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A time series of mercury speciation at Scripps Pier, La Jolla, CA: Insights on methylmercury production and cycling in the surface ocean



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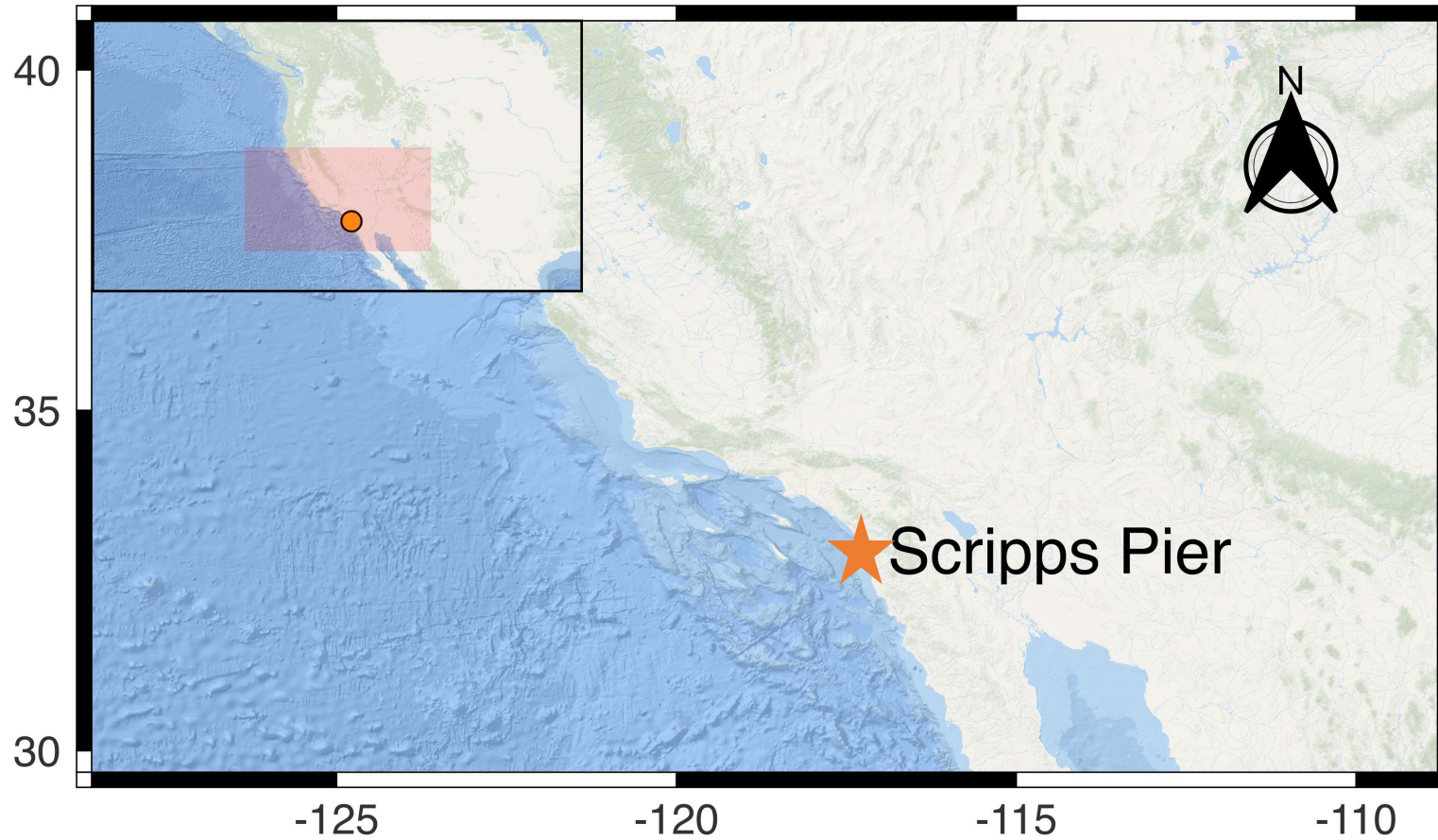
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What if we could accurately predict coastal MeHg?

Method: Establish a regular time series of Hg speciation at Scripps Pier to capture MeHg trends and variability over the course of multiple years.

Which physical and/or biological parameters control mercury speciation in the nearshore surface ocean?

Scripps Pier in La Jolla, California



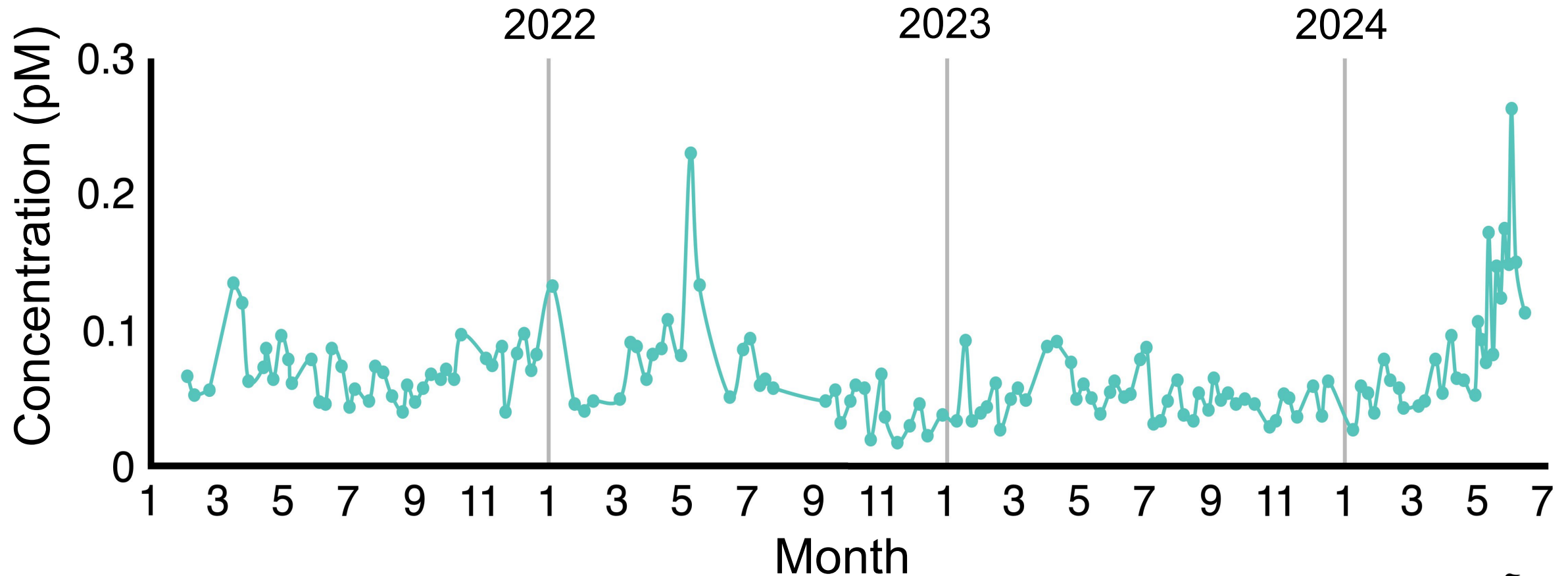
Scripps Pier is situated in an active environment

- Seasonal upwelling in the Spring and Summer
- Spring/Fall bloom cycle
- Coastal anthropogenic influence
- Atmospheric rivers
- El Niño

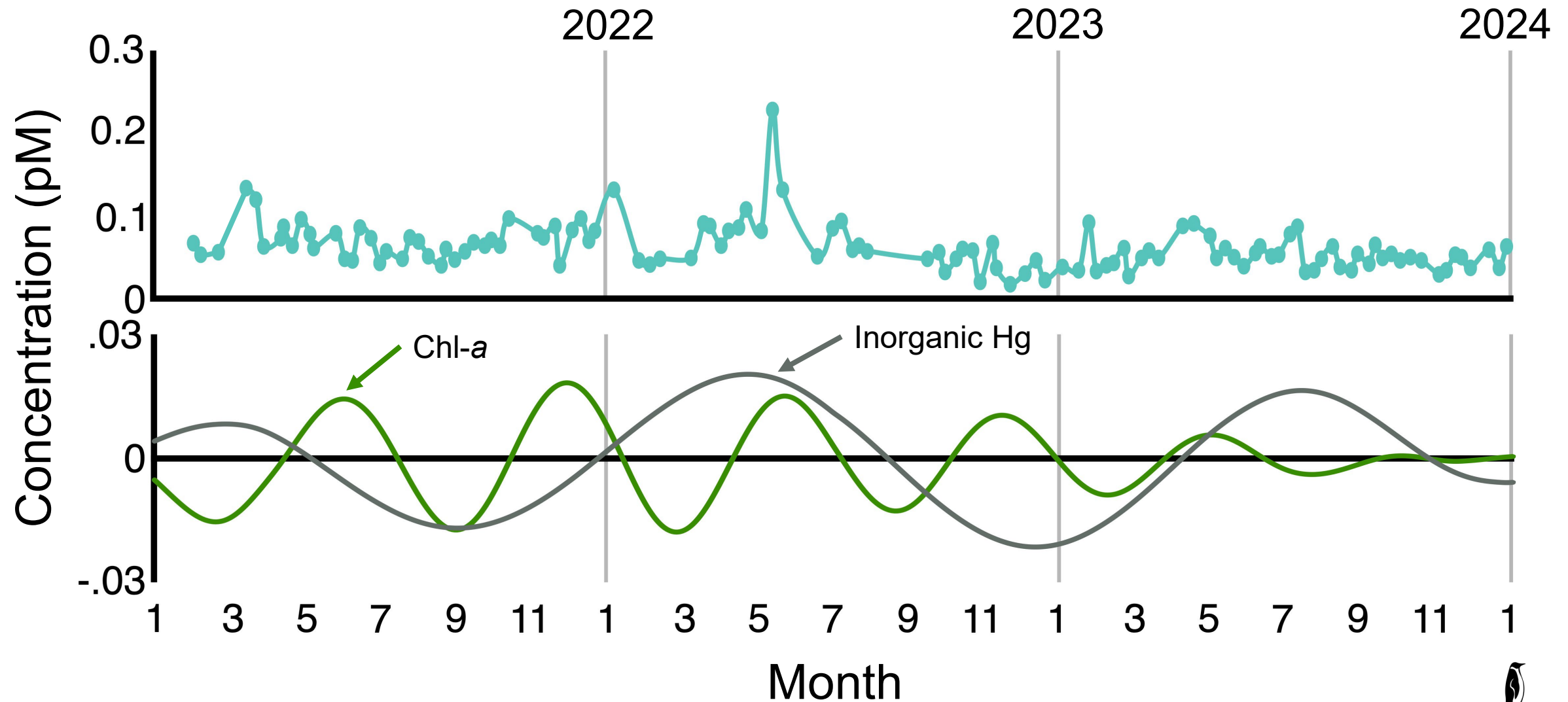


Over 3 years of weekly sampling show dynamic MeHg

Surface MeHg Concentrations at Scripps Pier

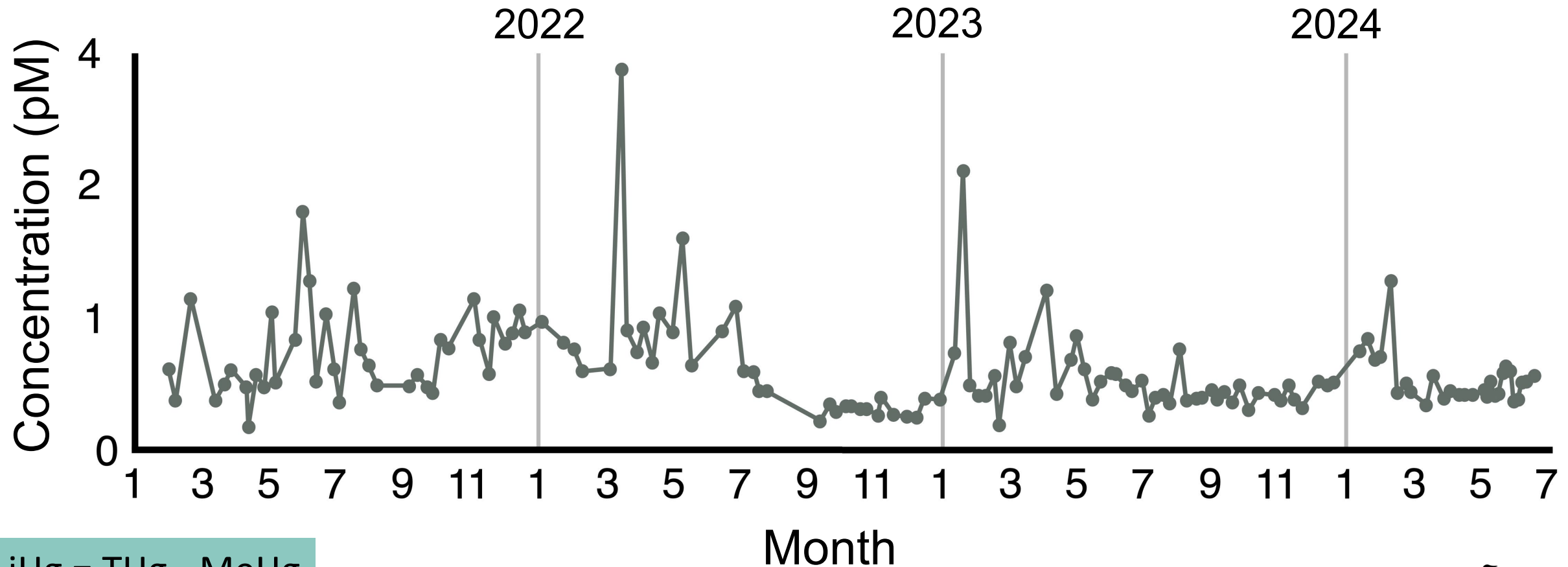


MeHg decomposition reveals two seasonal trends



Inorganic Hg is the substrate for methylation

Surface Inorganic Hg Concentrations at Scripps Pier

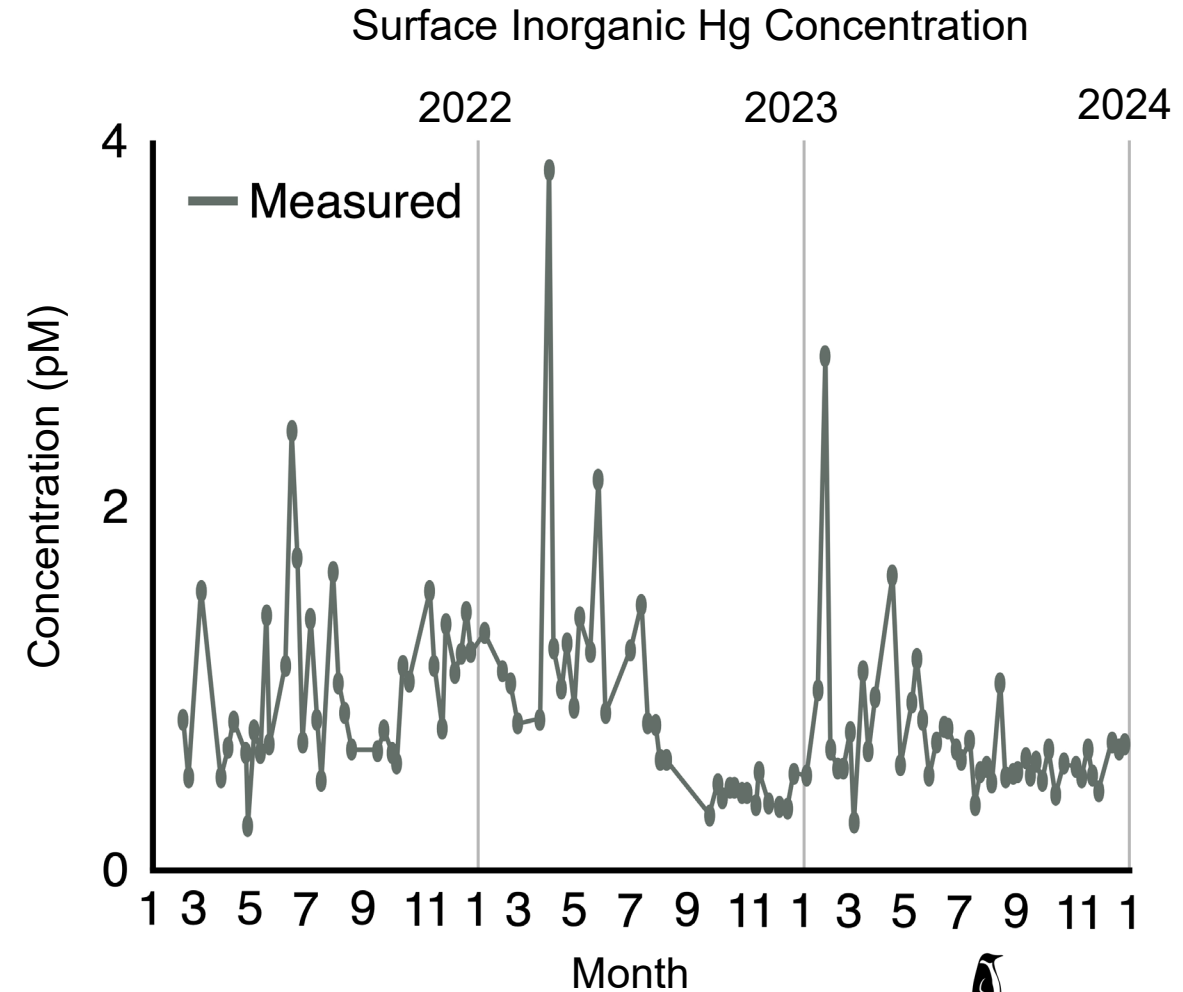


iHg = THg - MeHg



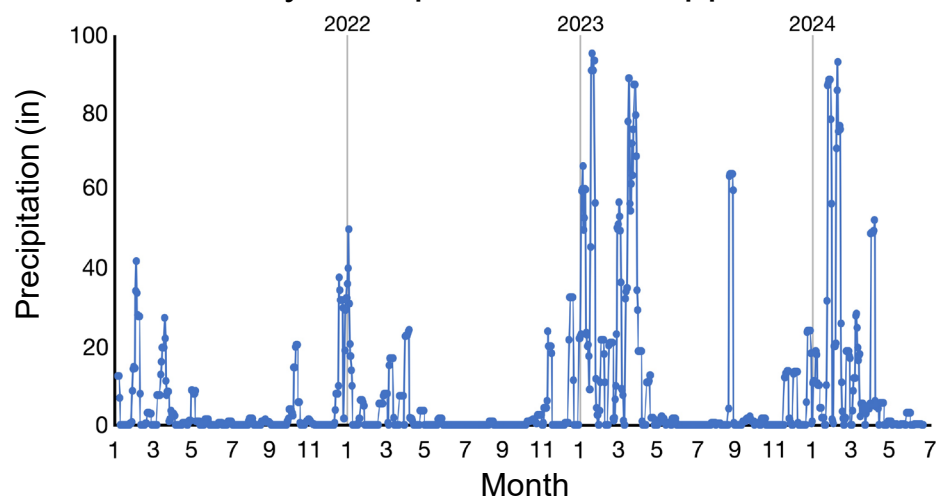
Can iHg concentrations be modelled using other data collected from Scripps Pier?

- Temperature
- Salinity
- Oxygen
- Precipitation
- Wind Speed
- Wave Height
- Upwelling Transport
- Chlorophyll-*a*
- Nutrient Concentrations

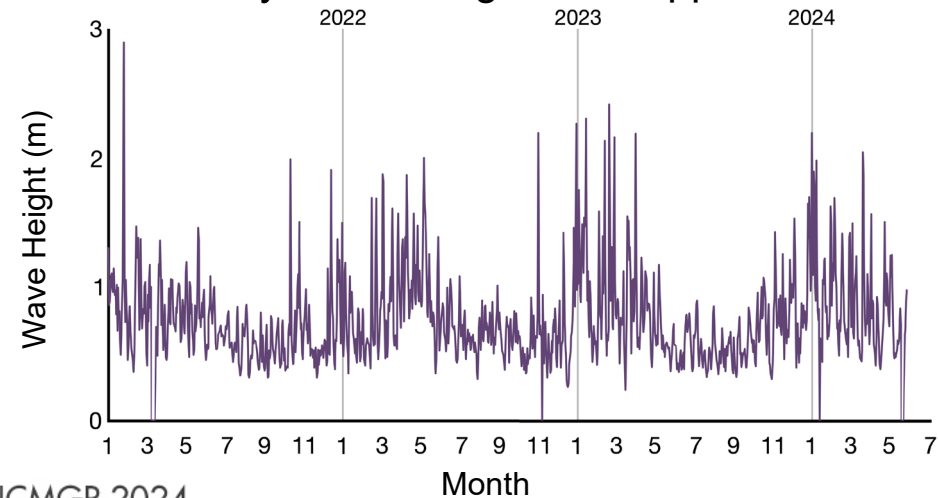


Precipitation and wave height controls iHg

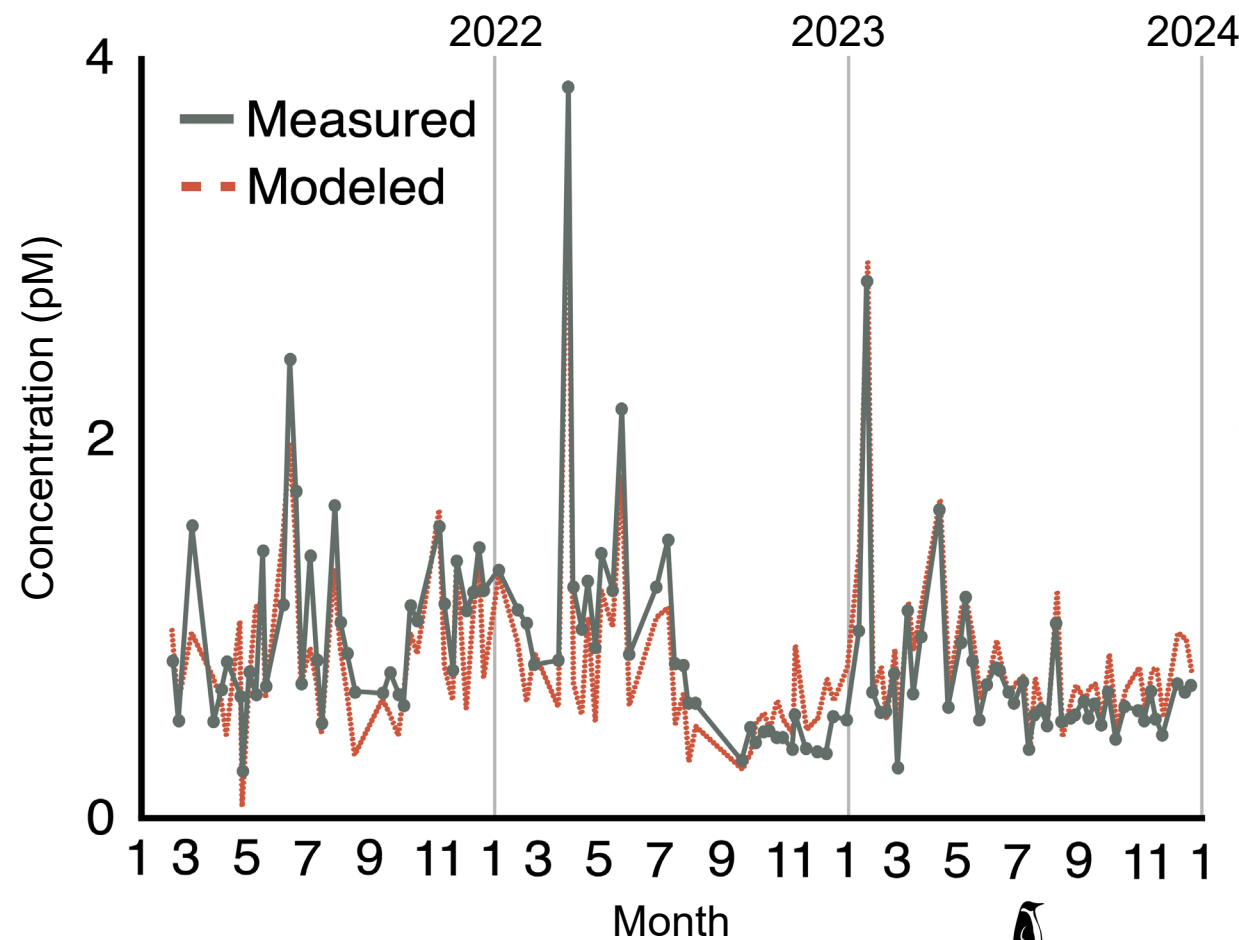
Weekly Precipitation at Scripps Pier



Daily Wave Height at Scripps Pier

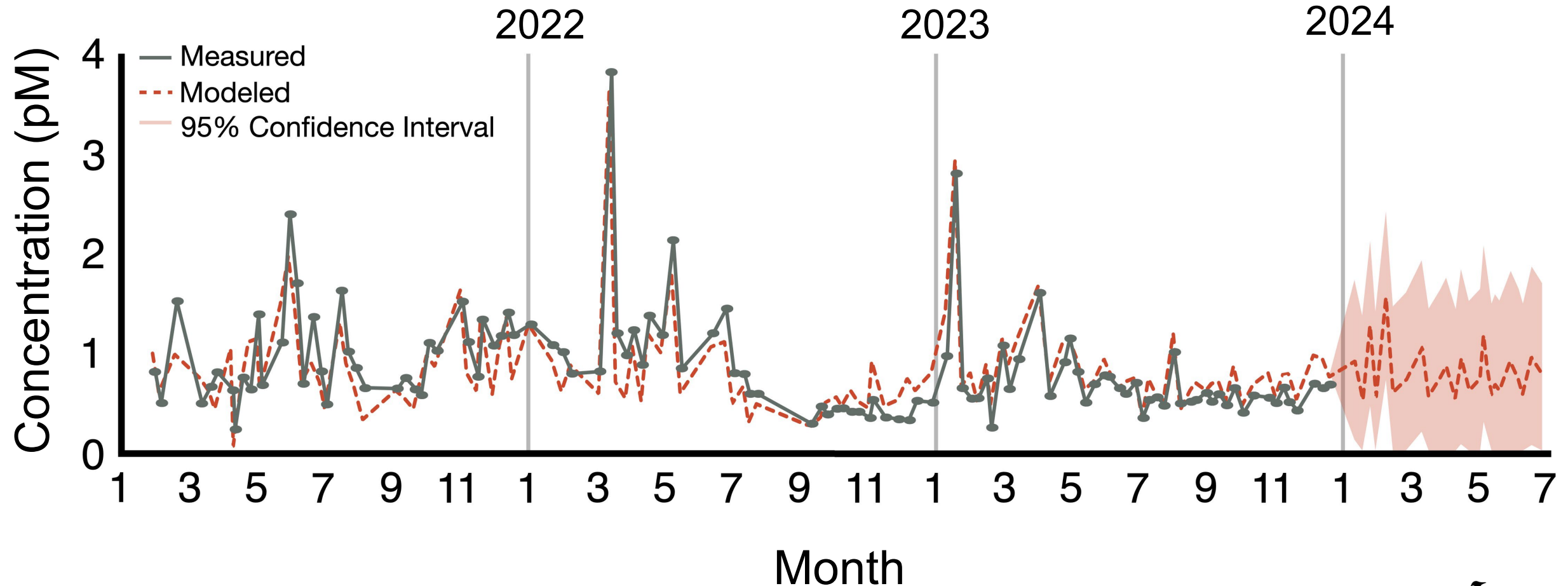


Surface Inorganic Hg Concentration



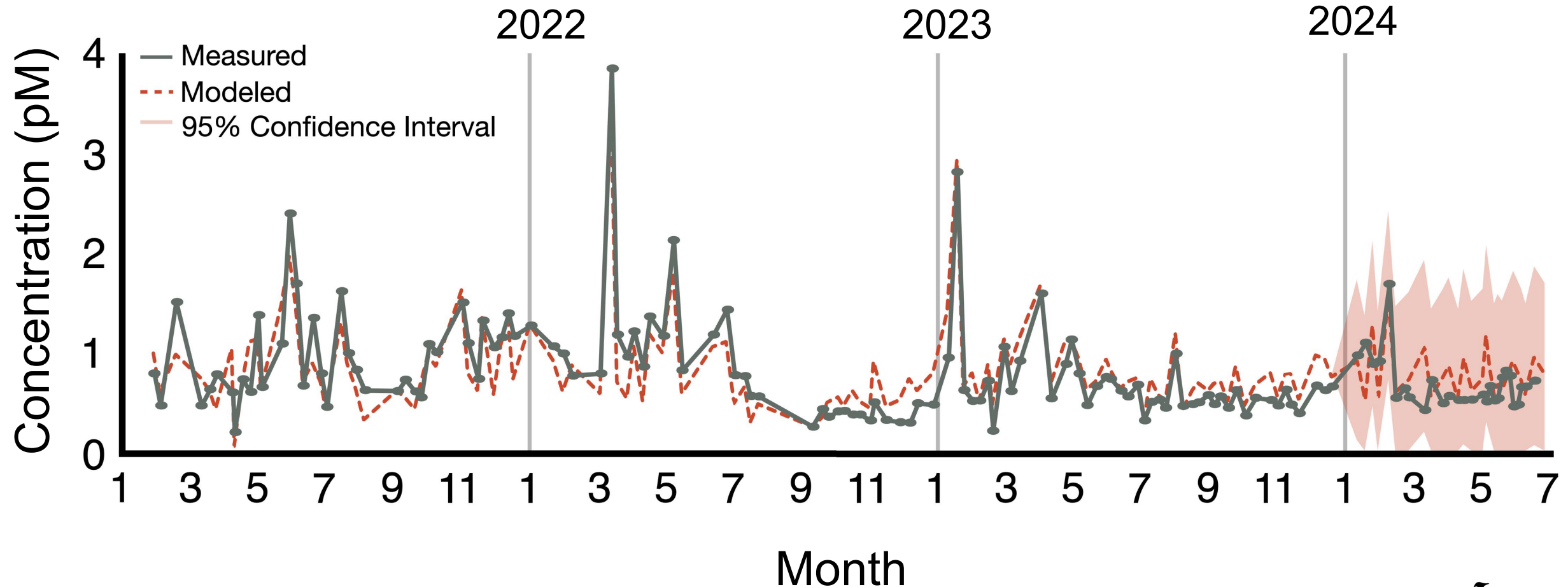
We can predict future iHg concentrations

Forecast of Surface Inorganic Hg Concentration at Scripps Pier



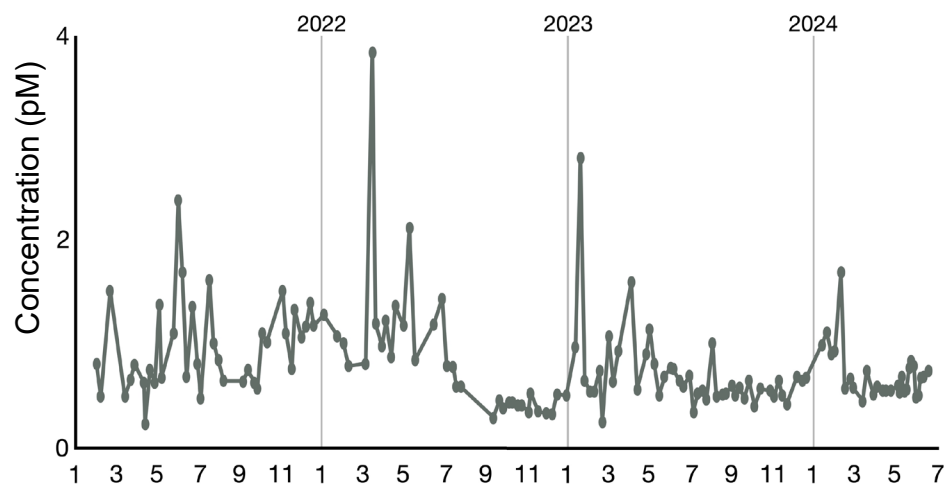
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Forecast of Surface Inorganic Hg Concentration at Scripps Pier

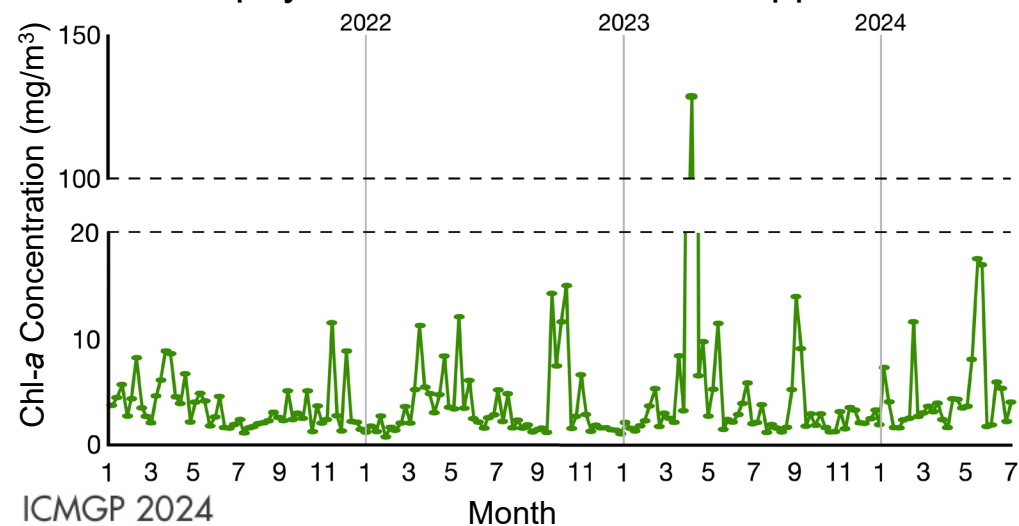


Surface iHg and Chlorophyll controls MeHg

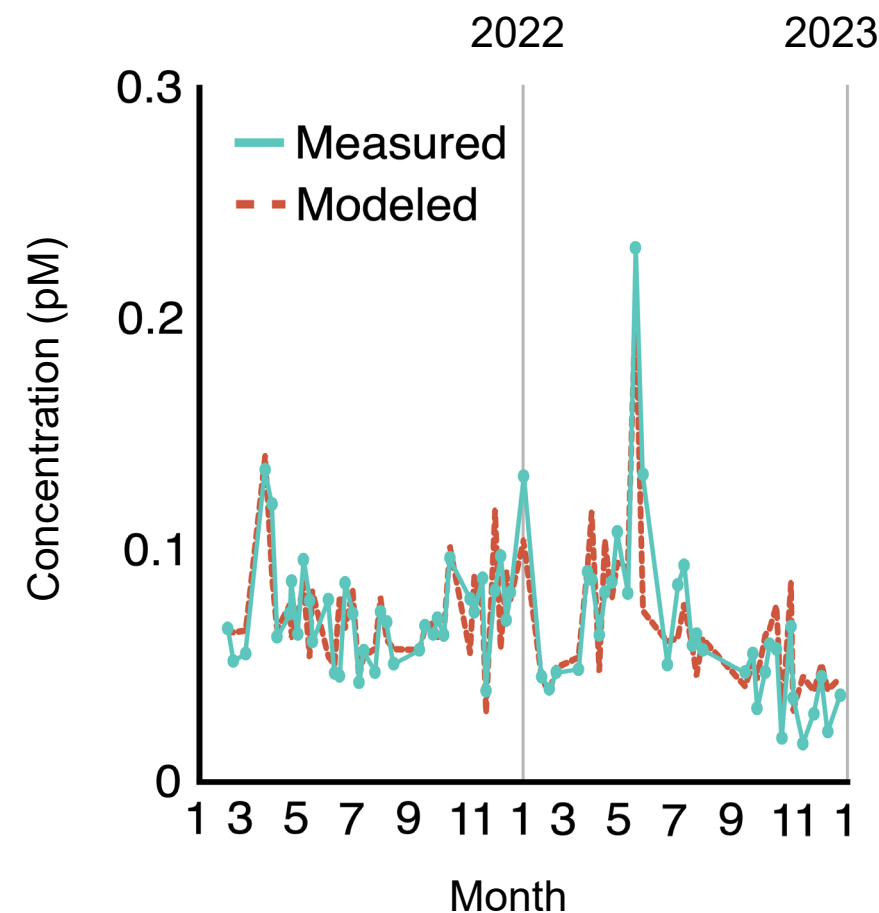
Surface iHg Concentration at Scripps Pier



Chlorophyll-a Concentration at Scripps Pier

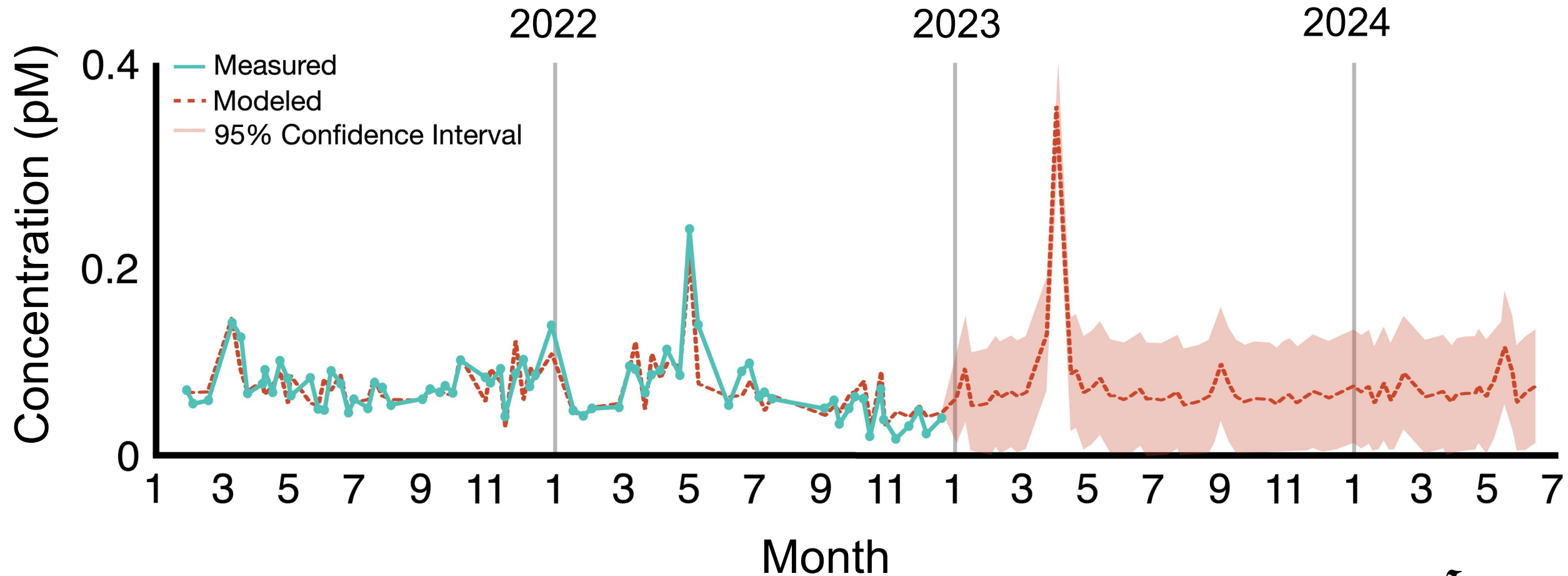


Surface Total Methylated Hg Concentration



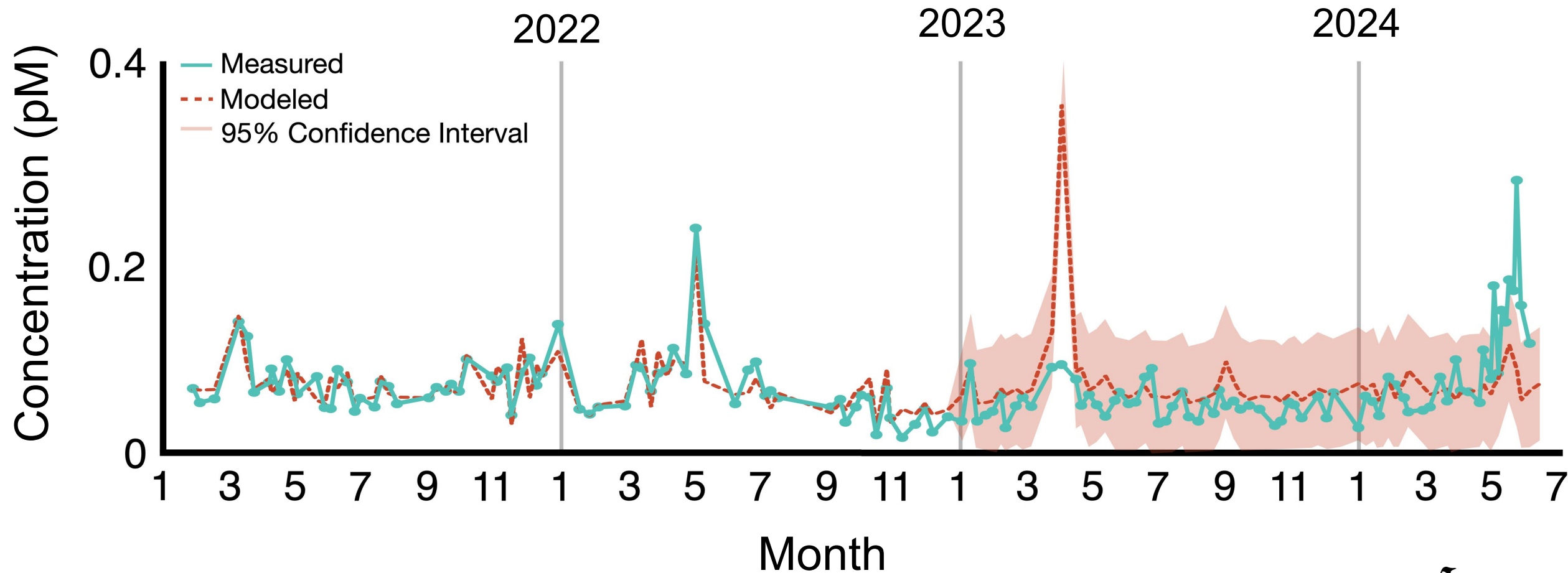
We can predict future MeHg concentrations

Forecast of Surface Methylated Hg Concentration at Scripps Pier



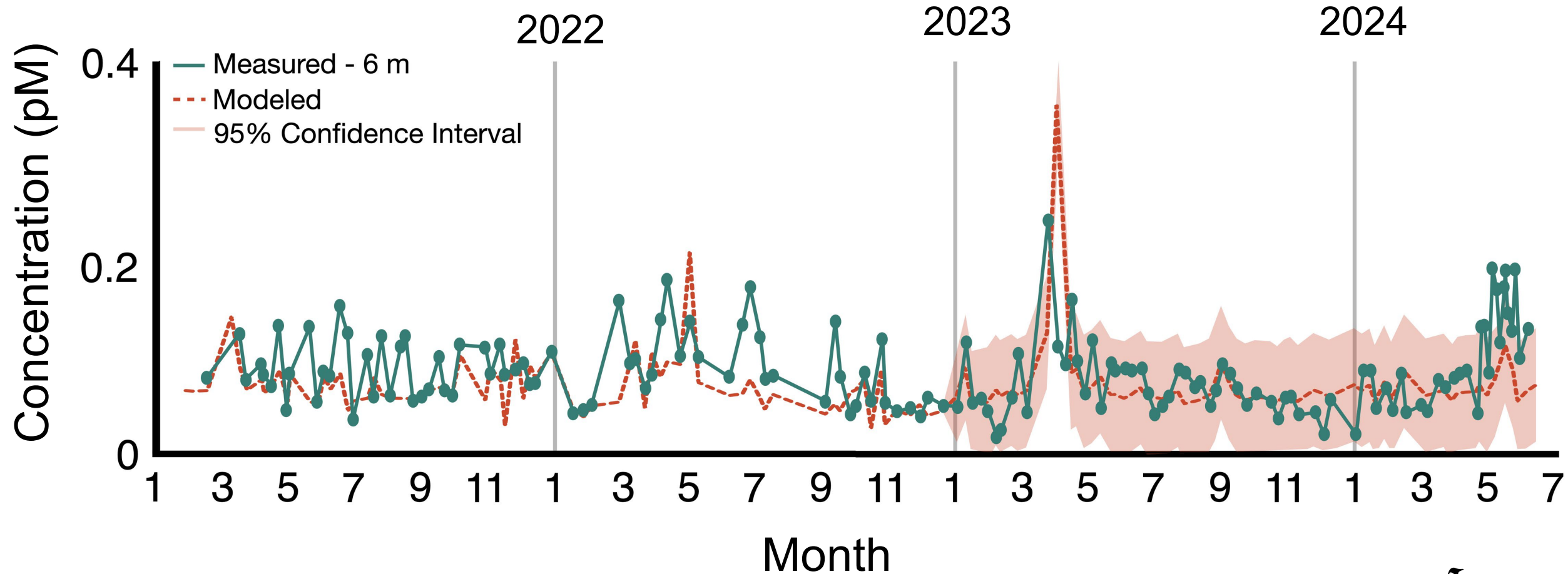
We can predict future MeHg concentrations

Forecast of Surface Methylated Hg Concentration at Scripps Pier



We can predict future MeHg concentrations

Forecast of Surface Methylated Hg Concentration at Scripps Pier



Conclusions

We have identified major factors controlling Hg speciation on short time scales at Scripps Pier

Inorganic Hg concentrations can be modelled by precipitation and wave height, indicating that external sources control concentrations

MeHg concentrations can be modelled by inorganic Hg and chl-*a* concentrations



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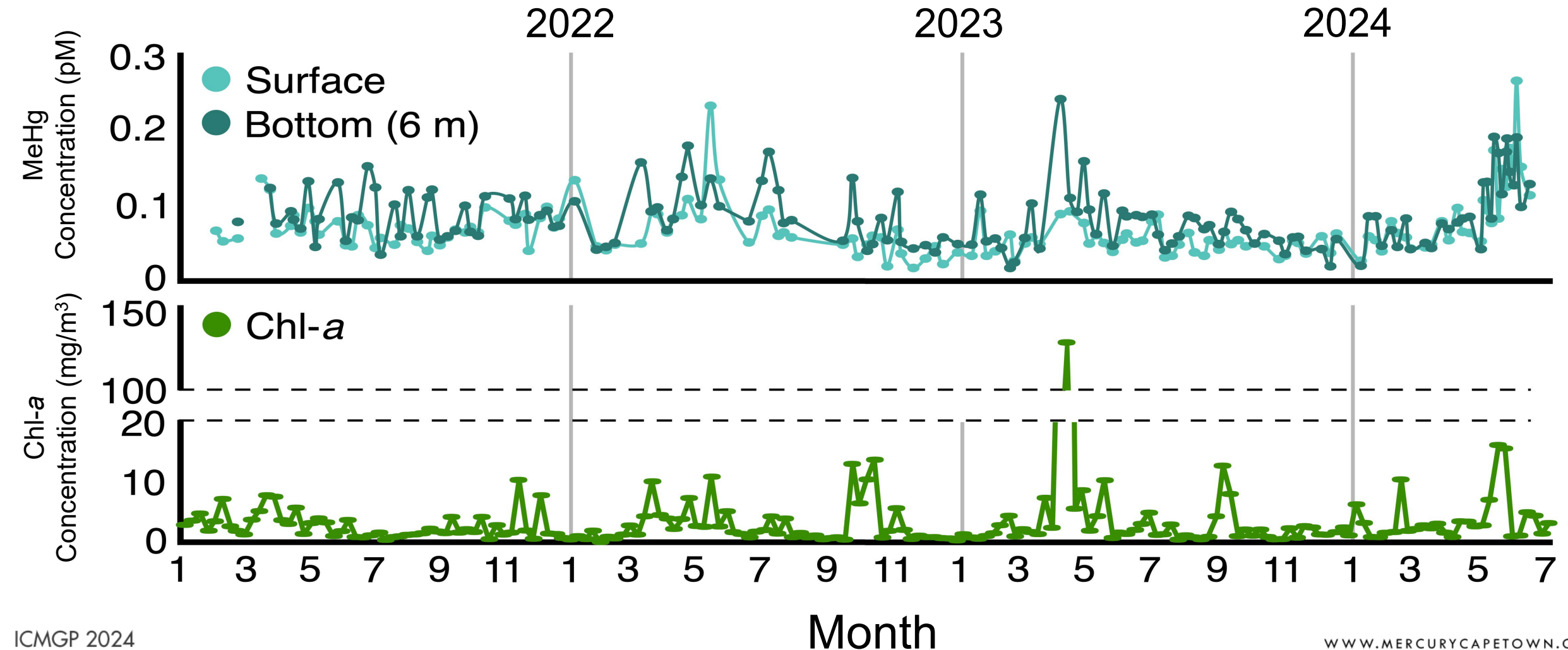
Acknowledgements

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- National Data Buoy Center (Wind & Wave Data)
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MeHg Enrichment Follows Spring Bloom

MeHg & Chlorophyll-*a* Concentrations at Scripps Pier



Is DMHg formation biologically mediated?

MeHg & DMHg Concentrations at Scripps Pier

