

Coccolithophore spatial distribution from an extremely oligotrophic gyre to an intense upwelling in the subtropical South Pacific

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Water samples were collected at multiple depths in the euphotic zone on an oceanic transect from the Marquesas Archipelagos to the Chilean upwelling, via the South Pacific Gyre, during the BIOSOPE cruise in austral summer, 2004. Based on full taxonomic identification of the coccolithophore community, we describe the spatial distribution of over 60 species. The coccolith concentration ranges from 400 to about 360 000 coccospheres/l, while the species richness ranges from 7 to 47 species per sample. The highest species richness is reached at each station along the transect in the vicinity of the deep chlorophyll maximum. The highest number of coccospheres and the greatest species richness are found in the margin of the Chilean upwelling system. The low-nutrient, low-chlorophyll South Pacific Gyre, often described as the world's poorest desert, is in fact inhabited by a deep coccolithophore community living down to 300 m depth. The concentration of this community, which is composed of 25 species, reaches about 18 000 coccospheres/l. This is the first report of such a deep coccolithophore community present in an oligotrophic region.

A Principal Component Analysis allowed the definition of 7 coccolithophore assemblages, each corresponding to an ecological niche. These niches are distributed longitudinally in the upper part of the water column and in depth in the deepest part of the water column. Assemblage characteristics and distributions can be summarised as follows:

1. in the western part of the transect, in the mesotrophic area of the Marquise plume, is dominated by *Gephyrocapsa* spp., *Umbellosphaera tenuis* and *Calcidiscus leptoporus*;
2. essentially composed of *Umbellosphaera tenuis*, *Emiliana huxleyi*, mini placoliths and *Calcidiscus leptoporus* corresponds to a high-salinity, high-temperature area;
3. found in the oligotrophic area of the South Pacific Gyre, is characterised by a domination of *Syracosphaera* spp. and large coccospheres, such as *Rhabdosphaera clavigera* and *Discosphaera tubifera*;
4. mainly composed of placolith bearing coccospheres, is present on the outside of the Chilean upwelling margin and within it;
5. corresponds to the higher-diversity assemblage on the oriental margin of the Chilean upwelling, and below the 4 other assemblages, around 150 m depth;
6. spread along the transect in the deeper sampling area, dominated by *Florisphaera profunda*, *Gladiolithus* spp;
7. located in the deeper part of the Chilean upwelling, is exclusively represented by small-sized placolith bearing coccospheres, and results of the mixing of water

masses.