Biogenic Emissions of Short-Lived Halocarbons by Naturally Occurring Tropical Seaweeds.

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Abstract: Volatile halocarbons form a major source of halogen radicals in the atmosphere, which are involved in the catalytic destruction of ozone. Studies show that marine macroalgae (Nightingale et al., 1995), phytoplankton (Tokarczyk and Moore 1994) and ice algae (Sturges et al., 1992) release halocarbons. It was estimated that 70% of global bromoform may be produced by marine algae (Carpenter and Liss, 2000). The role of halocarbons in algae is linked to their use as defense against epiphytes and grazing (Nightingale et al., 1995), as well as scavengers of strong oxidants e.g. hypochlorite and hydrogen peroxide in the cells (Abrahamsson et al., 1995; Pedersén et al., 1996). Halocarbon release rates are higher for tropical algae than temperate species (Abrahamsson et al., 1995). The fringing coral reef at Cape Rachado, west coast Peninsular Malaysia, is dominated by Phaeophyta (brown seaweeds). Regular monitoring of the seaweed community revealed that species diversity ranged from 69 to 81 species with biomass ranging from 17 to 104 g.m$^{-2}$ (Phang 1995). Our recent study at the reef showed that of the 27 species observed, the brown seaweeds comprised from 52 to 92% of the community, except for the monsoon period around December, with biomass from 48 to 101 g.m$^{-2}$. The seaweed communities at the intertidal reef are exposed to varying environmental conditions linked to the change of tides and the seasons. The emission rates of eight volatile halogenated compounds by three brown seaweeds dominant in the reef, namely Sargassum binderi Sonder ex J. Agardh, Padina australis Hauck, and Turbinaria conoides (J. Agardh) Kützing under varying irradiance were recorded, using a purge-and-trap sample preparation system with a gas chromatograph and mass-selective detector. The release of some halocarbons was found to be influenced by irradiance. Correlations were also observed between emission of certain halocarbons with photosynthetic activity, especially bromo-and iodinated compounds 0.6<r<0.9; (p<0.01) suggesting that environmental factors such as light can affect the release of these volatile halogenated compounds by the seaweeds into the atmosphere (Keng et al. 2013). We have started studying the effect of pH on the emission of the halocarbons from these intertidal seaweeds.

References:
Keng FSL, Phang SM, Noorsaadah AR et al. (2013) Volatile halocarbon emissions by three tropical brown seaweeds under different irradiances, J. Appl. Phycol. 25:1377-1386