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KEYNOTE: Recent insights from the noble gas 'whole ocean thermometer'

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Marine sediment reconstructions of ocean temperature provide valuable insight into past climate change on a range of timescales. However, resolving the global response of ocean temperature to past climate perturbations with these records remains challenging, as the alignment of multiple records, with high spatial coverage across the ocean basins, is required. The atmospheric ratios of xenon, krypton, and nitrogen (Kr/N2, Xe/N2, and Xe/Kr) are set by the relative partitioning of these gases between the ocean and atmosphere via their unique, temperature-dependent solubilities in seawater and therefore track total ocean heat content, or mean ocean temperature (MOT). Because the atmosphere is well mixed on annual timescales, these tropospheric gas ratios are globally uniform, and MOT may be reconstructed from a single ice core record. Since the development of the MOT proxy (Headly & Severinghaus, 2007), methodological advances and new ice core records have enabled MOT reconstruction at unprecedented resolution and precision and provided new insight into the subtleties of the proxy. While complexities in the interpretation of the proxy remain, considerable insight has been gained through comparison of MOT results between reconstructed Kr/N2, Xe/N2, and Xe/Kr, and between multiple ice core records over the same interval. In this presentation, we will discuss some of the recent applications of the MOT proxy in providing constraints and insights into a range of paleo topics, including past sea level, the planetary energy balance, atmospheric CO2, and ocean temperature variability across the mid-Pleistocene transition.

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Track Classification: Progress in proxy development and interpretation