

## Supplementary material of

### How does the phytoplankton-light feedback affect marine N<sub>2</sub>O inventory?

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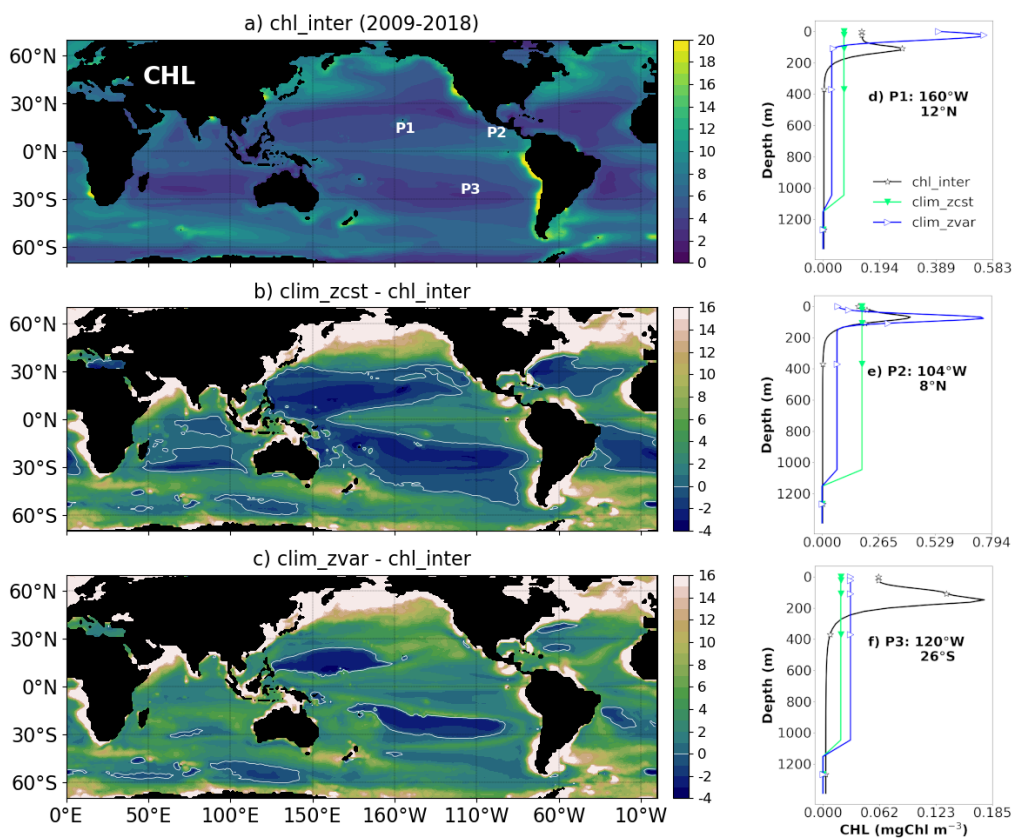


Figure S1: CHL concentration (mgCHL m<sup>-3</sup>) "seen" by the incoming shortwave radiation for each numerical experiment (Table 1). Maps a-c) show annual means of the vertical sum over 0-6000 m, a) as modelled over the 2009-2018 period for chl\_inter, and its differences with the CHL prescribed for b) clim\_zcst and c) clim\_zvar experiments. Labels P1 to P3 on subplot a) locate vertical profiles shown on subplots d-f).

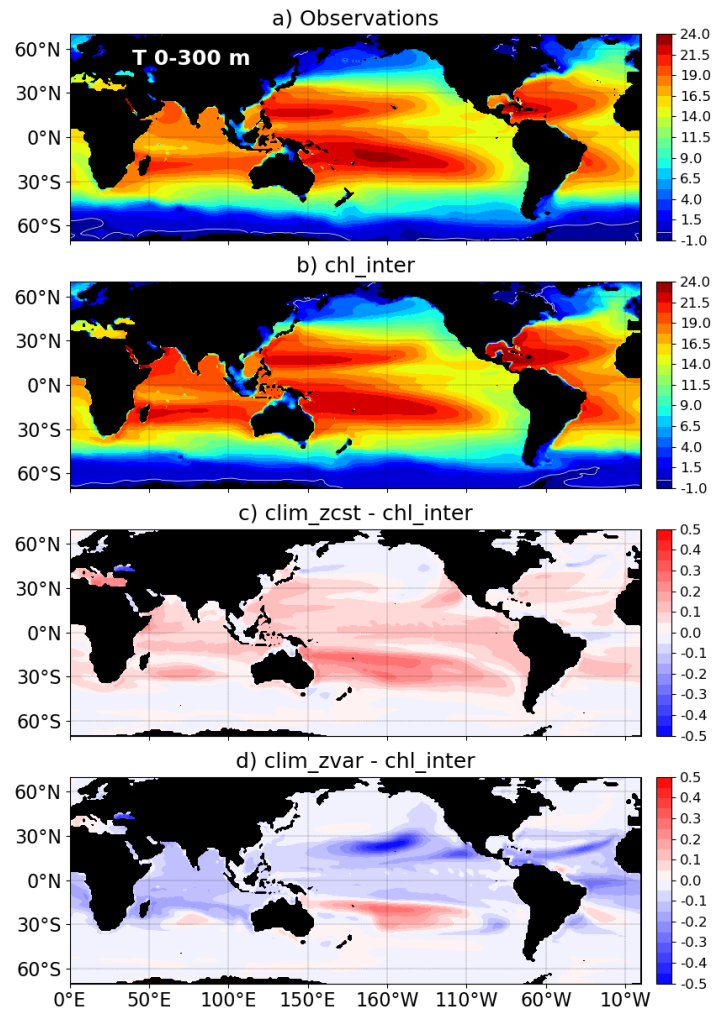


Figure S2: Annual mean **temperature** (°C) averaged over the 0-300 m ocean layer for the 2009-2018 period. The heat perturbations induced by changing the CHL field interacting with light are mainly gathered in the tropical area (*Figure S2, c-d*).

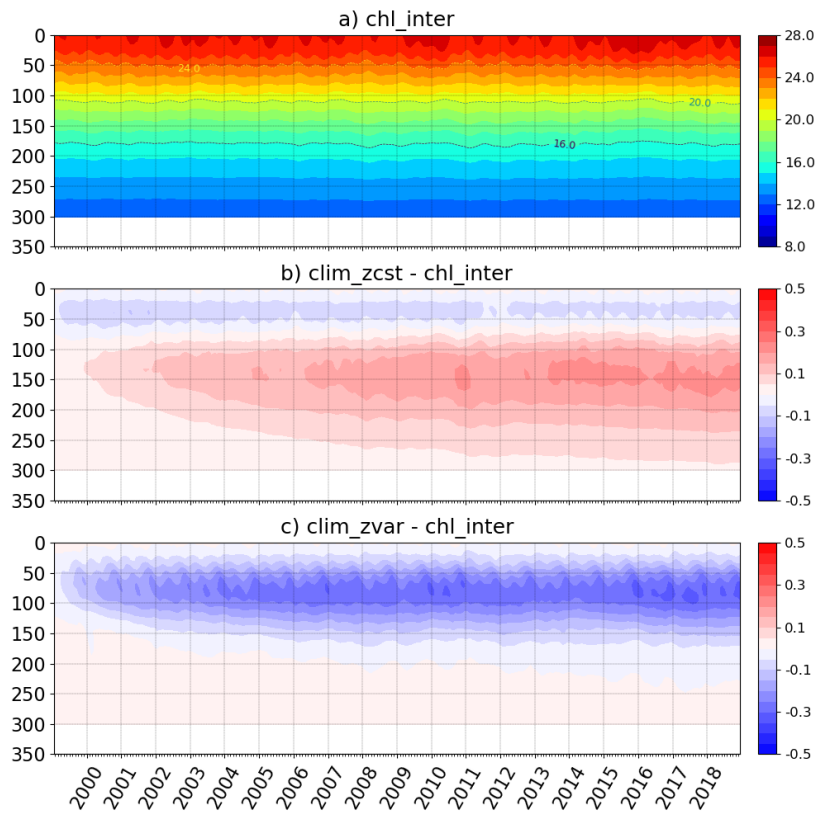


Figure S3: Time-depth diagram of temperature averaged over an extended tropical domain (35°S-35°N) for a) the control experiment chl\_inter, and its differences with b) clim\_zcst and c) clim\_zvar.

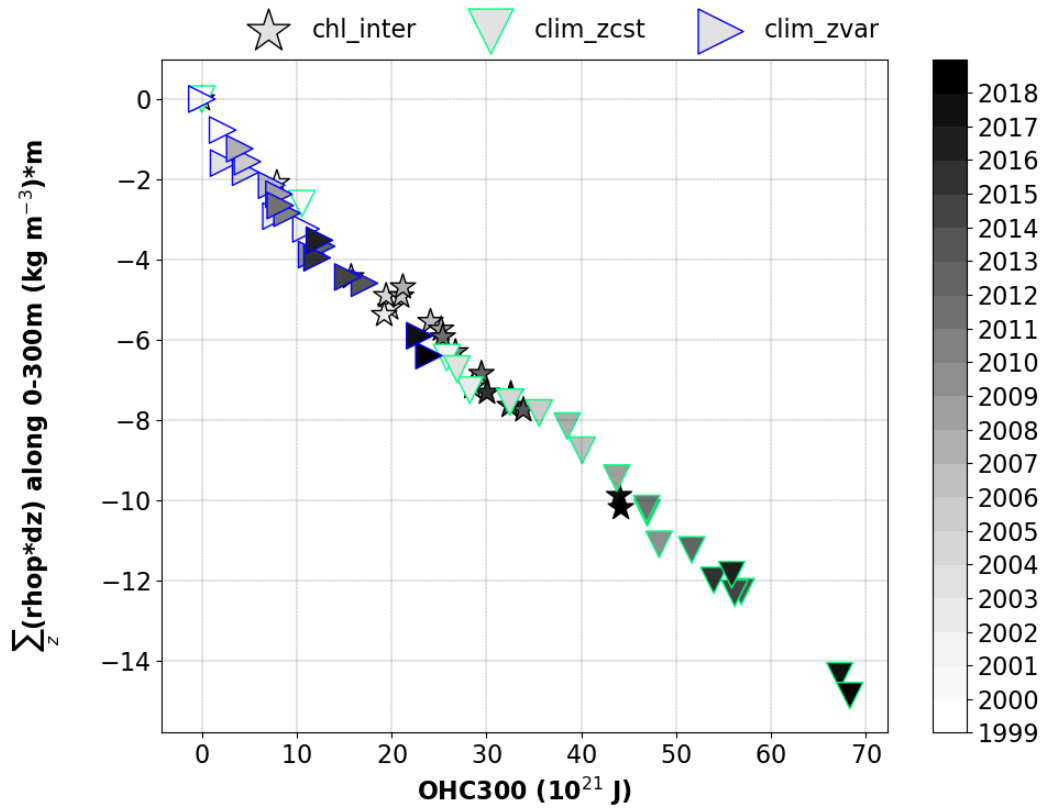


Figure S4: Annual density integrated over the 0-300 meters layer ( $\text{kg/m}^2/\text{yr}$ ) as a function of the annual OHC300 ( $\text{ZJ/yr}$ ) and annually averaged over an extended tropical domain ( $35^\circ\text{S}$ - $35^\circ\text{N}$ ).

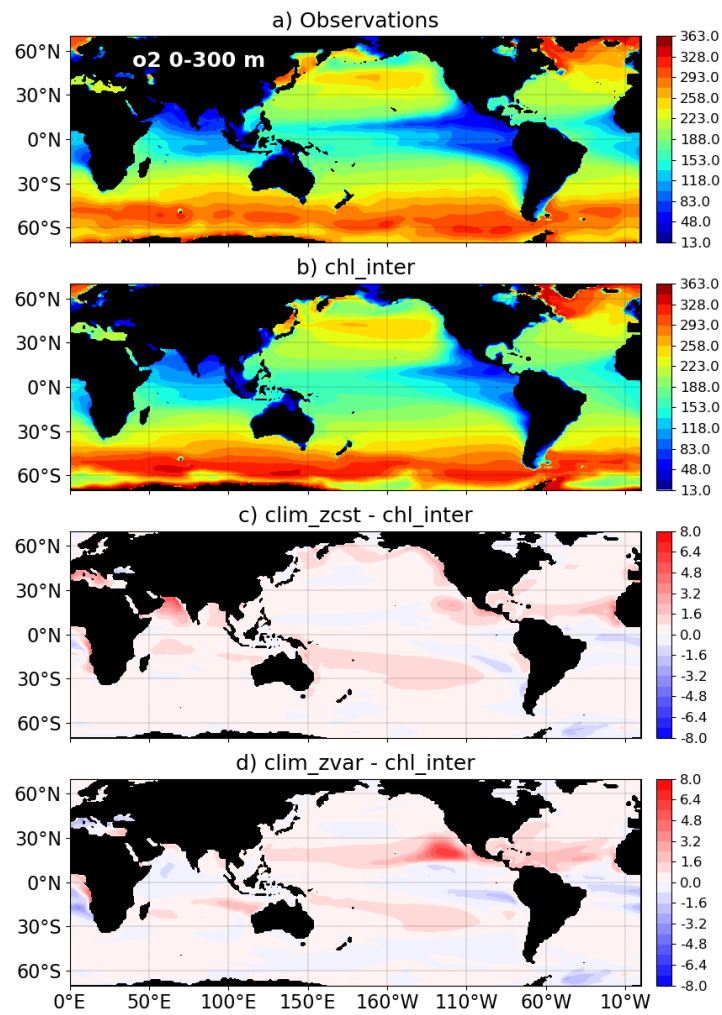


Figure S5: Annual mean **oxygen concentration** (mmol m<sup>-3</sup>) averaged over the 0-300 m ocean layer for the 2009-2018 period. An incomplete PLF contributes to overestimate the oxygen concentration in the North Pacific oxygen minimum zone, which in turn leads to a lack of local N<sub>2</sub>O production (Figure 4, e-f).