Publication MIO : Mathieu Caffin (MIO) , Hugo Berthelot, Véronique Cornet-Barthaux (MIO), Aude Barani (MIO) and Sophie Bonnet (MIO)- Transfer of diazotroph-derived nitrogen to the planktonic food web across gradients of N2 fixation activity and diversity in the western tropical South Pacific Ocean in Biogeosciences

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Abstract. Biological dinitrogen (N2) fixation provides the major source of new nitrogen (N) to the open ocean, contributing more than atmospheric deposition and riverine inputs to the N supply. Yet the fate of the diazotroph-derived N (DDN) in the planktonic food web is poorly understood. The main goals of this study were (i) to quantify how much of DDN is released to the dissolved pool during N2 fixation and how much is transferred to bacteria, phytoplankton and zooplankton, and (ii) to compare the DDN release and transfer efficiencies under contrasting N2 fixation activity and diversity in the oligotrophic waters of the western tropical South Pacific (WTSP) Ocean. We used nanometre-scale secondary ion mass spectrometry (nanoSIMS) coupled with 15N2 isotopic labelling and flow cytometry cell sorting to track the DDN transfer to plankton, in regions where the diazotroph community was dominated by either Trichodesmium or by UCYN-B. After 48?h, ? ?20–40?% of the N2 fixed during the experiment was released to the dissolved pool when Trichodesmium dominated, while the DDN release was not quantifiable when UCYN-B dominated ; ? ?7–15?% of the total fixed N (net N2 fixation?+?release) was transferred to non-diazotrophic plankton within 48?h, with higher transfer efficiencies (15?±?3?%) when UCYN-B dominated as compared to when Trichodesmium dominated (9?±?3?%). The pico-cyanobacteria Synechococcus and Prochlorococcus were the primary beneficiaries of the DDN transferred (? ?65–70?%), followed by heterotrophic bacteria (? ?23–34?%). The DDN transfer in bacteria was higher (34?±?7?%) in the UCYN-B-dominating experiment compared to the Trichodesmium-dominating experiments (24?±?5?%). Regarding higher trophic levels, the DDN transfer to the dominant zooplankton species was less efficient when the diazotroph community was dominated by Trichodesmium (? ?5–9?% of the DDN transfer) than when it was dominated by UCYN-B (? ?28?±?13?% of the DDN transfer). To our knowledge, this study provides the first quantification of DDN release and transfer to phytoplankton, bacteria and zooplankton communities in open ocean waters. It reveals that despite UCYN-B fix N2 at lower rates compared to Trichodesmium in the WTSP, the DDN from UCYN-B is much more available and efficiently transferred to the planktonic food web than the DDN originating from Trichodesmium.

Voir en ligne : https://www.biogeosciences.net/15/3...