Measuring atmospheric methane emissions from abandoned wells and natural sources: a case study from the Dutch North Sea

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Methane emissions from the Dutch North Sea can have an anthropogenic or natural origin. We developed ship-based methods to measure methane emissions from the sea surface to the atmosphere. A frame equipped with gas inlets positioned at three heights above sea level was mounted at the ships portside together with a 3D sonic anemometer (Figure 1). This allowed us to do gradient measurements while being stationary above a methane source. Gas emissions from the sea surface were determined by measuring CH_4, CO_2 and CO concentrations at each height with a gas analyzer, which enables us to compute the CH_4 fluxes from the water. Secondly, emission rates were then computed using a Gaussian plume model. First, the exact location where a bubble plume exits the water (exit point) was established with the multibeam echosounder. Then, the fluxes of the bubble plumes were assessed by sailing downwind of the bubble plumes with the inlets facing towards the exit point.
In this presentation, we will show data collected above a leaking well and from a natural seepage area. We will provide estimates of methane fluxes from individual bubble plumes into the atmosphere and compare the fluxes of the leaking well and natural seepage.

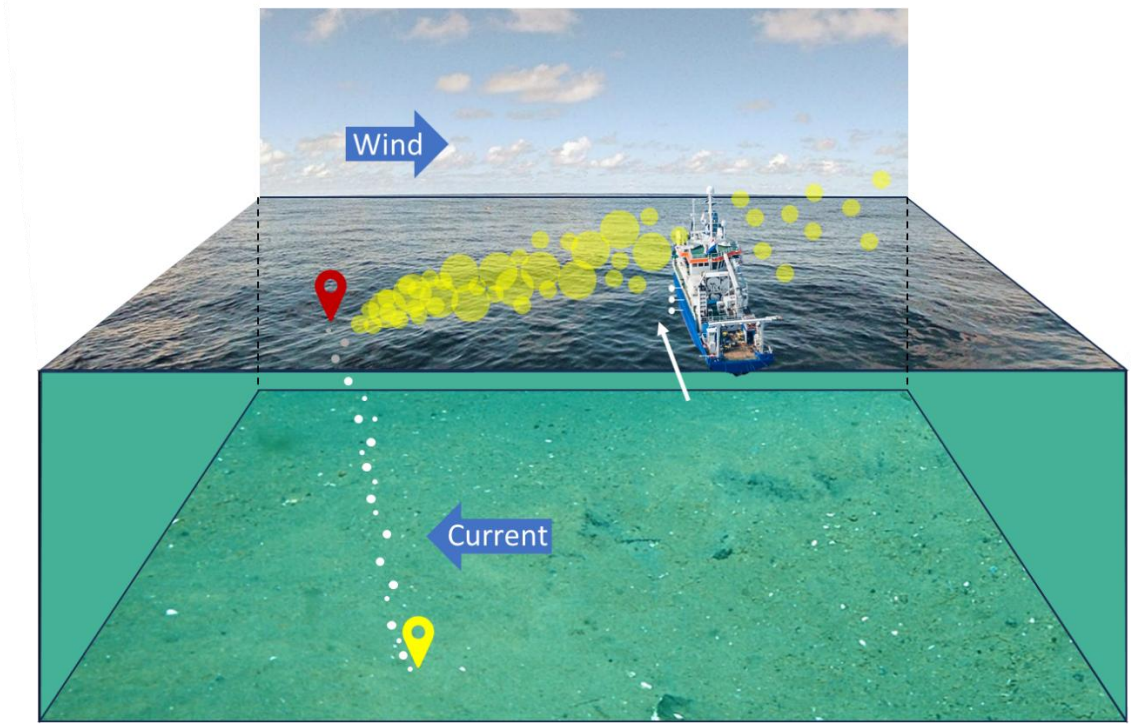

Figure 1 Schematic set-up of the ship-based gradient measurement method. White arrow shows the sailing direction to capture the plumes downwind of the exit point (red marker).