

Hidden Archives of Environmental Change: Application of Mass Spectrometry Methods in Coral Reef Science

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Abstract

In coral reef studies, mass spectrometry methods are widely applied to determine geochemical proxies in corals as a tool to evaluate seawater changes. As the coral grows, its skeleton forms annual bands similar to the growth rings found in trees. The density of the calcium carbonate skeletons changes as the water temperature, light, and nutrient conditions change. The elements stored within these bands can provide insight into the changing conditions of seawater over the entire lifetime of the coral, and serve as useful environmental records. Corals incorporate trace elements that can be precisely measured using high-resolution techniques, such as Laser Ablation-Inductively Coupled Plasma-Mass Spectrometry (LA-ICP-MS). This analytical tool offers high levels of precision to determine the distribution of trace elements along the annual bands of coral skeletons. This approach can serve to monitor fixed-point time-series for water quality research, as well as large-scale observations in ocean science. Ultimately, this procedure can be applied to reconstruct past climate oscillation episodes and/or to quantify the impacts of marine pollution on coral reefs. The benefits of techno-scientific aspects of new and established mass spectrometry applications in coral reef research hold great promise that may continue to be improved in future studies. Given the current climate crisis, this issue requires accurate measurements to increase our understanding on the impacts that have become more frequent and intense.



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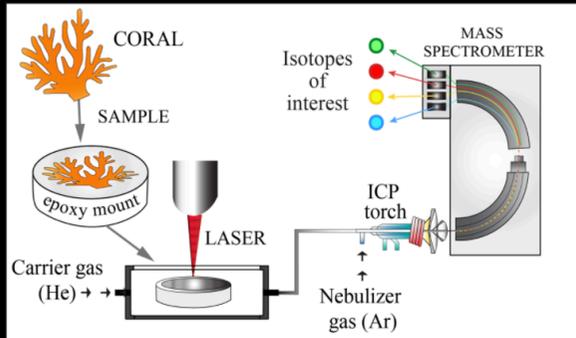


Coral reefs under pressure



A powerful technique to investigate seawater changes

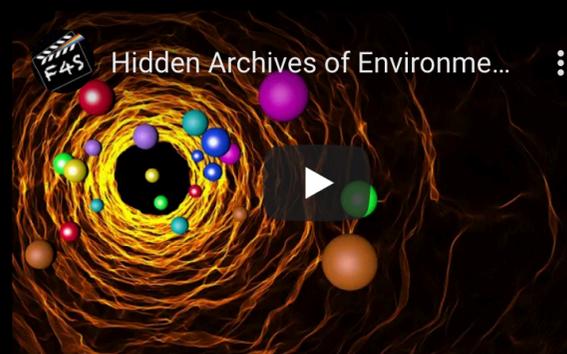
Laser Ablation-Inductively Coupled Plasma-Mass Spectrometry (LA-ICP-MS)



Why do we apply mass spectrometry methods in coral reef science?

Mainly, to understand the geochemistry of coral reefs, unraveling their complexities, quantifying them, and devising new methods of probing them.

Coral skeletons as climate archives



Challenges and existing solutions



Accessing the secrets of coral reefs

