

# Underwater Membrane Introduction Mass Spectrometers: Recent Developments and Deployments

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The need for chemical monitoring and profiling in our oceans is driven by basic scientific questions as well as more pressing considerations such as the recent Deepwater Horizon oil spill. Versatile in situ analyzers are needed to locate, map, and monitor the long-term fate of chemical compounds. In situ mass spectrometers fill this need with capabilities that far exceed traditional underwater chemical sensing techniques with respect to dynamic range, and to sensitivity and selectivity to a broad range of analytes. SRI International's in situ membrane introduction mass spectrometry (MIMS) instruments can quantitatively detect volatile organic compounds in water at trace levels, while simultaneously monitoring the concentrations of all light, stable dissolved gases to a depth of 1500 meters. Recent deployments of the UMS systems in the Santa Barbara Channel and the Gulf of Mexico will be discussed. In addition, the ever-growing concerns regarding global warming and ocean acidification have led to a significant interest in developing in situ methods to characterize the oceanic carbon system. Toward this goal, we will present a novel method to simultaneously determine the partial pressure of carbon dioxide ( $p\text{CO}_2$ ) and total dissolved inorganic carbon (DIC) in seawater using MIMS.