

Application of the In-Spectr 200 Membrane Introduction Mass Spectrometer for Measurements of Methane in Lake Constance (Germany) and the Western Baltic Sea.

Michael Schlüter, Torben Gentz

Alfred-Wegener-Institute for Polar and Marine Research

Organic rich sediments in the marine environment or lakes are considerably enriched in methane as well as other trace gases. These gassy sediments are sources for methane which emanates into the water column by ebullition or diffusion through the sediment-water interface. Unfortunately, standard techniques as water sampling by Rosette Samplers and measurement by gas chromatography (GC) often fail to detect gas plumes released from pockmarks, mud volcanoes or gas hydrate fields.

To bypass the disadvantages of discrete water sampling and time consuming GC analysis an online measuring system, based on the In-Spectr 200 Membrane Introduction Mass Spectrometer was applied for studies of methane concentrations in Lake Constance and the Western Baltic Sea. The system was used in situ in water depths of ~50m as well as onboard ship. In the later case a submersible pump, which can be operated down to 180m water depth was applied for continuous water sampling. To further improve the detection limit on methane a cold trap was applied. The data derived online by the In-Spectr 200 were verified by gas chromatography.

In March and August 2007 the CH₄ concentrations in surface and bottom waters of Lake Constance were measured along several transects crossing pockmarks and gassy sediments. Measurements by the In-Spectr 200 allowed the mapping of the CH₄ concentration in the bottom water around pockmarks located in 80m and 13m water depth. Concentrations of up to 1100nM were measured at pockmark sites, whereas concentrations close to the detection limit (~20nM) were observed in the surroundings. Even in surface waters above the pockmarks CH₄ concentrations of 600nM were observed. The data were compared to results obtained by Rosette Samplers and water samples collected by scuba divers.