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Power in Numbers: Multi-proxy Geochemical Insights into Natural and Anthropogenic Climate Variability - *Earl Ingerson Lecture*

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Understanding natural climate variability and past climate changes is critical for contextualizing modern climate shifts. Geochemical proxies offer powerful tools for reconstructing historical climate patterns, yet a significant gap remains between modern instrumental records and paleo reconstructions, particularly over the last millennium. Bridging this gap is essential for capturing high-resolution climate variability that can inform our understanding of present-day changes.

Recent efforts, particularly through PAGES (Past Global Changes), have advanced the compilation of high-resolution records from the past 2000 years. However, coral-based reconstructions often rely on a limited set of proxies, potentially underrepresenting the complexity of climate systems. In this study, we investigate monsoon-driven changes in ocean advection, precipitation patterns, sea surface temperature, and biological productivity via a multi-proxy approach. This research integrates a suite of geochemical proxies - lead, oxygen, nitrogen, and carbon isotopes, along with Sr/Ca and P/Ca ratios - on a 400-year-old coral from Vietnam (Coral: *To Nhật* (TN)), that when examined individually tells only one part of the story, but taken together, paints a more holistic picture on the behavior of the East Asian Monsoon.

Our findings reveal not only natural variability within the monsoon system but also early signals of anthropogenic influence. Our work demonstrates the potential of multi-proxy reconstructions to uncover connections between ocean-atmosphere interactions and broader climatic trends. This study highlights how careful site selection and complex geochemical analyses can extend the reach of paleo reconstructions, offering valuable perspectives on climate dynamics that transcend local conditions and inform our understanding of global climate systems.