Where methane seeps meet cold-water corals in northern Norway – Variability, habitat controls, and dissolved flux

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In the frame of EMAN7 (Environmental impact of Methane seepage and sub-seabed characterization at LoVe-Node 7), we synthesize how physical forcing shape methane fate and ecosystem interactions where seeps and cold-water coral reefs co-occur. A strong interannual variability in seep activity is linked to a combination of bottom waters temperature and tides that is also observed meters into the seabed (Ferré et al., 2024). Seafloor mapping shows methane-derived authigenic carbonate pavement with patchy microbial mats, and a macroscopic subsurface biofilm was found in a push core sediment, consistent with shallow sulfate methane transition zone and active anaerobic oxidation of methane; coral distribution aligns with hard carbonate substrate and energetic food-suppling currents rather than the seeps themselves (Argentino et al., in discussion in Biogeosciences). In the water column, seeps not only elevate dissolved inorganic carbon (DIC), but they also shift dissolved organic matter (DOM) and microbial communities near the reefs without disrupting the carbonate system at the observed low methane concentration, though sensitivity to warming and circulation is evident (Sert et al., 2025). A 3-D modeling framework based on field data shows that dissolved methane is quickly advected away from the source, but eventually reaches the sea surface where it could be transported to the atmosphere. Microbes represent a strong sink, eliminating ~60% of the methane in the water (Dølven et al., in discussion in Ocean Science).

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