Global nitrogen fixation seen from the small scale

SOPHIE RABOUILLE[12] AND ANDREAS OSCHLIES[3]

[1]Sorbonne Universités, UPMC Univ Paris 06, UMR 7093, LOV, Observatoire océanologique, F-06230, Villefranche/mer, France.
[2]CNRS, UMR 7093, LOV, Observatoire océanologique, F-06230, Villefranche/mer, France, srabouille@obs-vlfr.fr
[3]GEOMAR Helmholtz Centre for Ocean Research Kiel, Düsternbrooker Weg 20, D-24105 Kiel Germany, aoschlies@geomar.de

The discovery of new diazotrophic organisms in the world's ocean has widened the puzzle of the oceanic, nitrogen budget. Being virtually independent from the nitrogen (N) resource, diazotrophs can thrive in nitrogen depleted regions but the conditions promoting their survival and distribution are not fully clear. In situ studies and satellite observations point to episodic, high abundances of diazotrophs linked to physical processes, including mesoscale events. In basin scale or global models, nitrogen fixers, when explicitly described, are restricted to warm waters and sometimes considered as obligate diazotrophs. Laboratory studies are starting to reveal the complex nature of nitrogen fixation dynamics and diazotrophic growth, including non-obligate diazotrophy, sensitivity to temperature, light periodicity and fluctuating stoichiometry. Also, the genetic equipment of several diazotrophic strains such as the cyanobacteria *Trichodesmium* and *Crocosphaera watsonii* shows scavenging abilities for organic phosphorus (P) compounds, which might facilitate their survival in regions in which both N and P availabilities are low. We analyzed growth processes using cell-scale models, population models and global biogeochemical models to identify and describe the mechanisms driving nitrogen fixation. Here, we discuss how small-scale models may be transferred to global models, for global predictions of the N budget to be improved.