



## Supplement of

## Response of export production and dissolved oxygen concentrations in oxygen minimum zones to $pCO_2$ and temperature stabilization scenarios in the biogeochemical model HAMOCC 2.0

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Figure SD:1. Comparison of dissolved oxygen concentration in ml  $L^{-1}$  between the World

Ocean Atlas at 3000 meters depth to (b) the reference simulation at 3000 meters depth.



Figure SD:2. (a) Dissolved oxygen concentration for the extinction simulations and (b) reference simulation oxygen concentration.



Figure SD:3. Loss of dissolved oxygen due to changes in solubility in response to increase  $pCO_2$  and radiative forcing for (a) the reference simulation, (b) the difference in solubility between the reference simulation and 2 X CO<sub>2</sub>, (c) the difference in solubility between the reference simulation and 4 X CO<sub>2</sub>, (d) the difference in solubility between the reference simulation and 6 X CO<sub>2</sub> and (e) the difference in solubility between the reference simulation and 8 X CO<sub>2</sub>.



with 100% ventilation reduction

Figure SD:4. Response of particulate organic matter ( $P_{POC}$ ; gC m<sup>-2</sup> yr<sup>-1</sup>) to reduction in ventilation for (a) the reference simulation, (b) 25% reduction, (c) 50% reduction, (d) 75% reduction and (e) the 100% reduction.



Figure SD:5. Dissolved organic carbon (DOC;  $\mu$ mol kg<sup>-1</sup>) response to increase pCO<sub>2</sub> and radiative forcing for (a) the reference simulation, (b) the difference in DOC concentration between the reference simulation and 2 X CO<sub>2</sub>, (c) the difference in DOC concentration between the reference simulation and 4 X CO<sub>2</sub>, (d) the difference in DOC concentration between the reference simulation and 6 X CO<sub>2</sub> and (e) the difference in DOC concentration between the reference simulation and 8 X CO<sub>2</sub>,



Figure SD:6. Dissolved inorganic carbon (DIC;  $\mu$ mol kg<sup>-1</sup>) response to increase pCO<sub>2</sub> and radiative forcing for (a) the reference simulation, (b) the difference in DIC concentration between the reference simulation and 2 X CO<sub>2</sub>, (c) the difference in DIC concentration between the reference simulation and 4 X CO<sub>2</sub>, (d) the difference in DIC concentration between the reference simulation and 6 X CO<sub>2</sub> and (e) the difference in DIC concentration between the reference simulation and 8 X CO<sub>2</sub>,



Figure SD:7. Dissolved phosphate (PO<sub>4</sub>;  $\mu$ mol kg<sup>-1</sup>) response to increase pCO<sub>2</sub> and radiative forcing for (a) the reference simulation, (b) the difference in PO<sub>4</sub> concentration between the reference simulation and 2 X CO<sub>2</sub>, (c) the difference in PO<sub>4</sub> concentration between the reference simulation and 4 X CO<sub>2</sub>, (d) the difference in PO<sub>4</sub> concentration between the reference simulation and 6 X CO<sub>2</sub> and (e) the difference in PO<sub>4</sub>





Dissolved oxygen (µmol kg<sup>-1</sup>) for the control simulation.

Difference in dissolved oxygen ( $\mu$ mol kg<sup>-1</sup>) between the 2xCO<sub>2</sub> simulation and the control.



Figure SD:8. Mechanisms for oxygen loss in the OMZs at  $2 \times CO_2$ . (a) Reference simulation. (b) The difference in DO concentrations between  $2 \times CO_2$  and the reference simulation. (c) The difference in DO lost due to changes in solubility between  $2 \times CO_2$ and the reference simulation. (d) The increase in oxygen consumption due to remineralization of organic carbon between the  $2 \times CO_2$  and reference simulation.



Dissolved oxygen (µmol kg<sup>-1</sup>) for the control simulation.



Difference in dissolved oxygen ( $\mu$ mol kg<sup>-1</sup>) between the 6xCO<sub>2</sub> simulation and the control.



Figure SD:9. Mechanisms for oxygen loss in the OMZs at  $6 \times CO_2$ . (a) Reference simulation. (b) The difference in DO concentrations between  $6 \times CO_2$  and the reference simulation. (c) The difference in DO lost due to changes in solubility between  $6 \times CO_2$ and the reference simulation. (d) The increase in oxygen consumption due to remineralization of organic carbon between the  $6 \times CO_2$  and reference simulation.