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Combined use of foraminifera Mg/Ca and Sr/Ca concentrations to strengthen temperature reconstructions over geological timescales.

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To overcome the lack of long-term instrumental records, paleo-reconstructions using geochemical signatures preserved in the carbonate shells of foraminifera, provide a unique opportunity to reconstruct changes in seawater environmental parameters over time and evaluate the validity of climate change scenarios. High resolution paleoceanographic studies can provide new insights about Paleoclimatic perturbations allowing better prediction of biotic responses to modern warming and acidification. In this study, we will present calibrations using modern foraminifera sampled from surface seawater of the Atlantic Ocean, where all environmental parameters were recorded. Mg and Sr concentrations were determined using LA-ICP-MS, while the oxygen isotope composition of the same tests as used for the elemental analyses was subsequently measured by IRMS. Our results show that combining Mg and Sr data to compute temperature improve temperature reconstruction most probably by accounting for the impact of salinity and/or carbonate chemistry.

To further test this hypothesis a new set of temperature data covering the Paleogene was extracted from $\delta^{18}O$, porosity, and combined Mg/Ca and Sr/Ca data, measured on *Subbotina linaperta,* from three localities: South and North Atlantic, and North Pacific. This foraminifera multi-proxies approach allowed to determine a continuous Paleogene sub-surface temperature. For the first time, the results of the three proxies are consistent with each other and highlight the existence of a latitudinal gradient over the Paleogene, punctuated by short term variations. Hence, we emphasize here: 1) the combined use of Mg/Ca and Sr/Ca concentrations within temperature equation reconstruction to strengthen paleoenvironmental reconstructions on geological timescales, and 2) the utility of porosity as a complementary ecological proxy, to either discard or complement geochemical data.