



ICMGP 2024
CAPE TOWN • SOUTH AFRICA • 21 - 26 JULY

Linking Dimethylmercury and Monomethylmercury in a North Pacific Upwelling Region

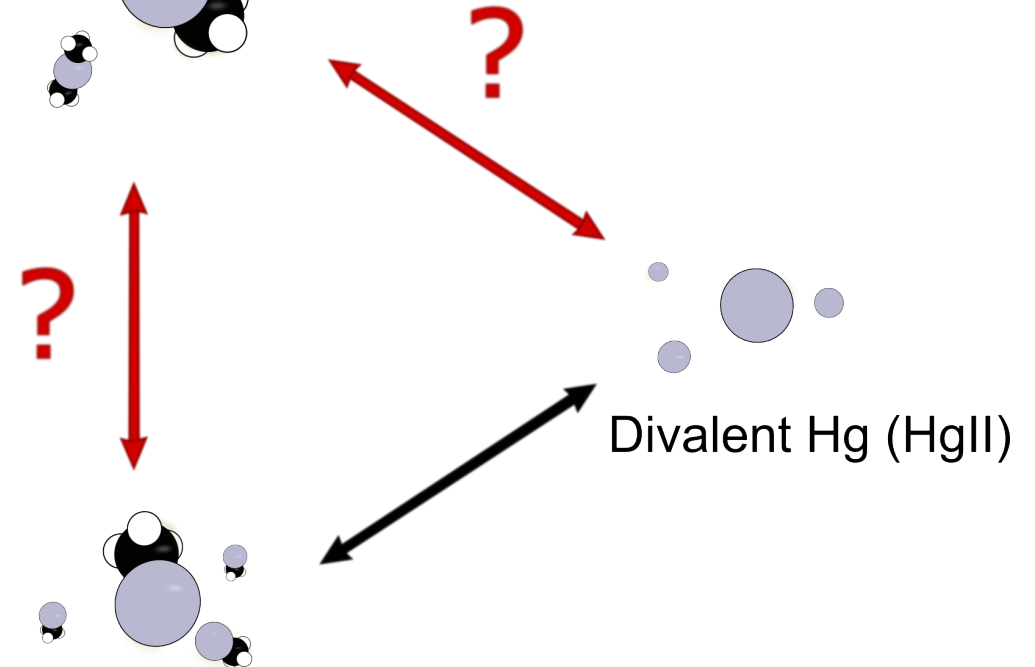
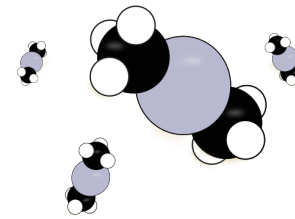
Johannes West, Hannah M. Adams, Erik T. Paulson, Iris Kubler-Dudgeon, C. Anela Choy, Amina T. Schartup
Scripps Institution of Oceanography, University of California, San Diego



Dimethylmercury (DMHg) often more abundant than Monomethylmercury (MMHg) in deep oceanic waters

Still, Not known what controls DMHg production/degradation and how it relates to MMHg

Dimethylmercury (DMHg)



Monomethylmercury (MMHg)

Divalent Hg (HgII)



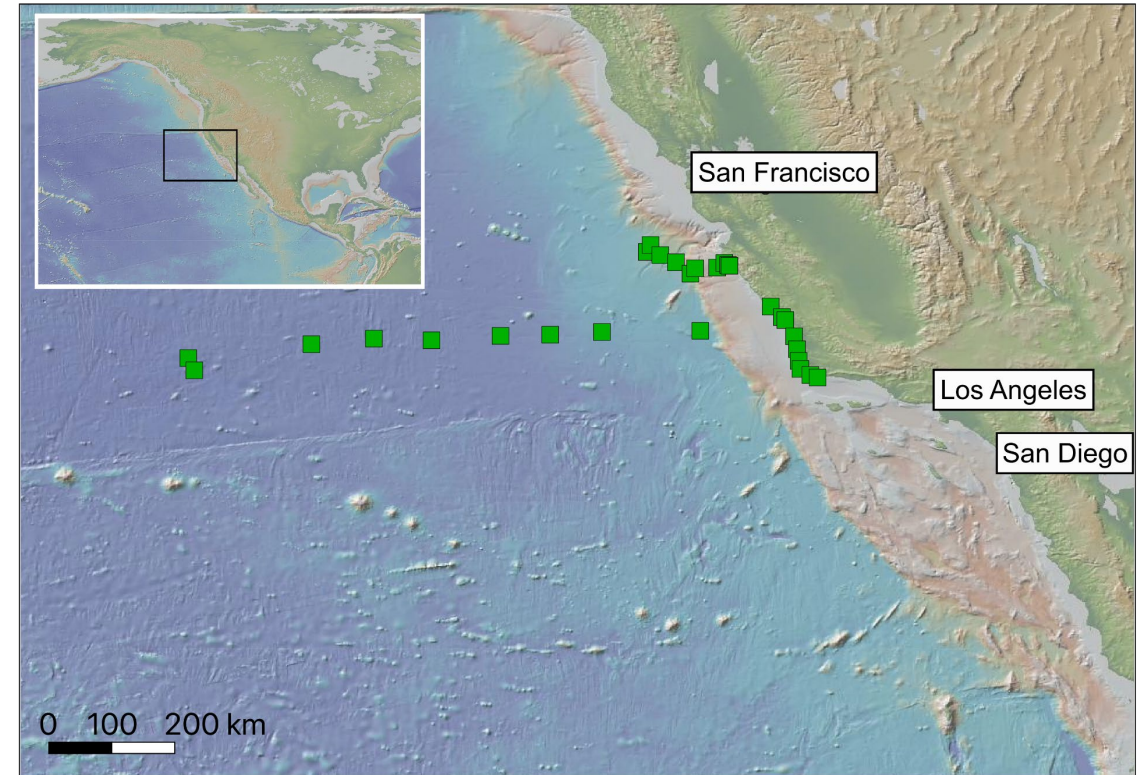
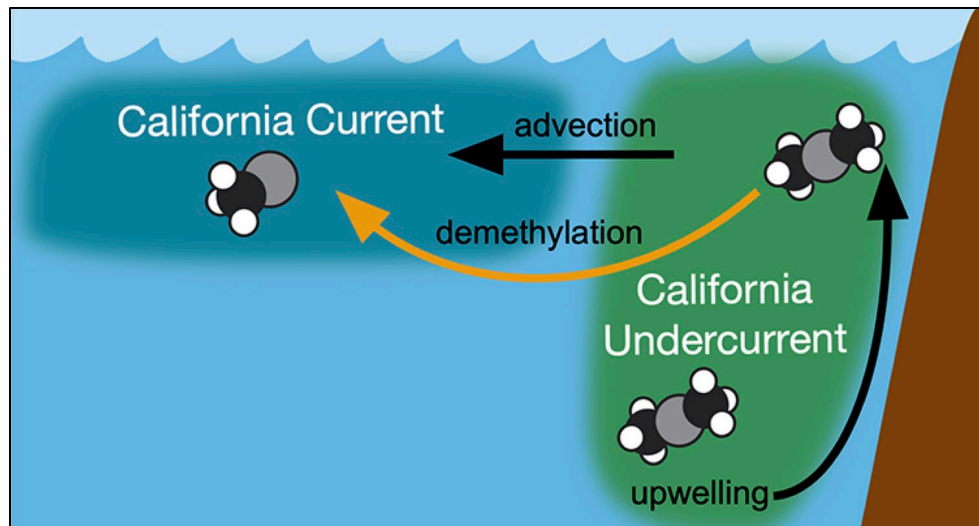
Modeling indicates deep DMHg source to surface waters in the California Current System

Dimethylmercury as a Source of Monomethylmercury in a Highly Productive Upwelling System

Hannah M. Adams*, Xinyun Cui, Carl H. Lamborg, and Amina T. Schartup*

Cite This: *Environ. Sci. Technol.* 2024, 58, 10591–10600

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■ CCE LTER P2107 Cruise July 10th – August 8th 2021

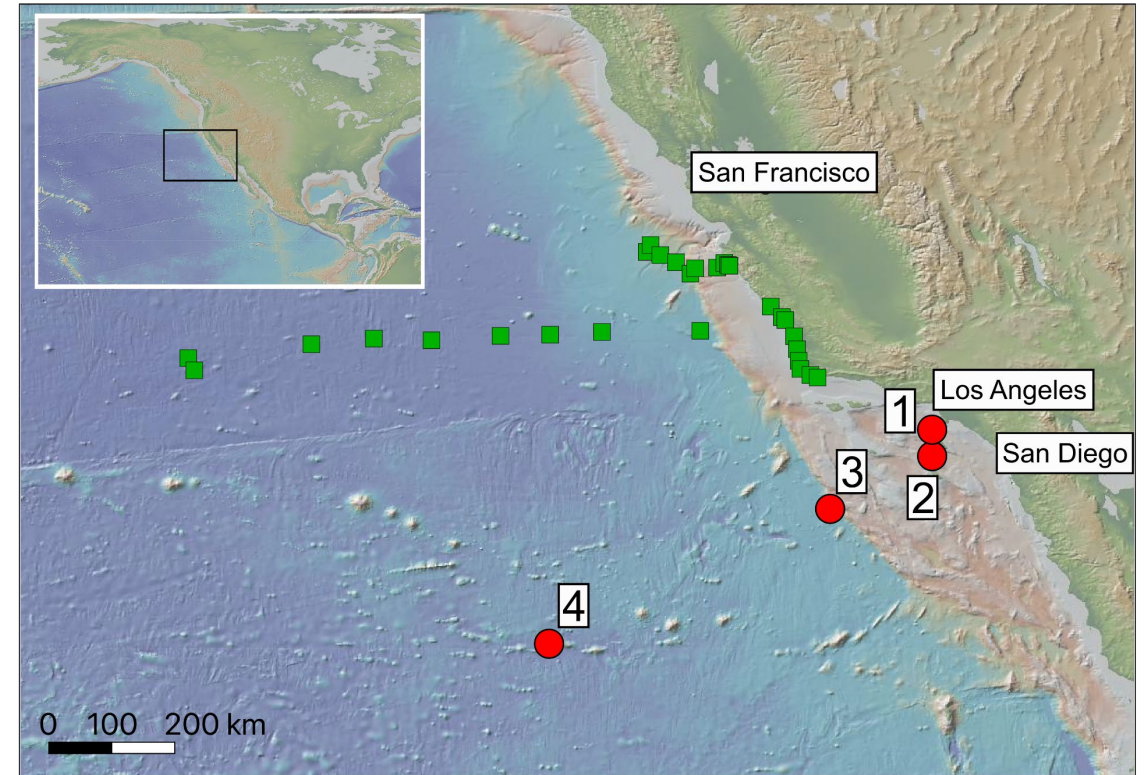
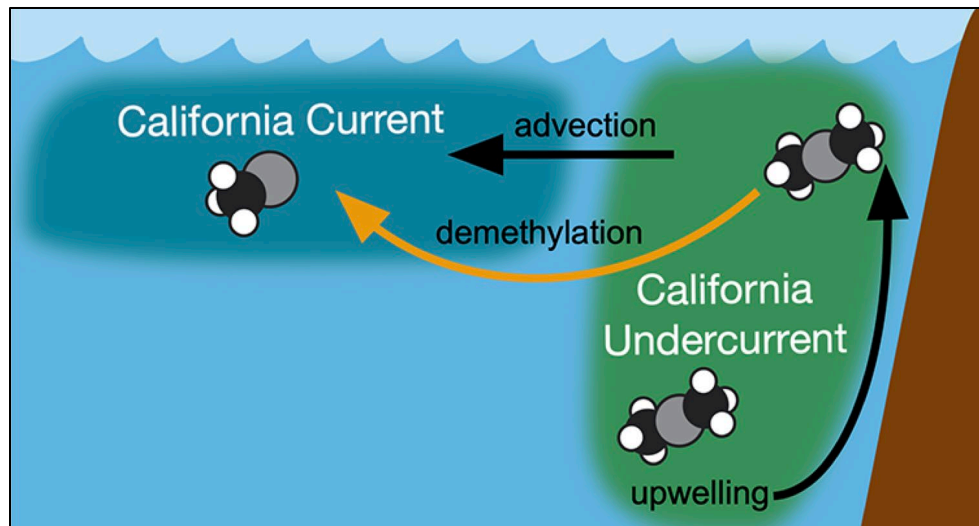
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● SR2323 Cruise October 11-24, 2023:

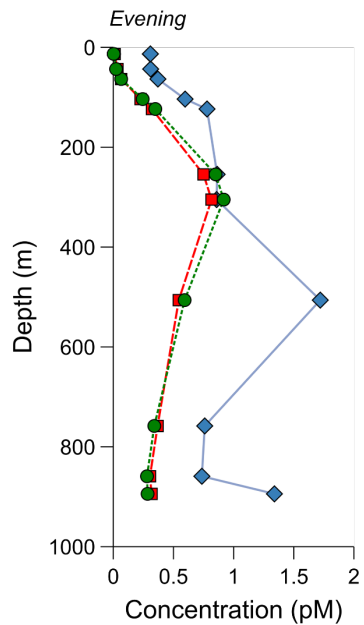
- DMHg
- Total methylated (TMeHg)
- Total Hg (THg)

Small diurnal and spatial variation

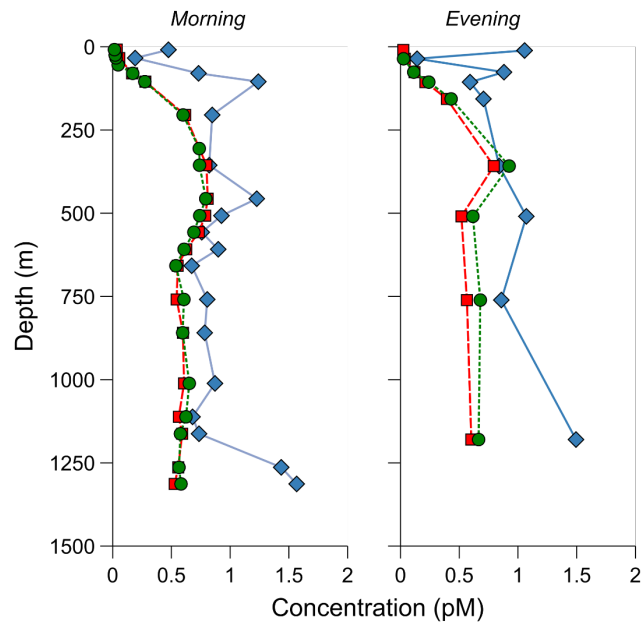
Seaward



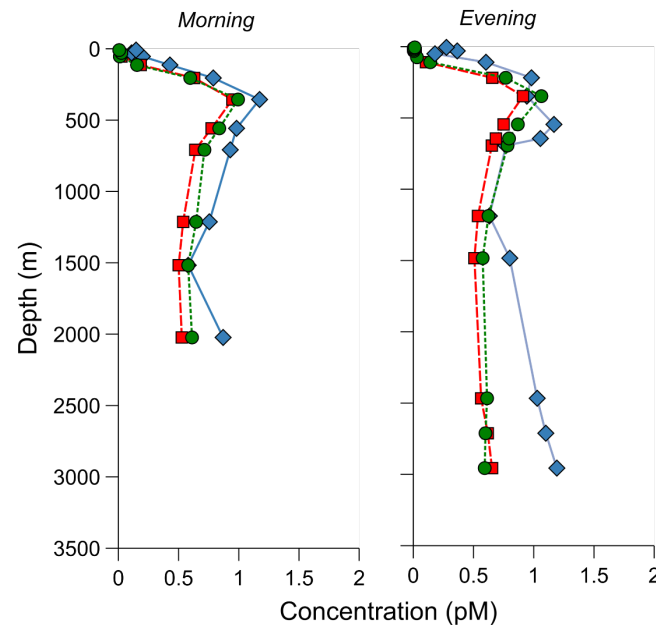
Station 1



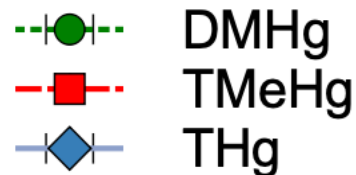
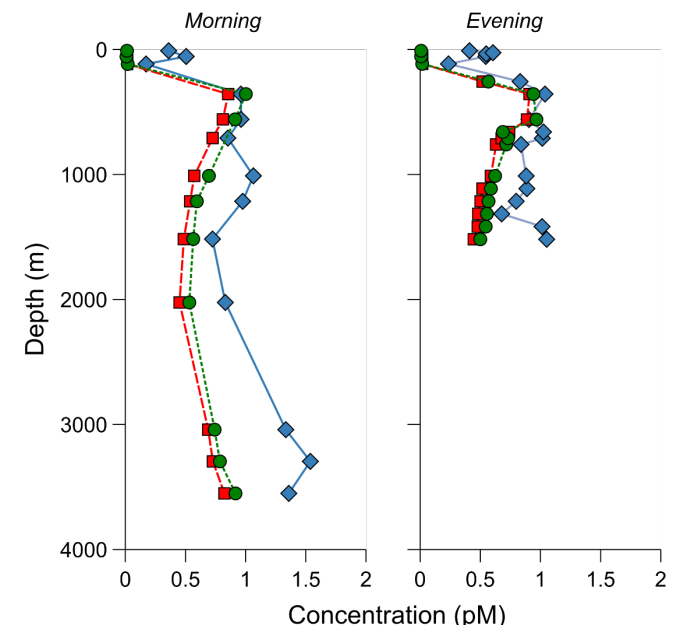
Station 2



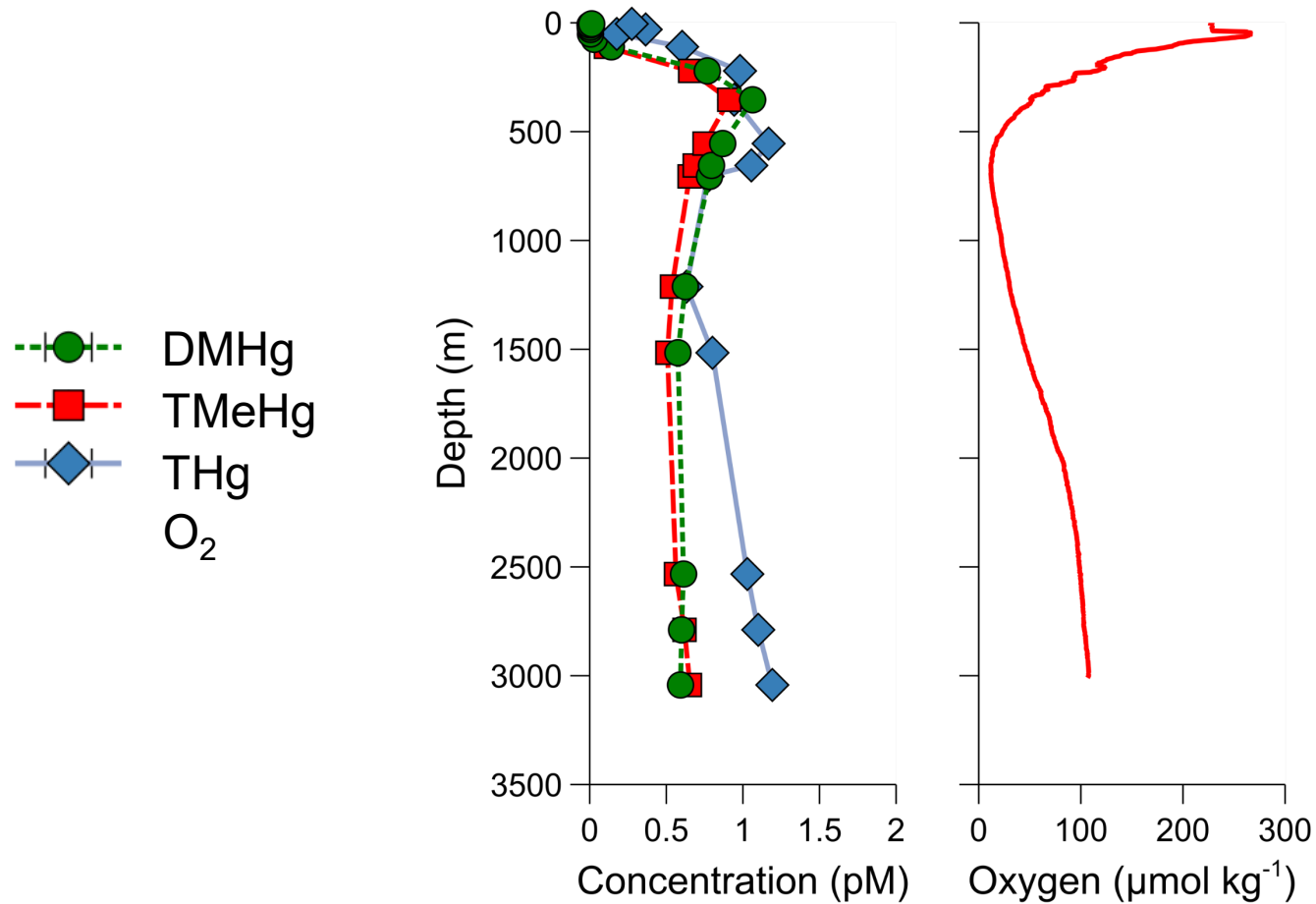
Station 3



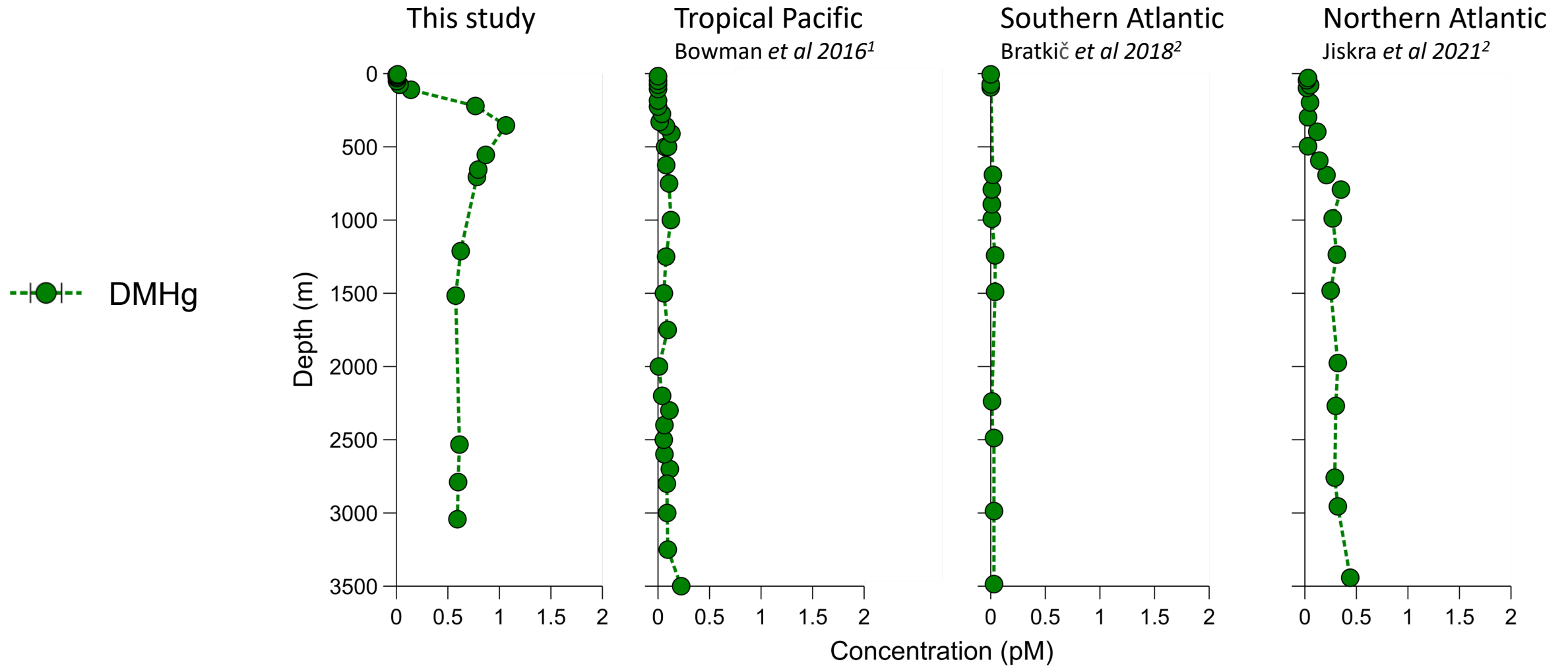
Station 4



DMHg \approx TMeHg \approx THg around OMZ



DMHg concentrations historically high



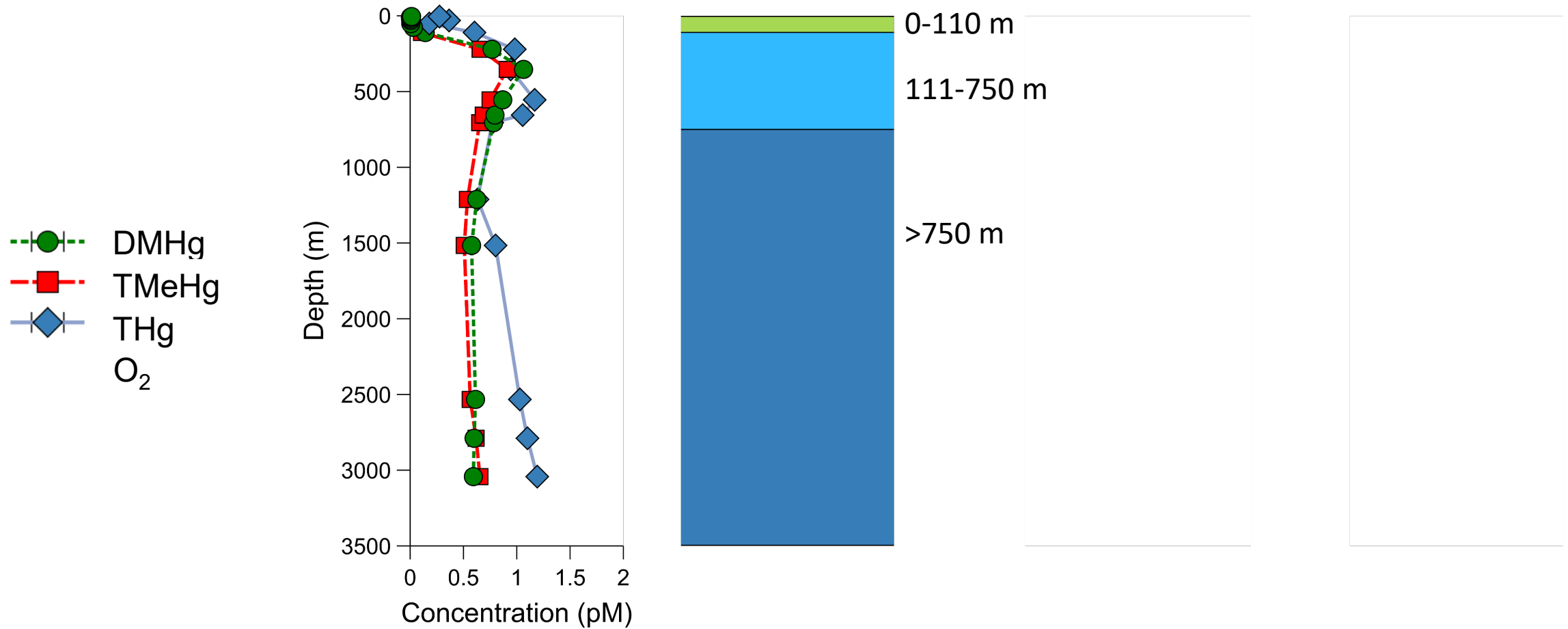
[1] K. L. Bowman, C. R. Hammerschmidt, C. H. Lamborg, G. J. Swarr, A. M. Agather, *Mar Chem* **2016**, 186, 156.

[2] A. Bratkič, M. Vahčić, J. Kotnik, K. Obu Vazner, E. Begu, E. Malcolm, S. Woodward, M. Horvat, *Global Biogeochem Cycles* **2016**, 30, 105.

[3] M. Jiskra, L. E. Heimbürger-Boavida, M. M. Desgranges, M. V. Petrova, A. Dufour, B. Ferreira-Araujo, J. Masbou, J. Chmeleff, M. Thyssen, D. Point, J. E. Sonke, *Nature* **2021**, 597, 678.

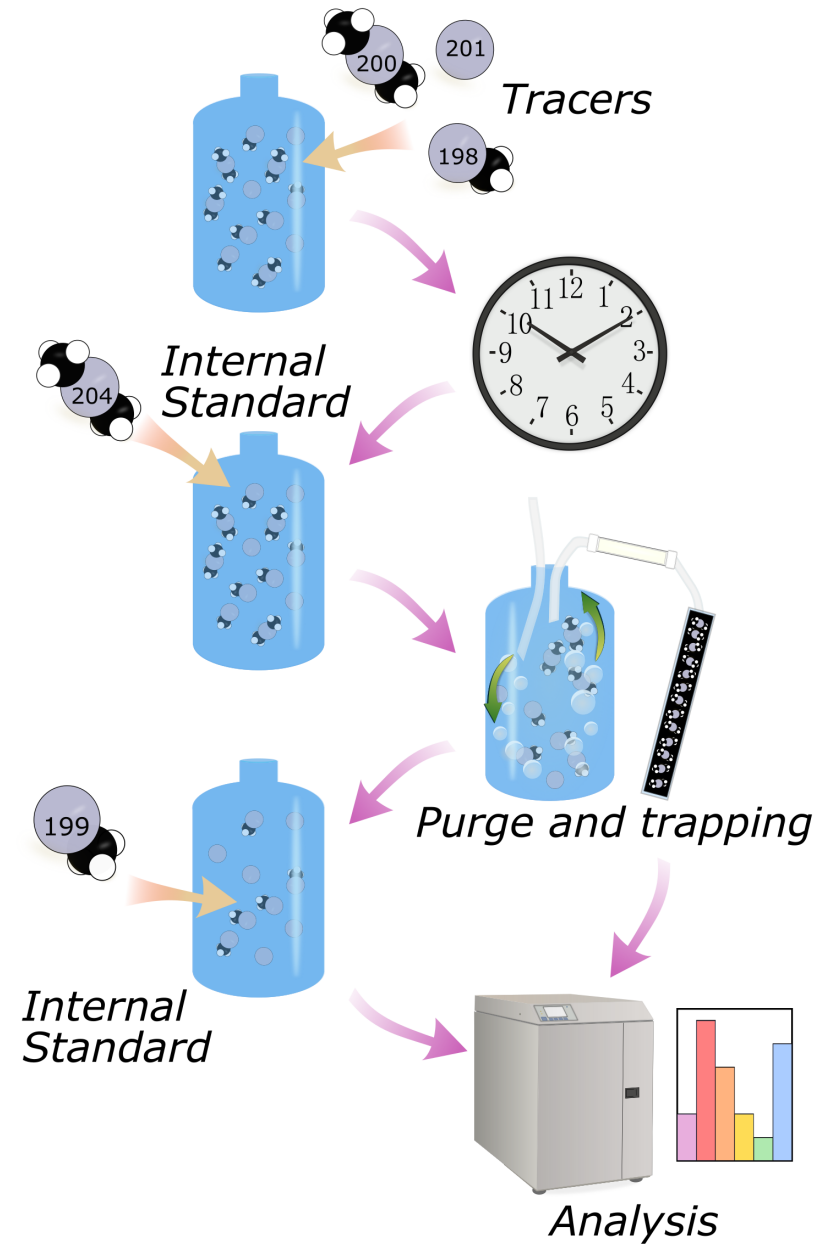
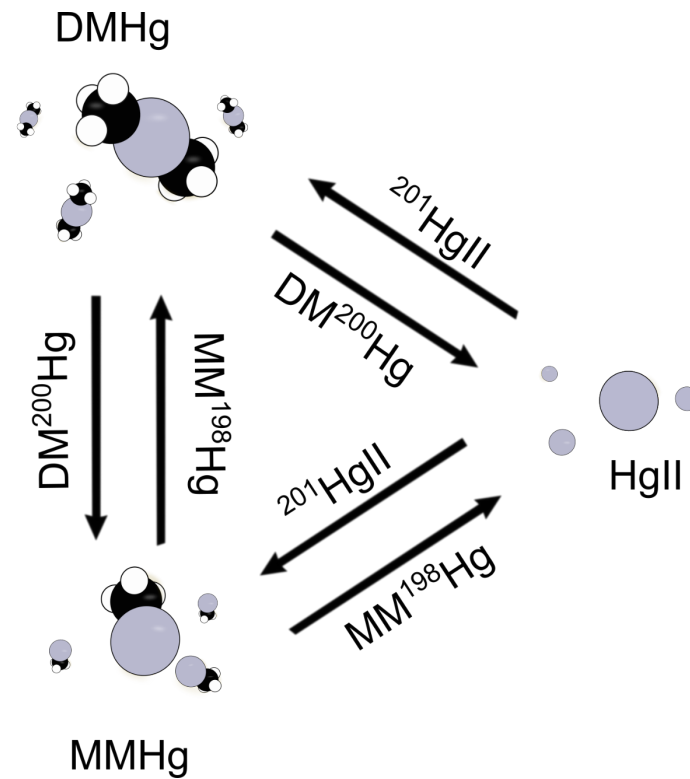


We pooled water samples for incubations

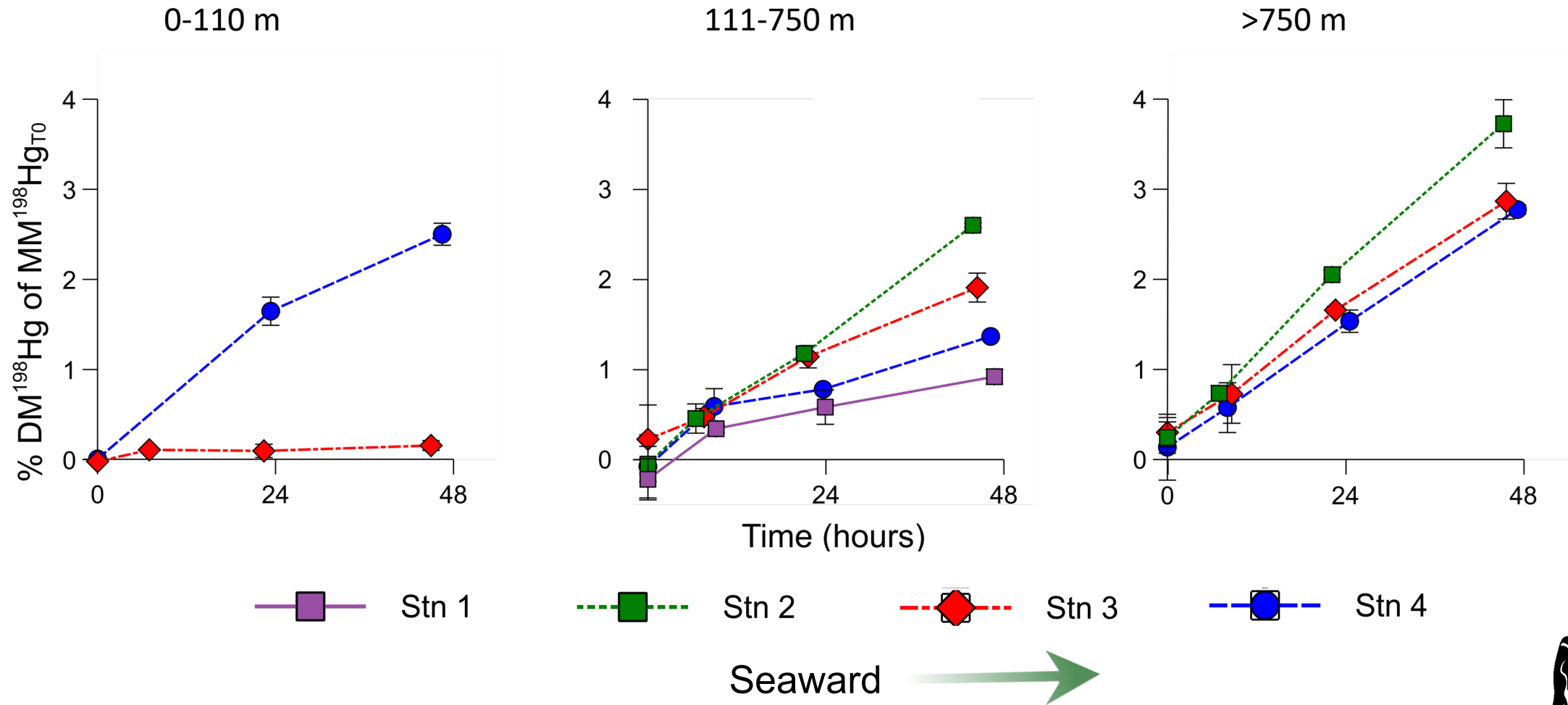


Multi-tracer incubation studies:

- $DM^{200}Hg \sim 0.1 \text{ pM}$
- $MM^{198}Hg \sim 0.5 \text{ pM}$
- $^{201}HgII \sim 2 \text{ pM}$

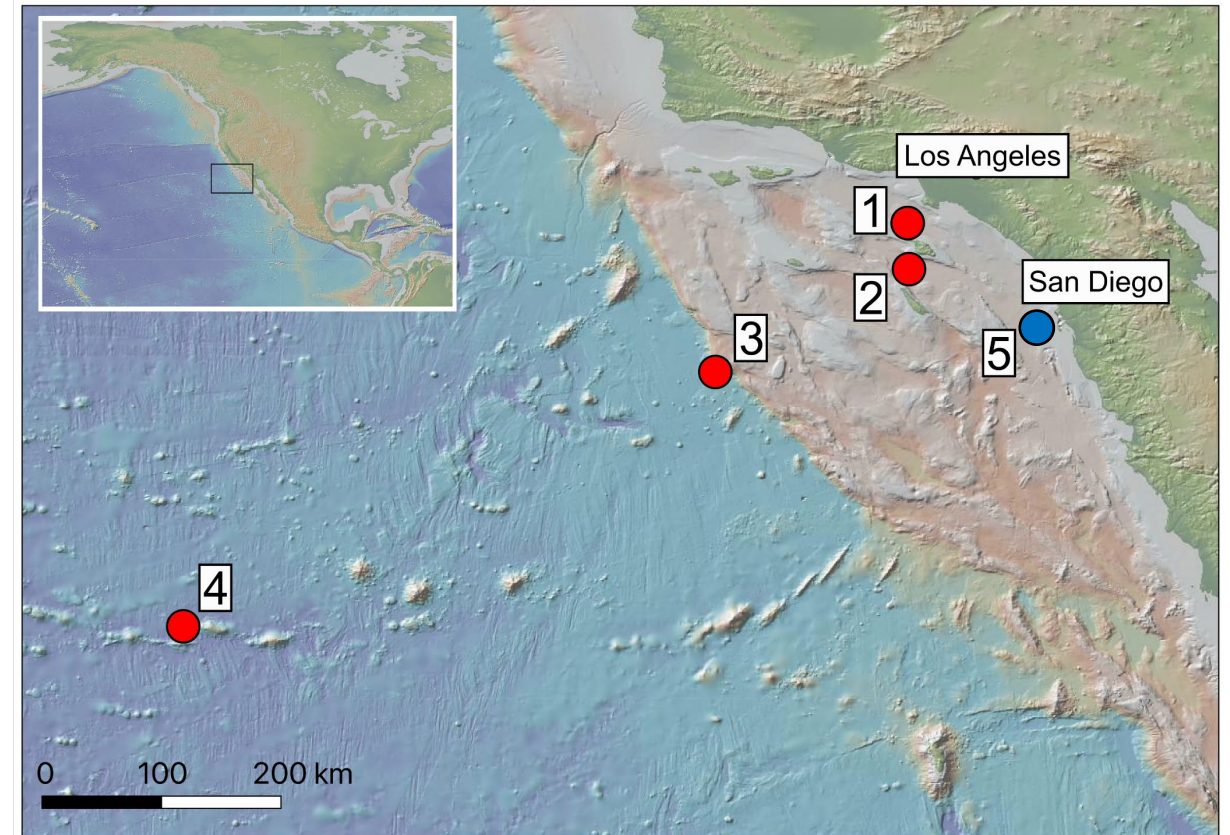


DMHg formation from MMHg at all depths



What causes DMHg formation?

- Additional incubations with water from 350 m depth (Site 5)
- 0.53 pM DMHg, 0.94 pM THg
- Investigated the combined effect of aging+freezing on DMHg formation



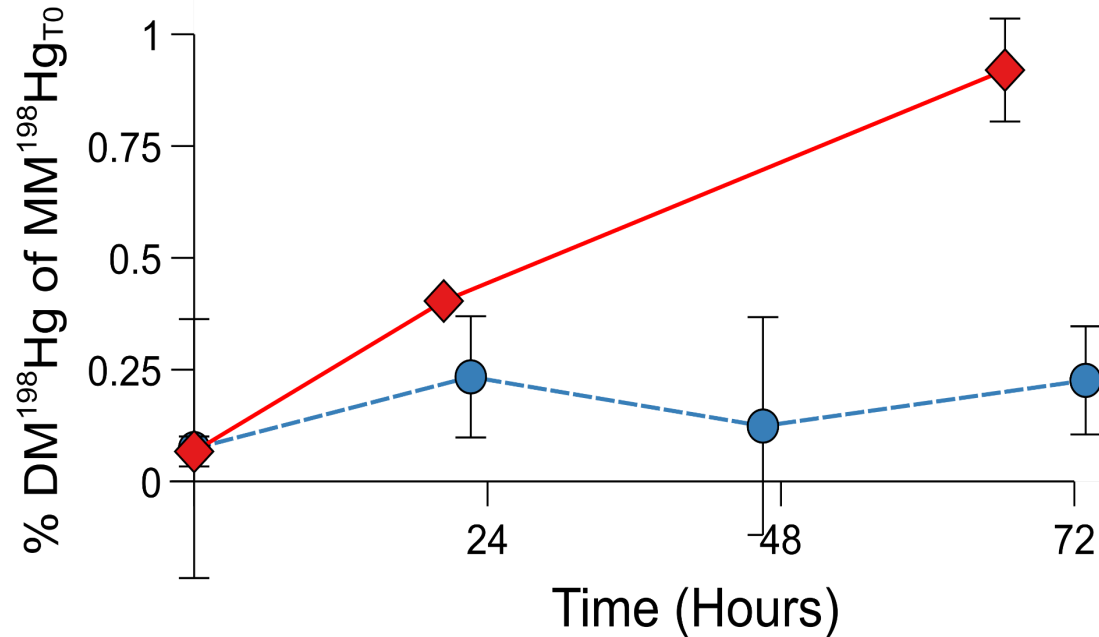
● October 11-24, 2023

● April 28th, 2024



Aging+Freezing of water enables DMHg formation

- ◆ Refrigerated for 11 days, frozen 4 weeks, ~0.1pM DM²⁰⁰Hg
 - Untreated ~ 1 pM DM²⁰⁰Hg
- } ~ 0.7 pM MM¹⁹⁸Hg



DMHg formation from MMHg through a mechanism coupled with organic matter degradation could cause DMHg enrichment in deep, aging water?





DMHg retained in PES filters

