

Calibration of multibeam echosounder bubble plume measurements using a controlled bubble plume generator

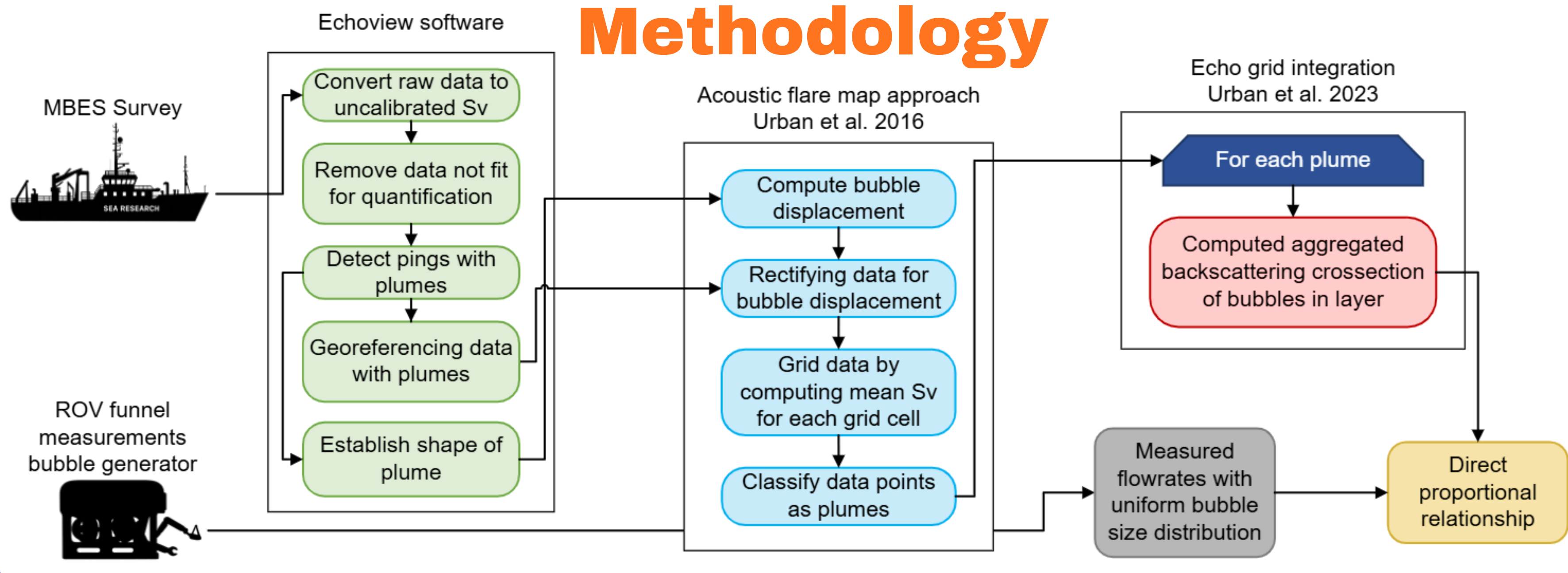
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Research objective

This study aims to calibrate MBES flow rate measurements by directly comparing the acoustic signatures of artificially created bubble plumes with their known release rates. Such direct in-situ calibration promises substantially lower uncertainties and enables both validation and real-world uncertainty quantification of MBES based gas flow quantification in a controlled setting.

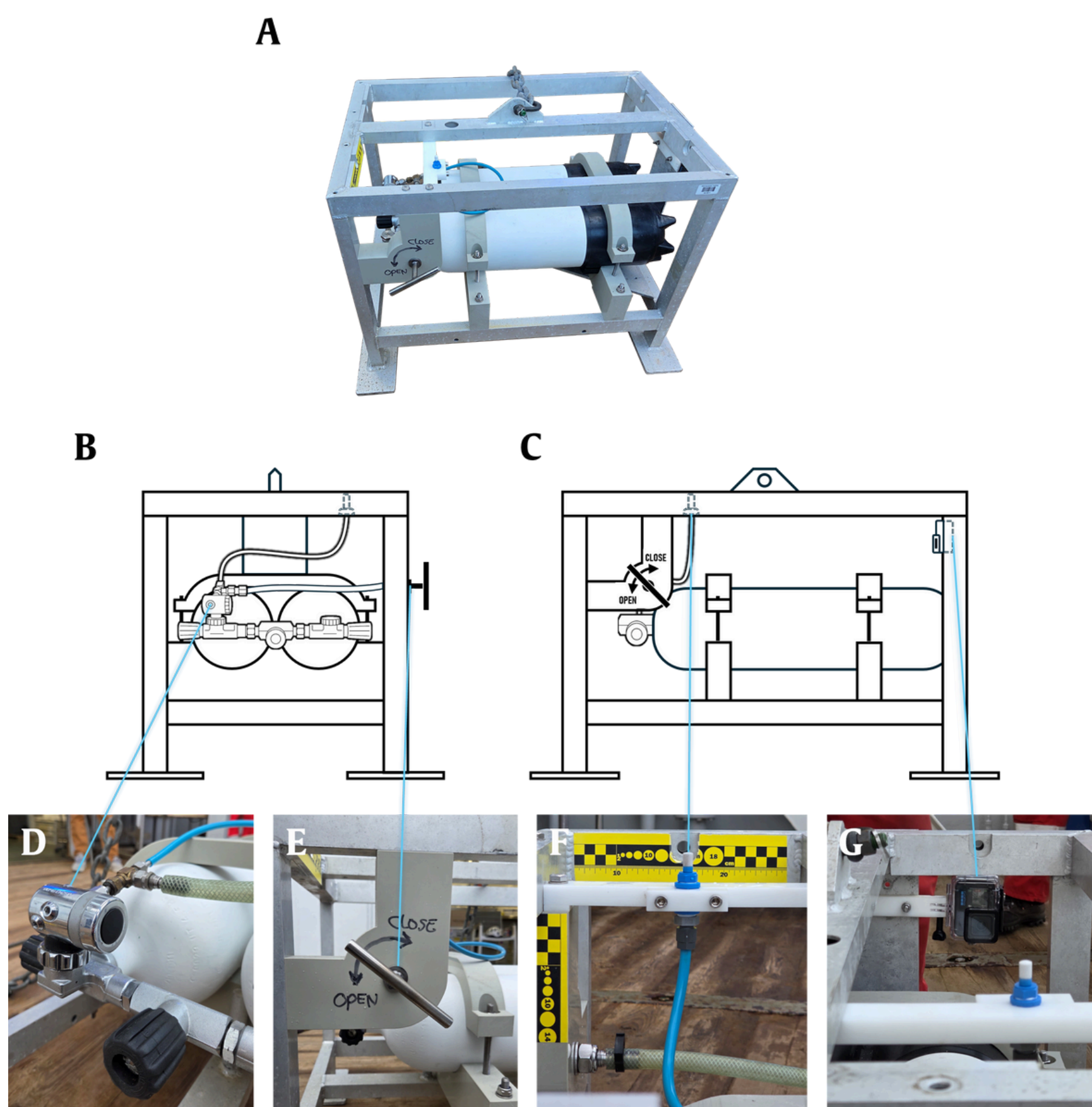
Methodology



Technical details

Development of a Bubble Generator

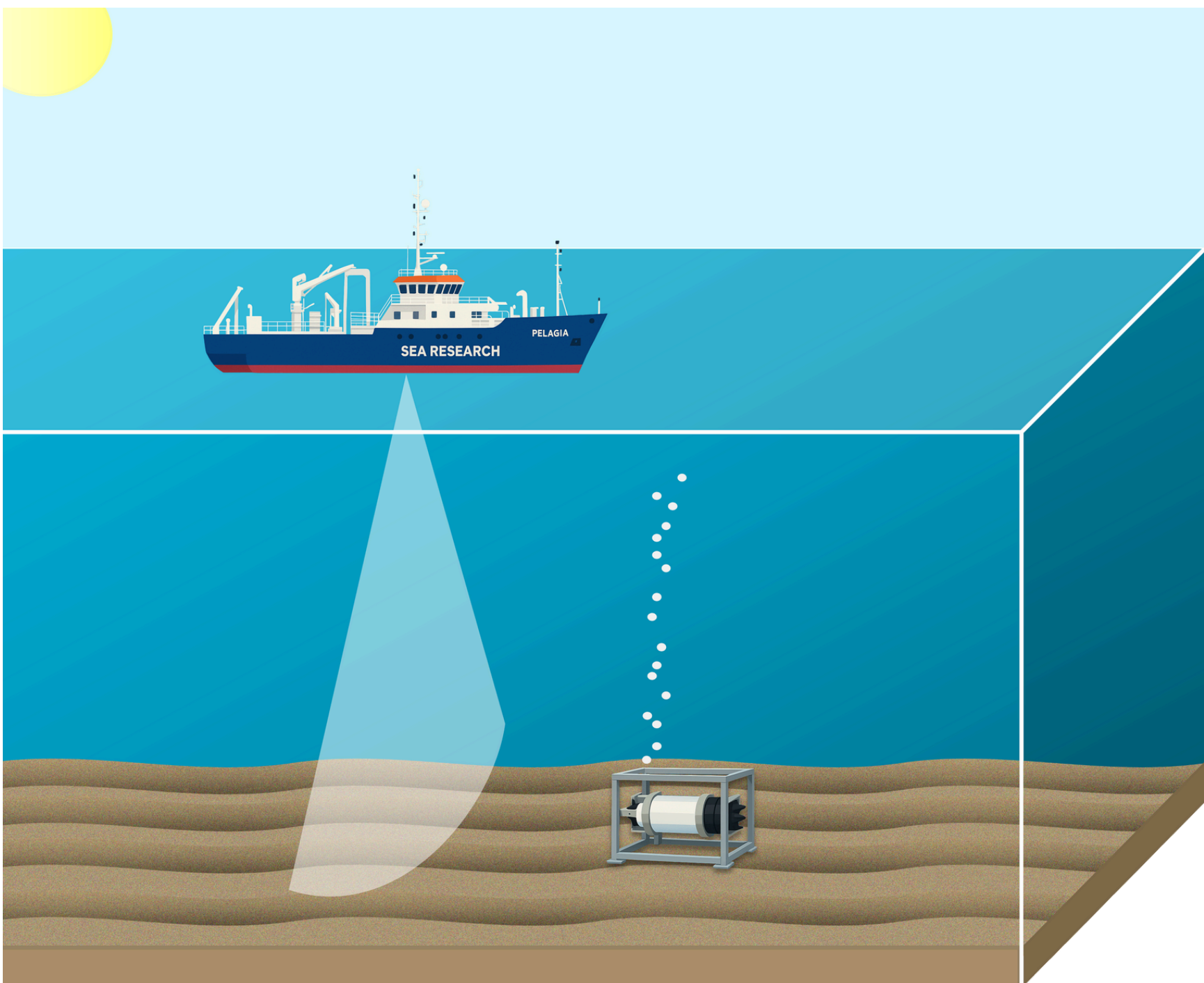
- Constant pressure of 10 bar (independent of depth)
- Adjustable and constant flowrate by turning handle specialized for ROV
- Sparger positioned on top of air outlet to create uniform and distinct bubbles
- Camera (GoPro) aimed at bubble release point for high quality imaging for bubble size distribution



Multibeam Echosounder measurements

Kongsberg EM 2040 MKII:

- High resolution shallow water MBES
- Operated at a frequency of 300 kHz
- Beamwidth of 1° for both TX & RX

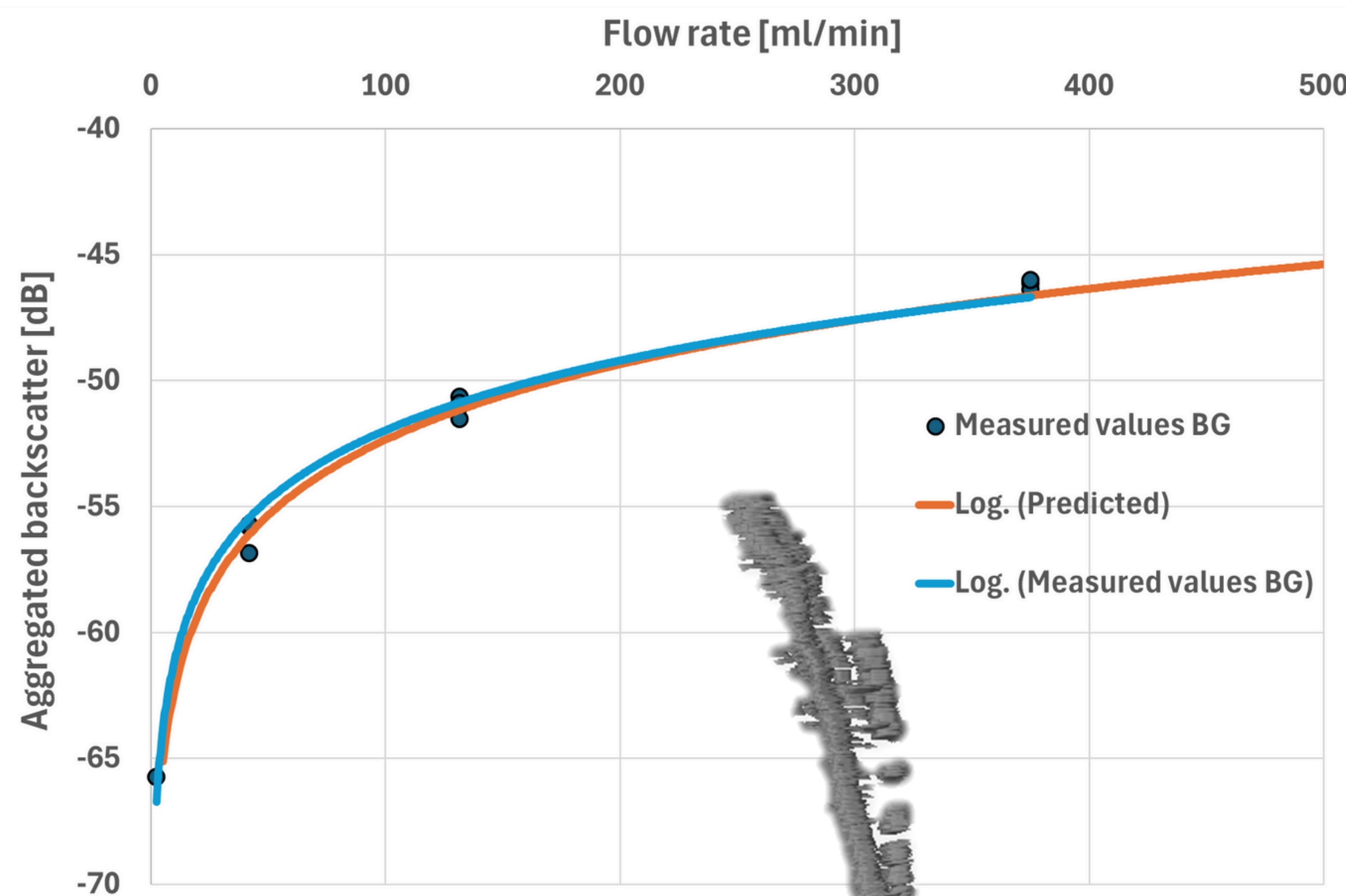


Preliminary results

Flowrate	Camera	MBES (raw)	MBES (3D)	MBES (processed)
Low 2.5 ml/min				
Med 131 ml/min				
High 375 ml/min				

Preliminary conclusion

This experiment proves that there is a direct proportional relationship between flowrate [ml/min] and acoustic backscatter [dB]



Next step: quantification of a leaking well by using the established relationship and the bubble generator.

Leaking well

Bubble generator