

Insights from Upwelling in the California Current System on Mercury Biogeochemistry: Implications for Methylmercury Supply

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Monomethylmercury (MMHg) is a neurotoxicant that biomagnifies within the marine food web, reaching elevated concentrations in apex predators. One potential source of MMHg in the ocean, the demethylation of dimethylmercury (DMHg) into MMHg, remains understudied and unquantified. Previous work within the California Current System has suggested that upwelling influences regional mercury (Hg) biogeochemical cycle by transporting Hg-enriched deep waters to highly productive surface waters. These upwelled waters originating within the California Undercurrent water mass are advected as a surface water mass to the California Current. To explore the impact of upwelling on Hg biogeochemistry, we measured concentrations of total mercury (THg), elemental Hg (Hg⁰), MMHg, and DMHg in 16 profiles within the California Undercurrent and the California Current. We find on average 60% lower THg concentrations in the California Current than in the California Undercurrent. Similarly, we find 77% lower DMHg concentrations in the California Current than in the California Undercurrent, allowing us to calculate a net demethylation rate of DMHg equal to $0.0518 \pm 0.0036 \text{ d}^{-1}$. We incorporate this value into a model of the California Current System to understand the impacts of DMHg demethylation on MMHg supply in the upper water column.