



# Supplement of

# iMarNet: an ocean biogeochemistry model intercomparison project within a common physical ocean modelling framework

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# **1** Surface fields



Figure S1. Annual average integrated primary production (g C m<sup> $^2$ </sup> d<sup> $^1$ </sup>) for all models and observations and a Taylor plot (top right) of all models relative to observations. Note that the models with negative correlation coefficients are not shown in the Taylor plot. Mean field values: observations 0.385; HadOCC 0.455; Diat-HadOCC 0.515; MEDUSA 0.473; PlankTOM6 0.188; PlankTOM10 0.289; ERSEM 0.365.



Figure S2. Annual average Dissolved Inorganic Carbon (DIC) (mmol C m<sup>-3</sup>) for all models and observations and a Taylor plot (top right) of all models relative to observations. Mean field values: observations 2059.9; HadOCC 2089.6; Diat-HadOCC 2107.7; MEDUSA 2096.5; PlankTOM6 2125.4; PlankTOM10 2134.5; ERSEM 2199.7.



Figure S3. Annual average alkalinity (meq m<sup>-3</sup>) for all models and observations and a Taylor plot (top right) of all models relative to observations. Mean field values: observations 2353.1; HadOCC 2377.8; Diat-HadOCC 2398.7; MEDUSA 2362.1; PlankTOM6 2434.4; PlankTOM10 2446.7; ERSEM 2450.9.

#### 2 Depth profiles



Figure S4. Oxygen depth profiles for the Equatorial Pacific, Southern Ocean and North Atlantic. Vertical scaling is logarithmic (log<sub>10</sub>).



Figure S5. Dissolved Inorganic Nitrogen (DIN) depth profiles for the Equatorial Pacific, Southern Ocean and North Atlantic. Vertical scaling is logarithmic (log<sub>10</sub>).

# **3** Computational cost



Figure S6. The compute cost of ocean biogeochemical models relative to a physics-only simulation against the number of model tracers.

#### **4 Modelled physics**



Figure S7. Comparison of observed (left) and modelled (right) mean annual sea surface temperature (top; °C), mixed layer depth (middle; m) and pycnocline depth (bottom; m). Observed fields are derived from the World Ocean Atlas 2009 fields of temperature and salinity (Locarnini et al., 2010; Antonov et al., 2010). Mixed layer depth is calculated using a 0.5°C criterion (Monterey & Levitus, 1997) and shown on a logarithmic scale, while pycnocline depth is calculated using the method of Gnanadesikan et al. (2002).

## **5** Export production



Figure S8. Annual average export flux of particulate organic carbon (POC) at 100m (g C m<sup>-2</sup> d<sup>-1</sup>) for all models. The flux is derived in each case from the final simulated year, 2007.



Figure S9. Annual average export flux of particulate inorganic carbon (PIC) at 100m (g C  $m^{-2} d^{-1}$ ) for all models. The flux is derived in each case from the final simulated year, 2007.



Figure S10. Annual average rain ratio (PIC:POC) of particulate material at 100m (-) for all models. The ratio is derived in each case from the final simulated year, 2007.