

Studies of microbial metabolisms employing stable isotope probing in combination with NanoSIMS

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Secondary Ion Mass Spectrometry (SIMS) on the nanoscale (lateral resolution down to 30 nm) facilitates studies analysing microbial metabolisms on the single cell level. A CAMECA NanoSIMS 50L is employed at the Leibniz Institute for Baltic Sea Research in Warnemünde, Germany for the analysis of stable isotope experiments in different microbial projects.

Cyanobacteria are one object of the studies. A project aimed on the origin of cyanobacterial blooms. Samples from the phycoerythrin-maximum (70-90 m water depth) were incubated with ¹³CO₂ und ¹⁵N₂. Two cyanobacterial species, *Anabena* sp. and *Nodularia* sp., were found to have incorporated the isotope labels. This indicates that organisms from this water depth are still viable and might act as seed for bacterial blooms. Above this, It was nicely depicted, that the uptake of ¹⁵N was restricted to the heterocyst of *Nodularia* sp.

Another study object is *Sulfurimonas gotlandica*, a chemolithoautotrophic prokaryotic key player of sulfur fluxes in the pelagic redox zone of the central Baltic Sea [1]. Incubation experiments of pure cultures and natural assemblages from the sulfidic, suboxic and interface zone of the Baltic Sea were performed employing ³⁴S, ¹⁵NO₃⁻ and ¹³CO₂. The combination of NanoSIMS analysis with fluorescence dying techniques enables the coupling of information about the abundance of this organism in the different water depths with its activity.

Soil organisms are another study field. A project deals with the fixation of nitrogen by diazotrophic bacterial strains under saline stress. The bacterial strains were isolated from the roots of *Salicornia herbaceae*, an extreme halophyte. An incubation experiment employing ¹⁵N₂ and different salt concentrations was performed. NanoSIMS analyses were able to depict the ¹⁵N incorporation in combination with the variation of other element abundances (e.g. Cl, P).

[1] Grote *et al* (2012), *PNAS* **109**, 506-510