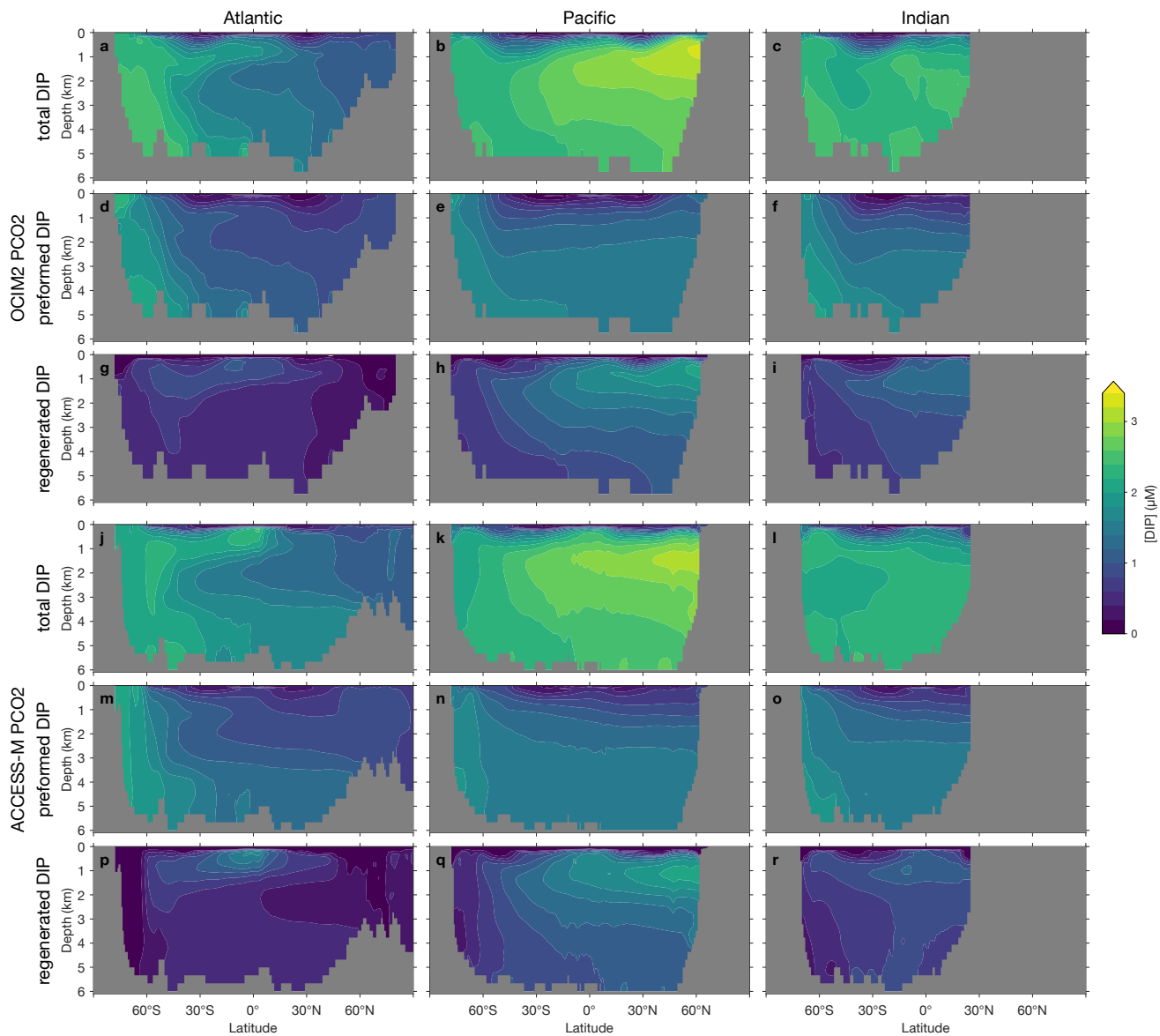


Figure S2. (a–c) Basin zonal means of total DIP from the PCO2 model embedded in OCIM2 for the Atlantic (a, left), Pacific (b, center), and Indian Ocean (c, right). (d–f) As (a–c) but for preformed DIP. (g–i) As (a–c) but for regenerated DIP. (j–r) As (a–i) but for ACCESS-M.

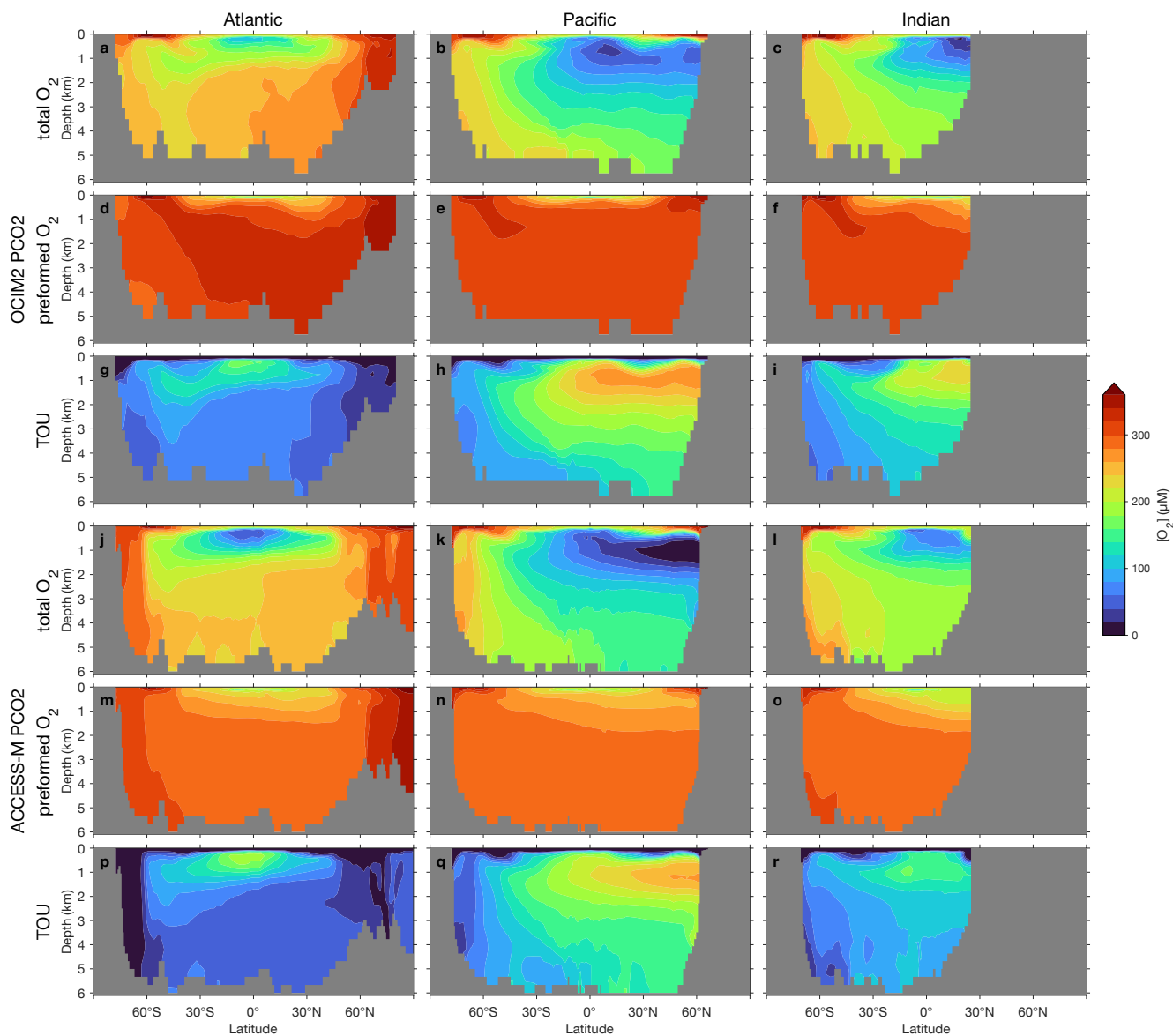


Figure S3. (a–c) Basin zonal means of total O₂ from the PCO₂ model embedded in OCIM2 for the Atlantic (a, left), Pacific (b, center), and Indian Ocean (c, right). (d–f) As (a–c) but for preformed O₂. (g–l) As (a–c) but for true oxygen utilization (TOU = [O₂^{pre}] – [O₂]). TOU can be thought as “negative regenerated” oxygen. TOU = –[O₂^{reg}], and is computed directly from Eq. D10–11 by replacing R with the oxygen utilization rate. (j–r) As (a–l) but for ACCESS-M.

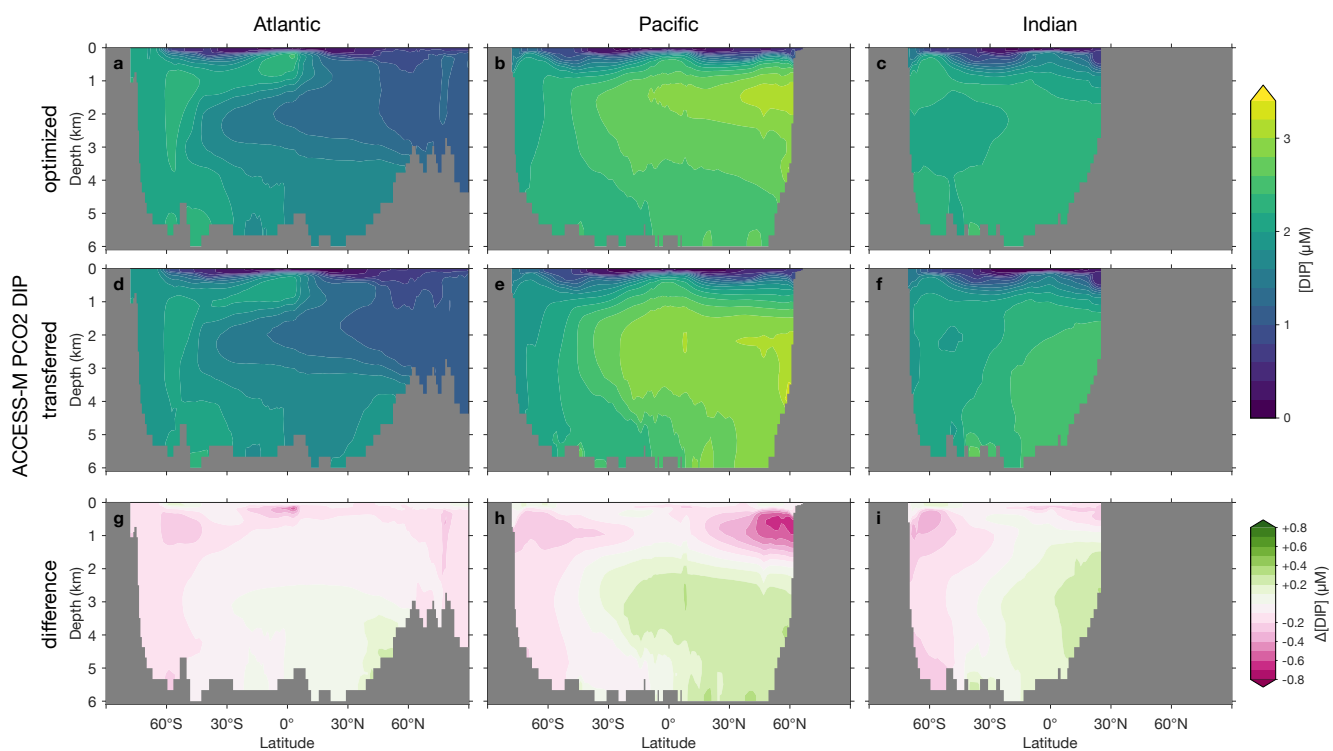


Figure S4. (a–c) Basin zonal means of DIP from the PCO₂ model optimized in ACCESS-M for the Atlantic (a, left), Pacific (b, center), and Indian Ocean (c, right). (d–f) As (a–c) but for non-optimized parameters transferred from the OCIM2 optimization. (g–i) Difference in DIP between transferred and optimized parameters.

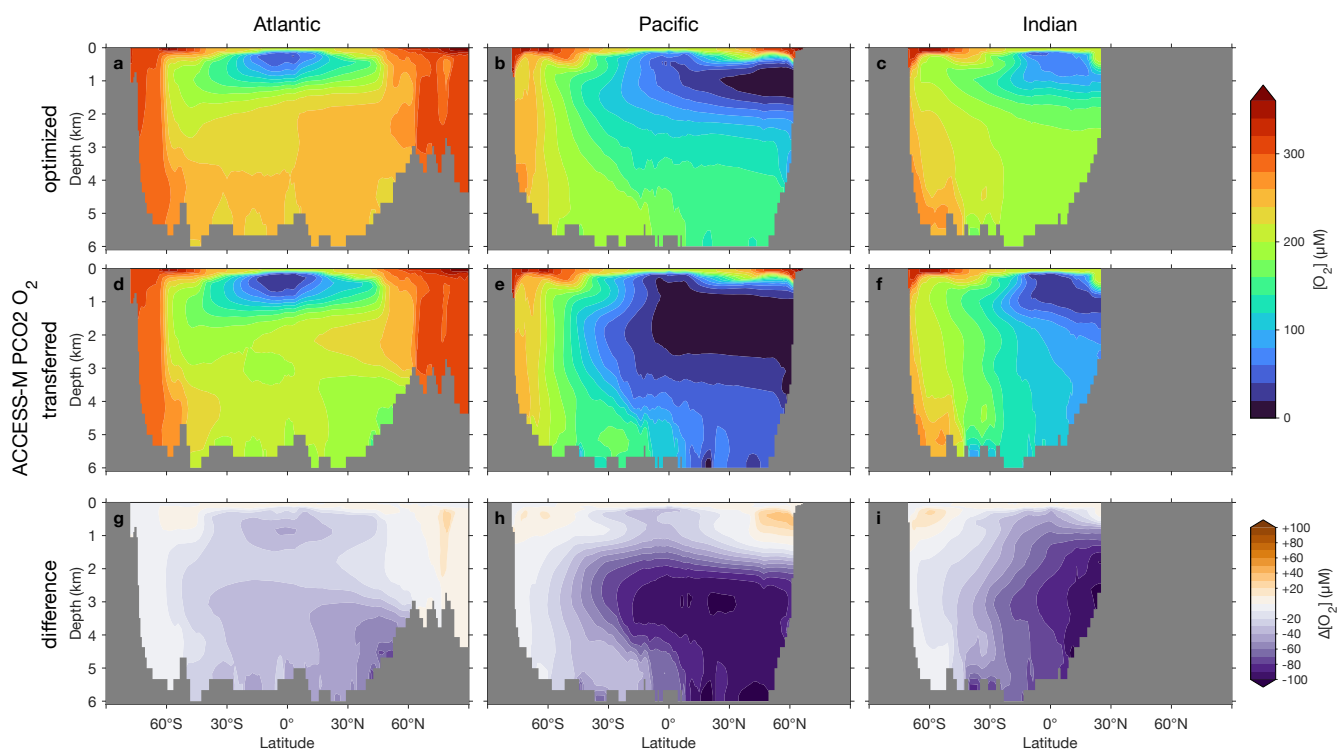


Figure S5. (a–c) Basin zonal means of O_2 from the PCO₂ model optimized in ACCESS-M for the Atlantic (a, left), Pacific (b, center), and Indian Ocean (c, right). (d–f) As (a–c) but for non-optimized parameters transferred from the OCIM2 optimization. (g–i) Difference in O_2 between transferred and optimized parameters.

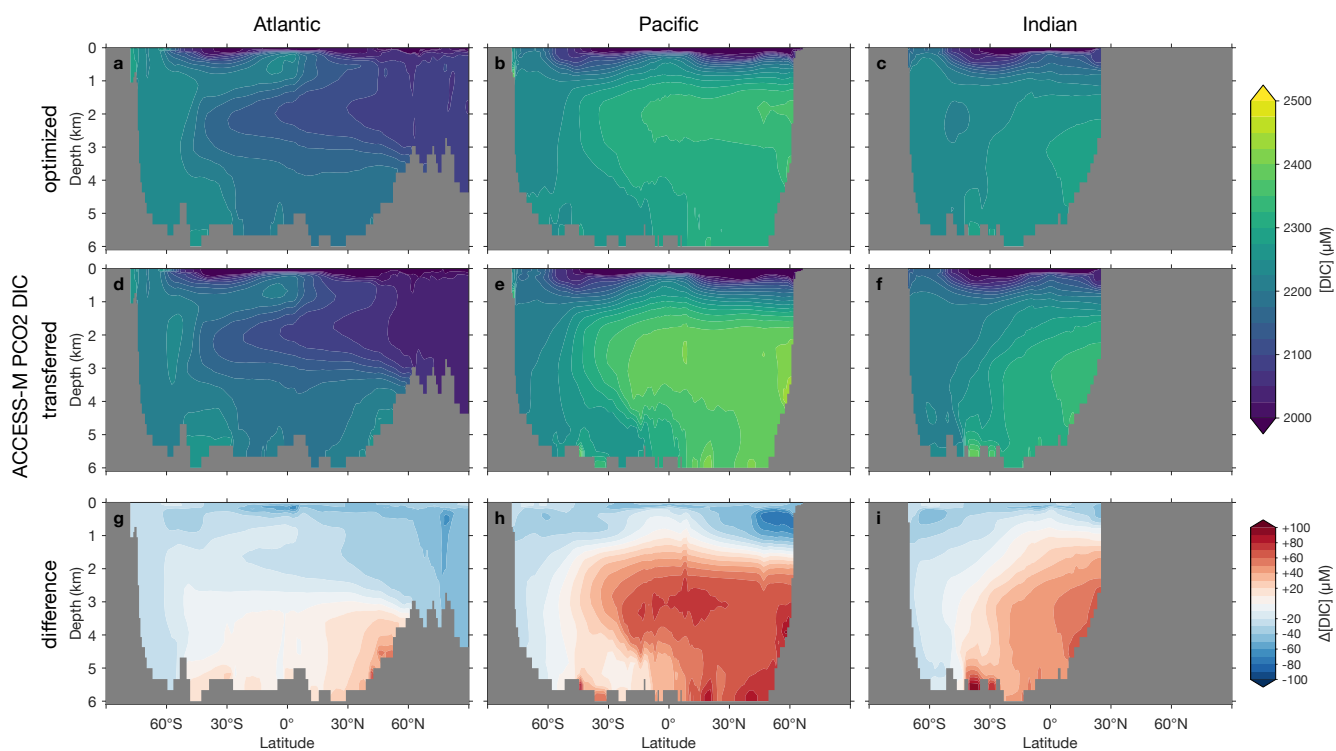


Figure S6. (a–c) Basin zonal means of DIC from the PCO₂ model optimized in ACCESS-M for the Atlantic (a, left), Pacific (b, center), and Indian Ocean (c, right). (d–f) As (a–c) but for non-optimized parameters transferred from the OCIM2 optimization. (g–i) Difference in DIC between transferred and optimized parameters.