

## Niche separation of nitrifiers from the sea surface to the hadal ocean

\*Takuro Nunoura<sup>1</sup>

1. Research and Development Center for Marine Biosciences, Japan Agency for Marine-Earth Science & Technology (JAMSTEC), 2. Department of Subsurface Geobiological Analysis and Research, Japan Agency for Marine-Earth Science & Technology (JAMSTEC)

Ammonium (ammonia) and nitrite are important intermediates of oceanic nitrogen cycle, but these are depleted in most of the oceanic waters. In contrast, availability of ammonia most likely influence on niche separation of nitrifiers, and thus the niche separation would be a signature of geochemical interface in oceanic environments. In fact, niche separation of nitrifiers has been observed in Arctic to tropical oceans, and sea surface to hadal ocean (Sintes et al. 2013, Nunoura et al. 2015 and references therein). In this study, we analyzed single amplified genomes (SAGs) to know genomic backgrounds of niche separation of ammonia-oxidizing thaumarchaeotes from sea surface to hadal oceans.

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