

Automated trace gas monitoring on a ship of opportunity in the Baltic Sea

Gregor Rehder*, Wanda Gülzow, Bernd Schneider, Oliver Schmale, Michael Glockzin, Bernd Sadkowiak

Leibniz Institute for Baltic Sea Research Warnemuñde, Warnemuñde, Germany

* Email: gregor.rehder@io-warnemuende.de

With the growing maturity of CRDS and oa-ICOS instruments, the continuous measurement of trace gases other than CO₂ in surface waters has become possible. We were the first to report the permanent installation of a Los Gatos GGA for the measurement of surface pCO₂ and CH₄ on a voluntary observing ship (VOS) as an amendment to an already installed LICOR-based equilibration system on the ferry M/S Finnmaid, traversing the Baltic Sea between Luñbeck and Helsinki approximately every 2 days (Gülzow et al., 2011). As a German contribution to ICOS (Integrated Carbon Observation System), the extension of the system to additionally monitor N₂O and the stable isotopic signature of carbon dioxide ($\delta^{13}\text{C}_{\text{CO}_2}$) is currently in preparation. We present the almost continuous record of surface water pCO₂ and dissolved CH₄ along the cruise track for the last three years, and highlight some of the reoccurring annual patterns. We also provide examples of the use of the data for regional process studies on the Baltic methane cycle from recent publications (Gülzow et al., 2013, Schneider et al., 2014, Jakobs et al., 2014), including upwelling induced methane release, the impact of the River Neva runoff on surface methane concentrations, and the role of methane oxidation to hamper the escape of methane from the deep anoxic central basins. Finally, we will draw attention on new challenges for equilibrator design resulting from the lower response time and higher contamination sensitivity of less soluble gases (e.g. CH₄, CO), as well as the larger volume of oa-ICOS sensors in particular.

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