

Annual net community production in the South Pacific subtropical gyre

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Annual net community production (ANCP) is about 2 moles C m⁻² yr⁻¹ in areas where it has been well measured [1]. We assess evidence for the rate of ANCP in the South Pacific subtropical gyre, which has the lowest chlorophyll concentration and deepest nitricline of any oceanic region.

Raimbault et al. [2] observed exceptionally high DOC concentrations in the euphotic zone. The DOC gradients, interpreted by applying particle tracking to an ocean circulation model, suggest high rates of ANCP. However, lower DOC concentrations were found in a subsequent CLIVAR cruise crossing the area [3].

Biological O₂ supersaturation, measured in the region on 8 samples collected during IODP Expedition 329, was 0.2±0.2 μmol kg⁻¹. The associated ANCP value would be ~0.2 moles m⁻² yr⁻¹.

Upper ocean vertical profiles of dissolved inorganic carbon (DIC) and O₂ supersaturation provide additional evidence of low regional ANCP. In the core of the low-chlorophyll region, the drawdown of DIC in the euphotic zone is smaller than in any other geographic area. In some depth profiles from CLIVAR P18, salinity-normalized NCP falls to a minimum below the euphotic zone. We interpret this feature as indicating DIC uptake in the seasonal thermocline (at the level of ~ 5 μmol kg⁻¹), with negligible drawdown in the mixed layer. Interpreted in this way, the DIC data are again compatible with ANCP ~ 0.2 mole m⁻² yr⁻¹. Finally, O₂ is supersaturated in the seasonal thermocline, as elsewhere, but generally by the magnitude expected from physical processes alone. In summary, the current evidence suggests that ANCP in the South Pacific subtropical gyre is about an order of magnitude less than has been observed elsewhere. However the definitive work remains to be done.

[1] Emerson, S. (2014) Annual net community production and the biological carbon flux in the ocean, global *Biogeochemical Cycles* **28**, 1-12. [2] Raimbault et al. (2008) *Biogeochemistry* **5**, 281-298. [3] Hansell et al. (2009) *Oceanography* **22**, 202-211.