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Laboratory determination of VOCs emitted by five marine phytoplankton species

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Laboratory experiments have been performed as part of the OOMPH project to assess the emission of volatile organic compounds (VOCs) from marine phytoplankton. Head-Space gas chromatography/mass spectrometry (HS-GC/MS) in single ion mode and head-space solid phase microextraction coupled to GC/MS (HS-SPME/GC/MS) in scan mode were employed in parallel to investigate the emission of several VOCs including: halogenated compounds, isoprene, monoterpenes, toluene, dimethylsulphide (DMS) and carbon disulfide (CS_2) from five marine phytoplankton species namely; *Calcidiscus leptoporus, Emiliania huxleyi, Phaeodactylum tricornutum, Chaetoceros neogracilis* and *Dunaliella tertiolecta*. Quantitative evidence is presented here to show which of the aforementioned VOCs are produced significantly by phytoplankton. Among the different algae groups, the two coccolithophorids, *C. leptoporus* and *E. huxleyi*, were the strongest emitters of DMS and CS_2, the two diatoms *Ch. neogracilis* and *P. tricornutum* were the major emitters of methyl bromide (CH_3Br). While *Phaeodactylum tricornutum* was the most emitter of monoterpene, *Chaetoceros neogracilis* was the major emitter of toluene and isoprene. Furthermore, we present evidence that several chlorinated organic compounds, normally considered as anthropogenic, can be produced from marine phytoplankton (namely CH_2Cl_2, trichloroethylene, tetrachloroethylene, chlorobenzene and dichlorobenzene). These results are in agreement with elevated ambient chlorobenzene mixing ratios that were measured in the remote atmospheric marine boundary layer over a biologically active oceanic front.