Seasonal variability of the dynamics of dimethylated sulfur compounds in a coastal northwest Mediterranean site

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ABSTRACT: We studied the seasonal variation of biotic and abiotic processes and the physico-chemical forcing factors involved in the production and consumption of dimethylsulfide (DMS) and its precursor dimethylsulfoniopropionate (DMSP) at a coastal sampling station in the northwestern Mediterranean. Monthly samplings of surface seawater for an 18-month period revealed that algal-associated DMSP and dimethylsulfoxide (DMSO) did not follow total phytoplankton biomass (measured as chlorophyll *a* [Chl *a*]). DMSP concentrations peaked 1 or 2 months later than the late winter Chl *a* bloom, following phytoplankton succession, whereas particulate DMSO was maximal in summer. Both Chl *a*-normalized concentrations (DMSP : Chl *a* and DMSO: Chl *a*) exhibited a clear seasonality with maxima in summer, which was indicative of concurrent phytoplankton succession and physiological acclimation toward higher dimethylated sulfur-producing taxa in summer. DMS concentrations also showed clear maxima in mid-summer and minima in winter, which is anticorrelated with Chl *a*. Gross DMS production rates were higher in summer, coinciding with higher DMSP-to-DMS conversion yields and exceeded microbial DMS consumption in this season. Heterotrophic bacteria and DMSP-assimilating phytoplankton only accounted for a portion (annual average 52%) of total DMSP transformations, suggesting that phytoplankton DMSP-lyases, either in stressed cells or upon grazing by herbivores, must play a more important role in DMS production than is generally believed. Calculated photolysis and measured microbial consumption alternated in dominance as DMS sinks over the year, with ventilation to the atmosphere generally being a minor loss process. Under higher solar radiation (from March to September), calculated photolysis followed variations of colored dissolved organic matter, a known DMS photosensitizer.

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