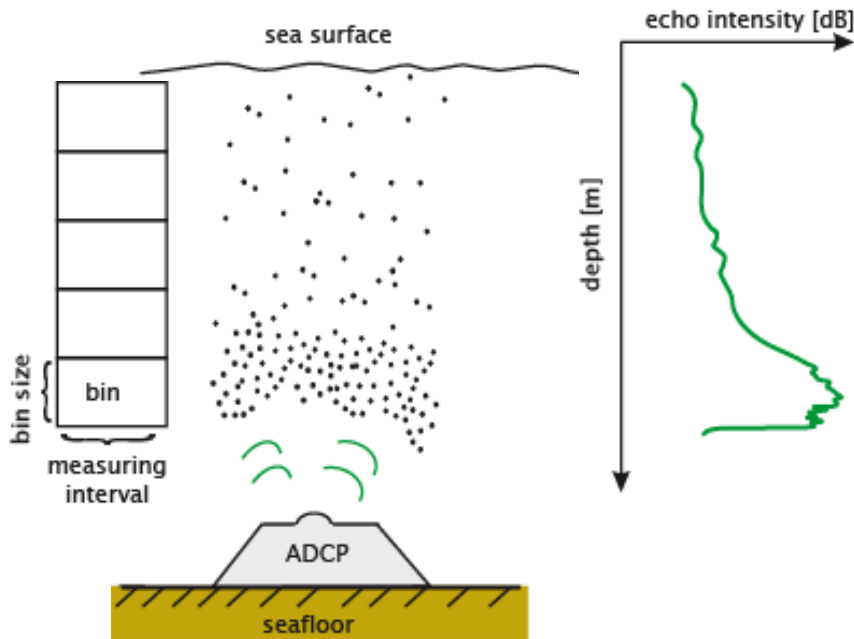


Suspended matter concentration derived from Acoustic Doppler Current Profiler (ADCP) Signals in Arctic environments

Background

The intensity of the backscattered acoustic signal (echo intensity) of the ADCP is a measure for suspended particulate matter (SPM) concentration within the water column: high echo intensity generally represents high SPM concentration and low echo intensity low concentration.



Conversion of acoustic data in SPM concentration

Applying the theoretical interaction of sound in the water to SPM, the acoustic backscatter signals can be transformed adapting a previously established approach by Holdaway et al. (1999):

$$SPM_{\text{acoustic}}(r) = \left\{ \frac{EI(r)}{K_s K_t} \right\} r^2 e^{4r(\alpha_w + \alpha_s)}$$

SPM_{acoustic}	SPM concentration
r	distance from transducer
EI	echo intensity
K_s	SPM properties
K_t	system parameters
α_w	attenuation due to water
α_s	attenuation due to scatterers in suspension

Comparison with direct SPM measurements

SPM concentrations estimated from the backscattered ADCP signals show a close similarity to SPM concentrations obtained from filtered water samples. In general, ADCPs tend to underestimate SPM concentrations (Wegner et al., 2006). Therefore co-deployment of ADCPs and turbidity meters will have distinct advantages over use of the respective sensors on their own.

Further information:

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References:

- Holdaway, G. P., Thorne, P. D., Flatt, D., Jones, S. E. & Prandle, D., 1999. Comparison between ADCP and transmissometer measurements of suspended sediment concentration. *Continental Shelf Research* 19, 421-441.
- Wegner, C., Hoemann, J.A., Klagge, T., Timokhov, L., & Kassens, H., 2006. Application of ADCPs for long-term sediment-transport monitoring in Arctic environments - examples from the Laptev Sea. OMAE 2006 - 25th International Conference in Offshore Mechanics and Arctic Engineering, June 4-9, 2006, Hamburg, Germany, OMAE2006-92551.