

FINE VARIABILITY OF DISSOLVED TRACE GASES USING A NEW EXTRACTOR DEVICE IN THE ARCTIC OCEAN SEAWATER DURING TRANSSIZ 2015

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Scientific and technical context:

In the frame of Arctic Rapid Change research program of the Arctic in Rapid Transition (ART) initiative the LSCE institute is deploying a new experiment to monitor the fine variability of dissolved trace gases in the Arctic Ocean. This experiment is taking place a board the RV POLARSTERN during the TRANSSIZ campaign 2015.

Methodology:

An **On Line Water Extractor Device (OLWED)** has been recently developed in the framework of our CBRN-E (chemical, biological, radiological, nuclear and explosive risks) research project funded by the French Atomic Energy Commission Department of Military Application (CEA-DAM). The OLWED has been coupled simultaneously with a Proton Transfer Mass Spectrometer (PTRMS, S/N=68, Ionicon Austria) for Volatile Organic Compound's (VOC) measurements and to a gas chromatograph (GC) for Carbon Monoxide (CO) monitoring. The general concept is to mix a constant volume of water with thousands of micrometric bubbles to produce a constant and high flow of concentrated continuous air. The resulting head space containing the extracted trace gases can be directly injected on any analytical system.

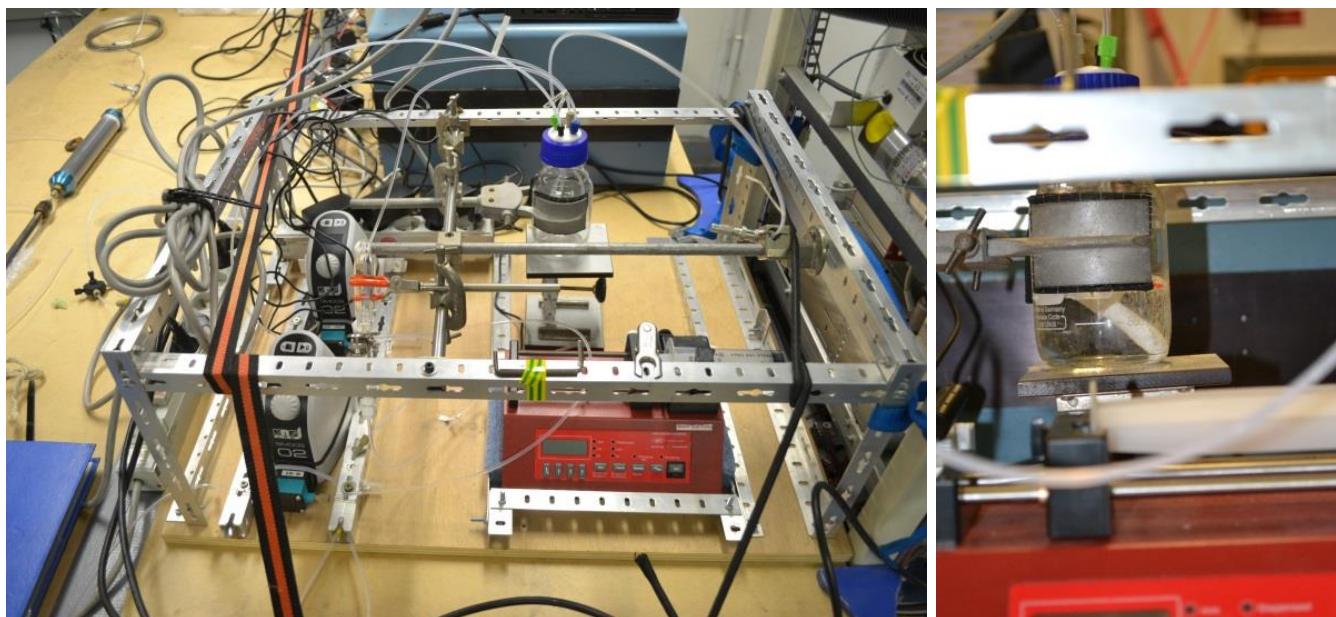


Fig. 1 **On Line Water Extractor Device (OLWED)**, property of CEA Saclay, France),
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Analytical systems:

We used a PTR-MS especially designed for onboard experiment. The basic principle of this instrument is to mix millions of protons generated by a hollow cathode with atmospheric air to produce ionized compounds that can be selected by a Quadrupole Mass Spectrometer (QMS) and detected with a Secondary Electron Multiplier (SEM). In this case we can measure VOC's concentration at trace levels (ppt).

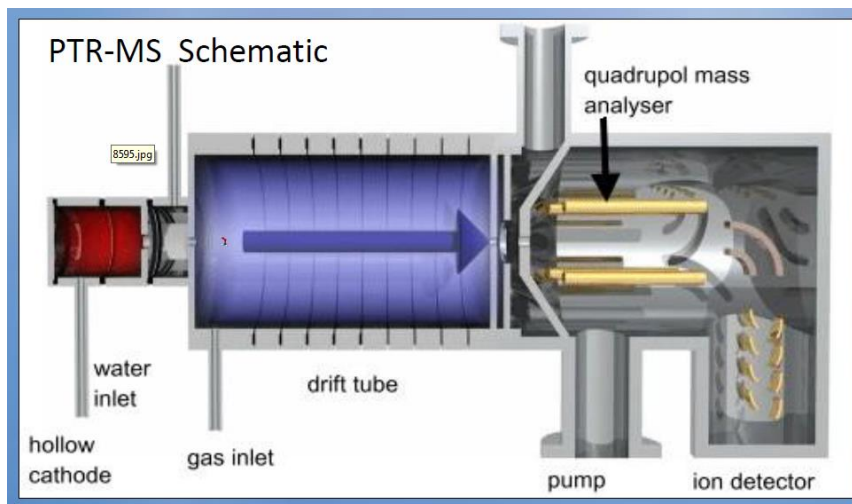


Fig. 2 Proton Transfer Mass Spectrometry principle, ©Ionicon

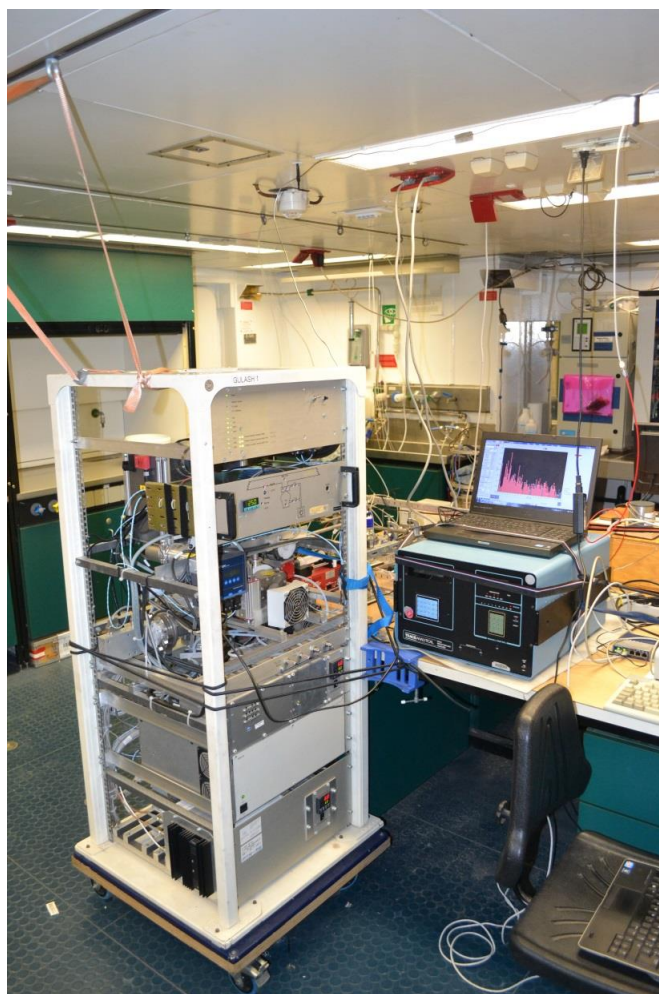


Fig. 3 Ionicon PTRMS SN68 and CO GC on- board the RV POLARSTERN
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Preliminary results:

The robustness of our experiments allows to get continuous on-line measurements of dissolved CO and VOCs with a high time resolution (one data point every two minutes) since the day after the departure from Bremerhaven (see Fig. 4). We choose to perform 24 hour measurements in the scan mode of the PTR-MS in order to do a screening of all potential interesting molecules and therefore to select the compounds that we will monitor during the campaign.

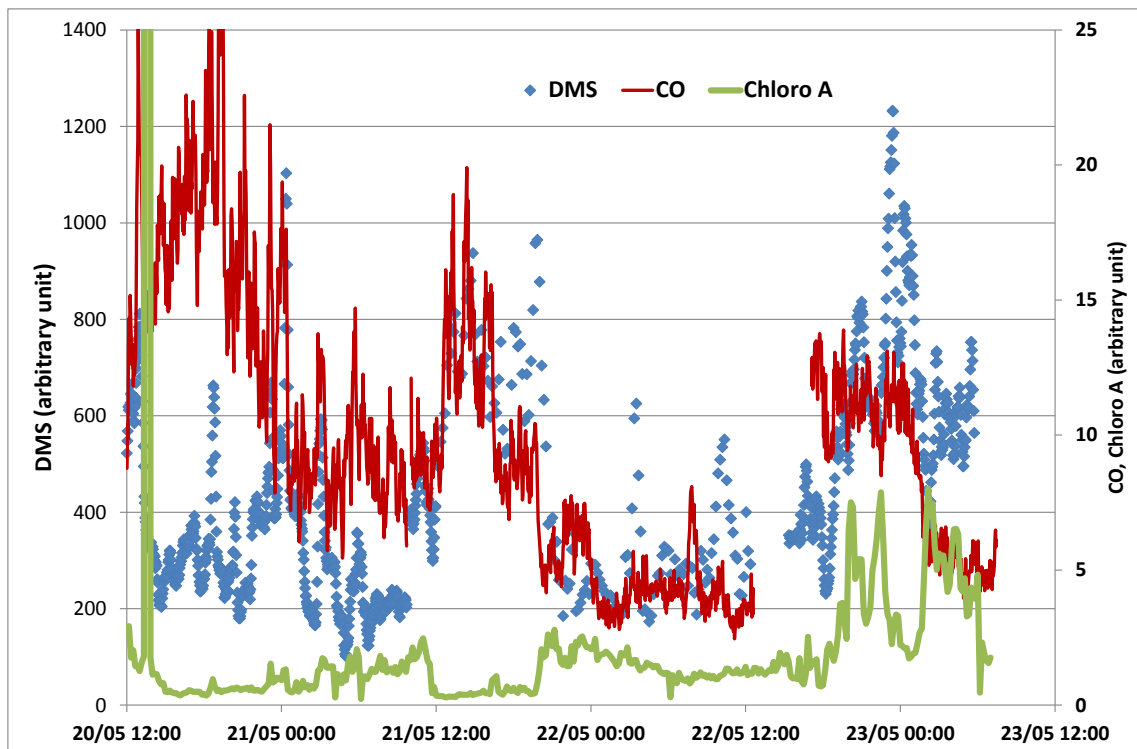


Fig. 4 Preliminary results from Dimethyl sulfide (DMS), CO and chlorophyll-A