Light sensitivity of Marine group II archaea in the subtropical Pearl River estuary: implication for microbial niche adaptation

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Marine group II archaea (MGII) are widely distributed in the global ocean and dominate the total archaeal community within the upper euphotic zone of temperate waters. However, environmental factors controlling the distribution of MGII are poorly defined and the physiology and ecological functions of these still uncultured organisms are elusive. In this study, we investigated the planktonic MGII associated with particles and in free-living forms in the Pearl River Estuary (PRE) over a 12-month period. The abundance of particle-attached MGII was 10-fold higher than that of the free-living MGII, demonstrating their preference for particle attachment. 10‰ salinity appeared to be a threshold value for these Thalassoarchaea because MGII abundance decreased sharply below it. The results also showed that the abundance of MGII was overall positively correlated with phototrophs while the salinity is higher than 10‰. However, those MGIIs in the surface water were more affected by monthly PAR during the sampling period. MGIIa_35466 which was the most abundant MGII in the surface water and had a proteorhodopsin gene, was significantly negatively correlated with PAR, suggesting the present of proteorhodopsin might not promote their adaptation to high sunlight environments. Our study further presents a comprehensive analysis of the potential ecological interactions between MGII and other microorganisms, particularly phototrophs and other archaea, and provides insight into microbial niche adaptation in the estuarine ecosystem.