

Fluctuations in methane emissions from a leaking well in the Dutch North Sea

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Quantifying methane emissions from leaking wells is becoming increasingly important. According to new EU-regulations, methane emissions need to be measured and reported in tonnes per year. However, (ship-based) measurements are typically in the order of minutes to hours at most and therefore it is unclear whether these ‘short’ measurements are representative for reporting yearly emission figures. We want to investigate whether the emission from leaking wells fluctuate overtime, and whether they decrease or increase overtime.

Here we aim to estimate fluctuations in methane emissions from one leaking well (A15-03) in the Dutch North Sea (de Bruin et al., 2025). We measured this well 47 times over a 3-year period (2022, 2023 and 2024) with the RV Pelagia. We used backscatter data of multibeam echosounder system (Kongsberg EM2040) to detect the bubble plumes. Next, we use a fish-detection algorithm of Echoview to extract a 3D envelop around the bubble plumes (fig1). We compute the spine of these objects with the open-source software PING and corrected for currents (i.e. we correct for the fact that plumes do not go straight up in the water column due to currents). Finally, aggregated backscattering cross-section of a bubble stream is computed and plotted on a map.

We found 3 different bubble plumes at the leaking well where most of the time only 2 locations were active. One of these two plumes (fig 1) is constant while the second shows an intermittent flow (bubble bursts of 6-12 second). The constant bubble plume is about 50% stronger than the intermittent plume. The bubble-stream measurements show relatively high variation of $\pm 2\text{dB}$ (ca $\pm 50\%$) between measurements and both plumes fluctuate jointly (i.e. they both increase or decrease). Over time we observe changes on several orders of magnitude with respect to the acoustic response. Calibration to actual rates of gas release are needed to verify true numbers for gas flow.

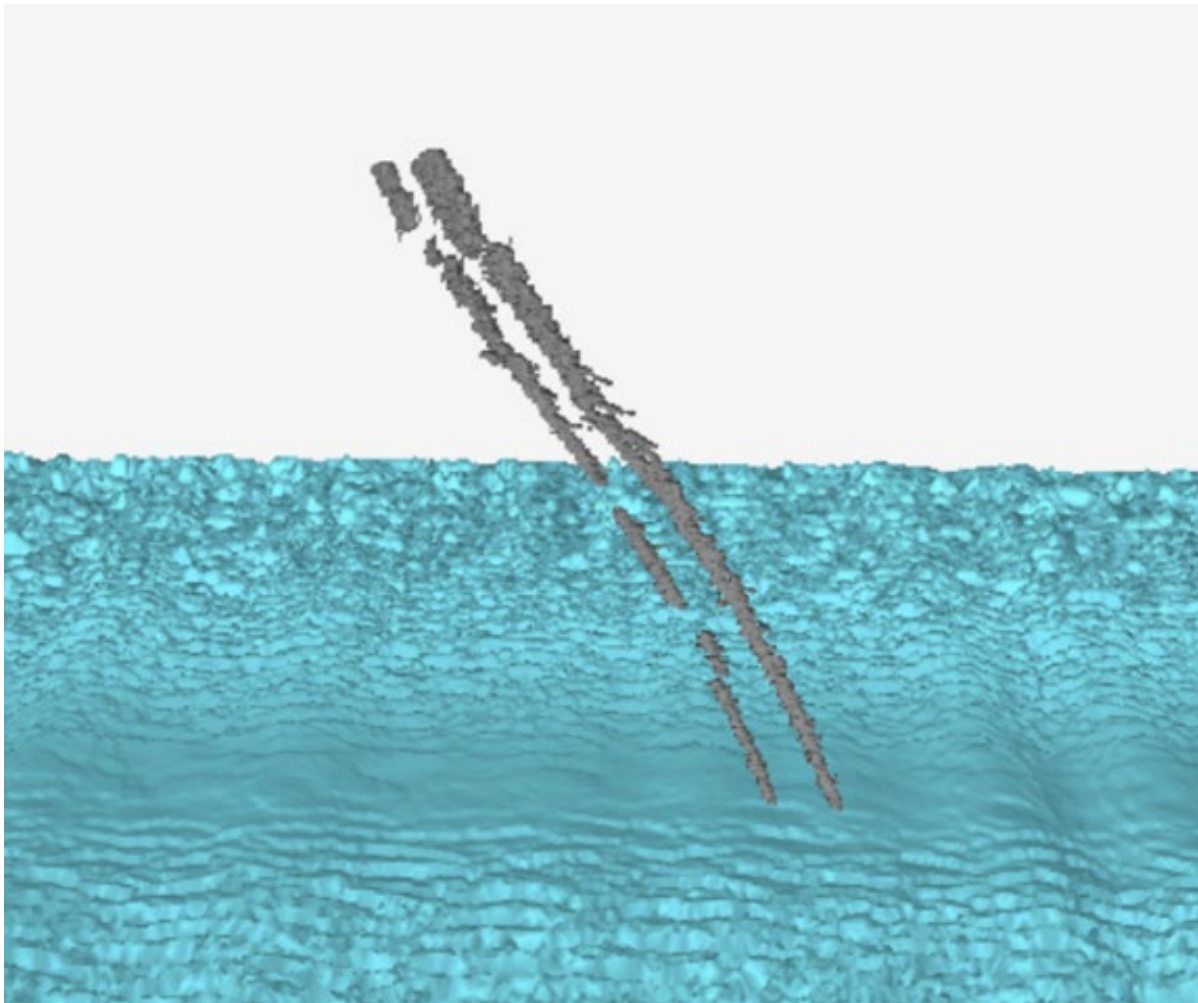


Figure 1: Two bubble plumes are extracted in 3D from multibeam echosounder data. The plumes originate from leaking well A15-03. The plume on the right has a constant flow, while the plume on the left exhibits an intermittent flow. The plumes are displaced by currents.

References

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Ping <https://github.com/themachinethatgoespings>

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