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Title:
“Methanol Cycling in the Marine Environment: Big Signal from a Small Molecule"

Abstract:
Methanol is a major volatile organic compound (VOC) on Earth and serves as an important carbon and energy substrate for abundant methylotrophic microbes. Previous geochemical surveys coupled with predictive models suggest that the marine contributions are exceedingly large, rivaling terrestrial sources. Although well studied in terrestrial ecosystems, the sources of methanol are only beginning to be understood in the marine environment and warrant further investigation. To this end, we adapted a Purge and Trap Gas Chromatography/Mass Spectrometry (P&T-GC/MS) method which allowed reliable measurements of methanol in seawater and various marine phytoplankton cultures with a method detection limit of 120 nanomolar. All phytoplankton tested produced methanol, ranging from 0.8–13.7 micromolar in culture and methanol per total cellular carbon were measured in the ranges of 0.09–0.3%. Our findings suggest that phytoplankton represent a significant source of methanol in the marine environment. Recently, we have also found that methanol can be quite high in karst subterranean and coastal estuary water samples and may serve as a potential substrate for microbial methane production. Overall, it appears that the marine biogeochemical roles of methanol may be more diverse than previously recognized.