Biogeochemistry of Weeks Bay during bottom water hypoxic and norm-oxic events

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Weeks Bay (WB), as well as many other estuaries, faces the threat of hypoxia. WB is used by many people for both recreation and commercial practices, which could be seriously affected if a sustained major hypoxic event occurs. While several studies have been conducted in WB, very little is known about the biogeochemistry of the bay or its response to hypoxic conditions.

During the project, ten sediment cores were taken from sampling locales in WB, and O_2 and H_2S microelectrode profiles were conducted. Porewater was extracted from cross sections and analysed, and water column data was recorded using a sonde. Combining this information, a hypoxia likihood index (HLI) was formed indicating sites likely to experience hypoxia.

The results provided an understanding of the sediment and water column geochemistry. H_2S levels rose in the absence of O_2, and the HLI indicated some sites were more likely to go hypoxic than others.

Marine SOA: Gas-to-particle conversion and oxidation of primary organic aerosol

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A multi-technique approach was exploited to characterize organic marine aerosol collected during high biological activity period over North-East Atlantic, outside continental pollution plumes onboard the research vessel Celtic Explorer, in the frame of the EU project MAP (Marine Aerosol Production) Elemental analysis, nuclear magnetic resonance spectroscopy (NMR), liquid chromatography-mass spectrometry (LC-MS) and ion chromatography provided a unique characterization of the complex mixture of water soluble (WSOC) and water insoluble (WIOC) organic matter in the sub micron aerosol.

Beside MSA and amine salts, which constitute the main gas to particle SOA single species, WSOC showed the occurrence of two main fractions: one more hydrophilic, rich of sulphonates and hydroxy-carboxylic acids, likely derived by gas to particle conversion processes, and another one, less hydrophilic, likely forned by oxidation products of hydrophobic sea-sray organic matter. This last observation is is supported by PMF- NMR analysis indicating that a fraction up to 30% of WSOC can be accounted for by C7-C9 aliphatic carboxylic acids, plausibly produced by the degradation of lipids in primary marine organic particles. Moreover NMR analysis of water insoluble fraction, indicated that submicron particles contain a relevant fraction of long chain fatty acid, the likely precursors of the less- hydrophilic WSOC fraction.

This picture shows that WSOC is mainly of secondary origin not only due to gas-to-particle conversion, but also, and for a relevant fraction, is originated from oxidation of sea spray organic particles.