Effect of irradiance on the emission of short-lived halocarbons from three common tropical marine microalgae

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ABSTRACT

Marine algae have been reported as important sources of biogenic volatile halocarbons that are emitted into the atmosphere. These compounds are linked to destruction of the ozone layer, thus contributing to climate change. There may be mutual interactions between the halocarbon emission and the environment. In this study, the effect of irradiance on the emission of halocarbons from selected microalgae was investigated. Using controlled laboratory experiments, three tropical marine microalgae cultures, *Synechococcus* sp. UMACC 371 (cyanophyte), *Parachlorella* sp. UMACC 245 (chlorophyte) and *Amphora* sp. UMACC 370 (diatom) were exposed to irradiance of 0, 40 and 120 μmol photons $m^{-2}s^{-1}$. Stress in the microalgal cultures was indicated by the photosynthetic performance (F_v/F_m, maximum quantum yield). An increase in halocarbon emissions was observed at 120 μmol photons $m^{-2}s^{-1}$, together with a decrease in F_v/F_m. This was most evident in the release of CH_3I by *Amphora* sp. *Synechococcus* sp. was observed to be the most affected by irradiance as shown by the increase in emissions of most halocarbons except for $CHBr_3$ and $CHBr_2Cl$. High positive correlation between F_v/F_m and halocarbon emission rates was observed in *Synechococcus* sp. for CH_2Br_2. No clear trends in correlation could be observed for the other halocarbons in the other two microalgal species. This suggests that other mechanisms like mitochondria respiration may contribute to halocarbon production, in addition to photosynthetic performance.

Subjects Marine Biology, Biosphere Interactions, Climate Change Biology, Biogeochemistry, Environmental Impacts
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INTRODUCTION

Long-lived anthropogenic substances such as chlorofluorocarbons are widely known as the main cause of the depletion of stratospheric ozone, but more recently, especially since preindustrial times, very short-lived substances, typically of lifetimes no longer than six