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Deep-sea panoramas: Progress and remaining challenges in late Miocene stratigraphy and climate

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During the late Miocene, meridional sea surface temperature gradients, deep ocean circulation patterns, and continental configurations evolved to a state similar to modern day. Deep-sea benthic foraminiferal stable oxygen ($\delta^{18}O$) and carbon ($\delta^{13}C$) isotope stratigraphy remains a fundamental tool for providing accurate chronologies and global correlations, both of which can be used to assess late Miocene climate dynamics. Until recently, late Miocene benthic $\delta^{18}O$ and $\delta^{13}C$ stratigraphies remained poorly constrained, due to relatively poor global high-resolution data coverage.

Here, I present ongoing work that uses high-resolution deep-sea foraminiferal stable isotope records to improve late Miocene (chrono)stratigraphy. Although challenges remain, the coverage of late Miocene benthic $\delta^{18}O$ and $\delta^{13}C$ stratigraphies has drastically improved in recent years, with high-resolution records now available across the Atlantic and Pacific Oceans. The recovery of these deep-sea records, including the first astronomically tuned, deep-sea integrated magneto-chemostratigraphy, has also helped to improve the late Miocene geological timescale. Finally, I will briefly touch upon how our understanding of late Miocene climate evolution has improved, based on the high-resolution deep-sea archives that are now available.