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TITLE: Sinking particles promote vertical connectivity in the ocean microbiome

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ABSTRACT:

The sinking of organic particles formed in the photic layer is a main vector of carbon export into the deep ocean. Although sinking particles are heavily colonized by microbes, so far it has not been explored whether this process plays a role in transferring prokaryotic diversity from surface to deep oceanic layers. Using Illumina sequencing of the 16S rRNA gene, we explore here the vertical connectivity of the ocean microbiome by characterizing marine prokaryotic communities associated with five different size fractions and examining their compositional variability from surface down to 4,000 m across eight stations sampled in the Atlantic, Pacific, and Indian Oceans during the Malaspina 2010 Expedition. Our results show that the most abundant prokaryotes in the deep ocean are also present in surface waters. This vertical community connectivity seems to occur predominantly through the largest particles because communities in the largest size fractions showed the highest taxonomic similarity throughout the water column, whereas free-living communities were more isolated vertically. Our results further suggest that particle colonization processes occurring in surface waters determine to some extent the composition and biogeography of bathypelagic communities. Overall, we postulate that sinking particles function as vectors that inoculate viable particle-attached surface microbes into the deep-sea realm, determining to a considerable extent the structure, functioning, and biogeography of deep ocean communities.

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