

The distribution of archaeal intact polar lipids in the upper water column of the northwestern Pacific Ocean: Effect of cyclonic eddy perturbation

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Intact polar lipids (IPLs) of dibiphytanyl glycerol tetraethers (GDGTs) are the building blocks of the majority of archaeal cellular membranes. Because the polar head groups hydrolyse quickly after cell death, IPLs can be used as biomarkers for the living cells. In this study, samples of suspended particulate matter from surface water (2~5 m) and subsurface water (~50 m) of northwestern Pacific Ocean were collected, in which two sites were perturbed by cyclonic eddies. Three classes of IPL-GDGTs were detected, being monoglycosidic GDGTs (Gly-GDGTs), diglycosidic GDGTs (2Gly-GDGTs) and phosphomonoglycosyl GDGTs (P1G-GDGTs). At the reference site, the relative abundance of these IPLs in surface water is 46%, 31% and 22%, respectively, showing the predominance of Gly-GDGTs; in subsurface water, however, P1G-GDGTs are dominant (55%). At the sites with cyclonic eddy perturbation, P1G-GDGTs are dominated in both surface and subsurface water (63%~86%). A previous study has indicated that P1G-GDGTs are less stable than mono- and diglycosidic GDGTs after cell death, making them more effective as a living cell signal. Based on this premise, our results suggest that more living archaeal cells are present in subsurface water at the reference site; whereas the cyclonic eddy perturbation may cause the vertical mixing of the water column, homogenizing the distribution of P1G-GDGTs in both surface and subsurface layers.