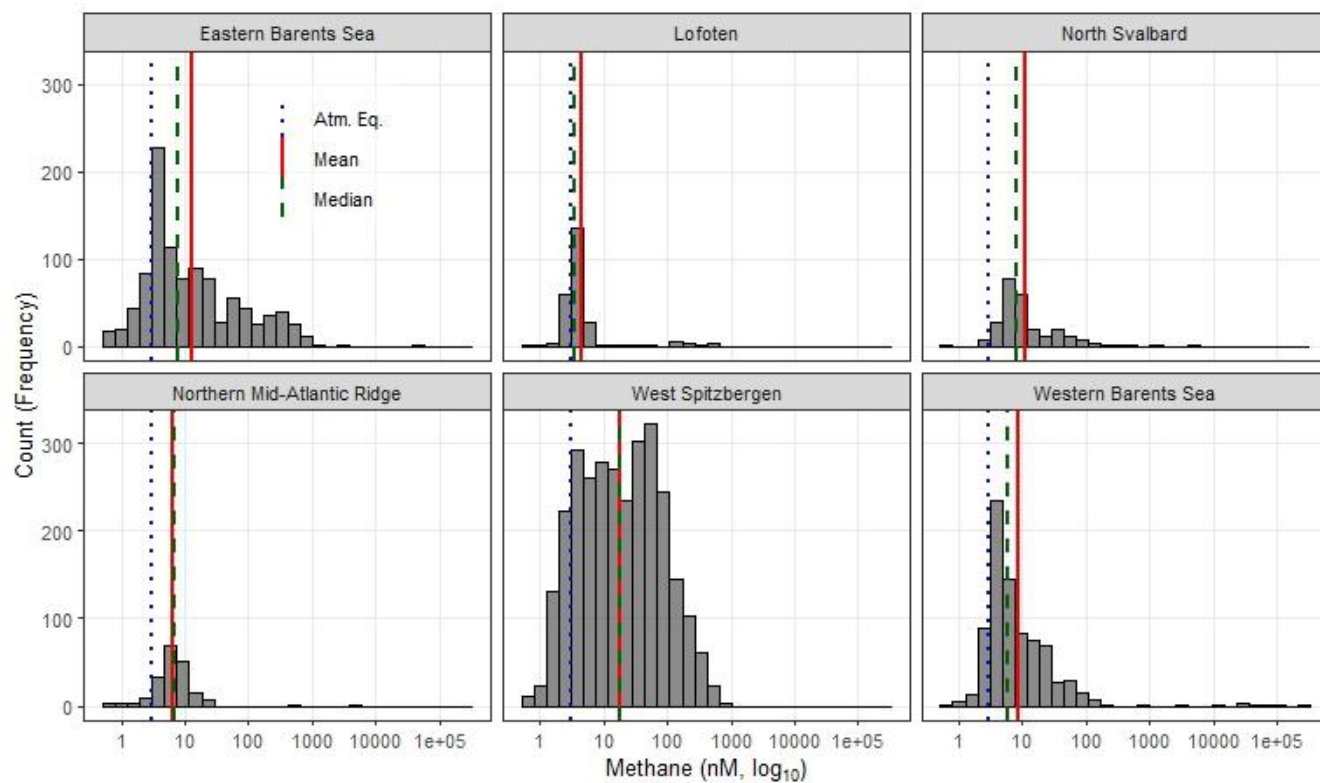
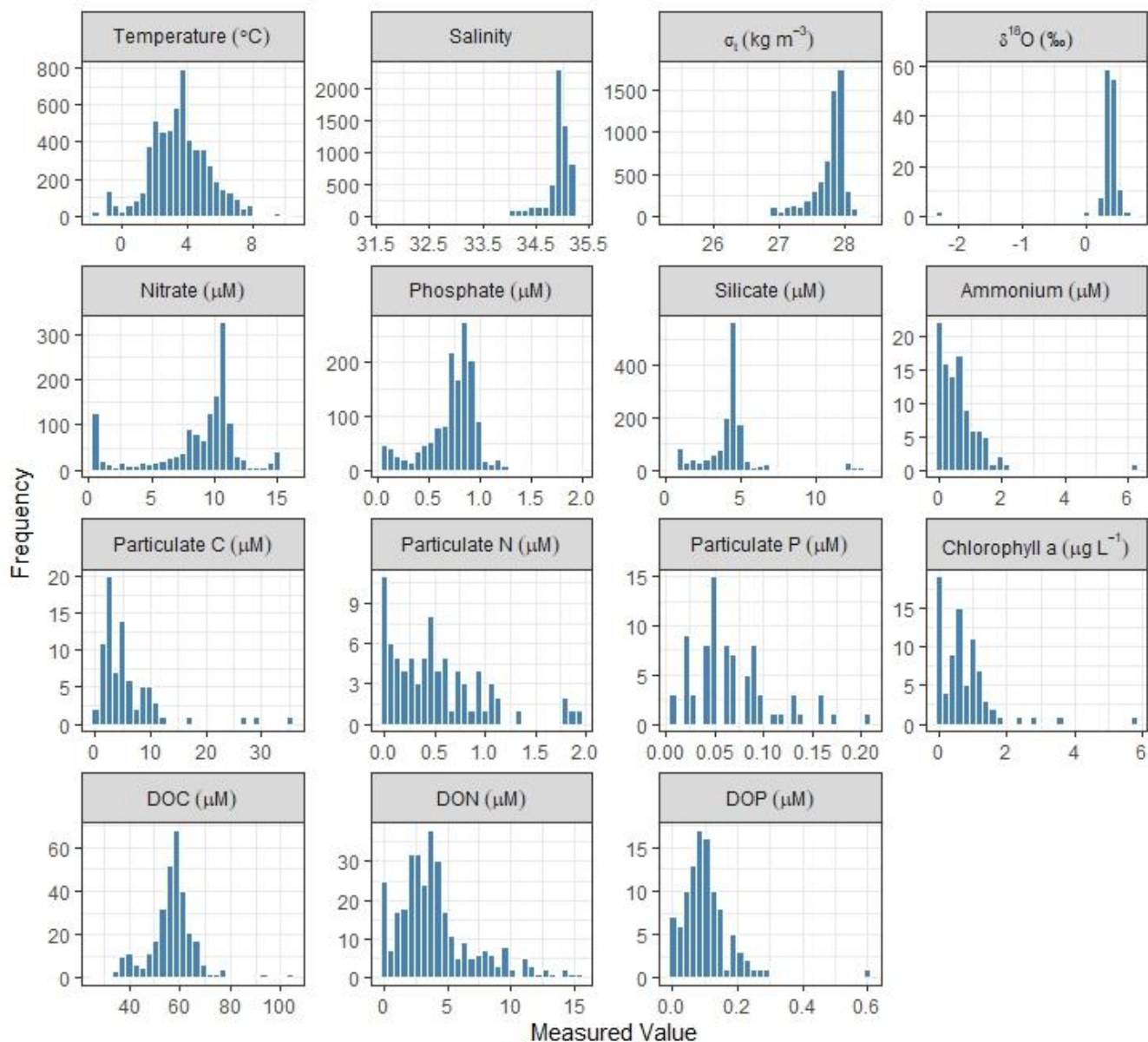


Supplementary Information



- 5 **Figure S1: Frequency distributions of dissolved methane concentrations measured across the study regions. Vertical lines indicate the atmospheric equilibrium concentration (2.7 nM; blue dotted line), the regional mean (red solid line), and the regional median (green dashed line). Methane concentrations are shown on a log₁₀ scale.**



10 **Figure S2: Frequency distributions of measured hydrographic, isotopic, nutrient, and organic matter parameters across all study sites. Histograms show the distributions of temperature, salinity, density (σ_t), $\delta^{18}\text{O}$, dissolved inorganic nutrients (nitrate, phosphate, silicate, ammonium), particulate organic matter (particulate C, N, and P), chlorophyll *a*, and dissolved organic matter components (DOC, DON, and DOP).**