

N₂ fixation persists throughout the euphotic zone of the ultra-oligotrophic South Pacific Gyre

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Biological dinitrogen (N₂) fixation is the main source of new bioavailable nitrogen (N) in N-limited, oligotrophic ocean regions and thus fuels new primary production. Primary production in the South Pacific Gyre (SPG), the largest ocean biome, is very low as detected by satellite imagery (surface chlorophyll *a*). In addition to the large size and the ultra-oligotrophic conditions, the SPG receives very little aeolian dust deposition, generally a major source of iron (Fe). These aspects combined have for a long time been presumed to exclude significant N₂ fixation in the SPG. However, few studies in the SPG indicate that N₂ fixation might nevertheless be important there and could contribute significantly to the global N₂ fixation due to the vast area of the SPG. Along a transect cruise through the SPG during austral summer 2015/16, we measured significant rates of N₂ fixation within the euphotic zone, with the highest rates in the most oligotrophic parts of the gyre situated above the chlorophyll *a* max (down to ~200 m). Our preliminary results indicate that the “classical” cyanobacterial N₂-fixing microorganisms such as *Trichodesmium* sp. and the unicellular cyanobacteria group A (UCYN-A) were absent. At two stations we detected diatom diazotroph associations (DDA) at low abundance. However, the detected DDAs alone cannot account for the measured bulk N₂ fixation rates. Our combined results and findings of previous studies strongly indicate that non-cyanobacterial diazotrophs are major contributors to newly fixed nitrogen in the SPG which in turn supports a substantial portion of the new primary production.