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Testing effectiveness of lithium isotopes in tracing climate using Miocene mudrocks from the Qaidam Basin

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Silicate weathering plays a key role in regulating the atmospheric carbon dioxide content and global climate over the Cenozoic. Lithium isotopes have great potential to fractionate during silicate weathering, so they are promising proxies for tracing Cenozoic climate. However, it remains uncertain how to relate lithium isotopic compositions (δ^7Li) in sediments to past climate in terrestrial setting. To tackle this question, we choose the warm middle Miocene climate optimum (MMCO, 17-14 Ma) and the following late Miocene climate cooling period (LMCC, 14-11 Ma), as two climate contrasting intervals to study lithium isotopes variations. The Qaidam Basin, located at the northeastern Tibetan Plateau, is suitable for clarifying link between climate and δ^7Li variations because previous studies have demonstrated no provenance shift over the studied interval. The Qaidam Miocene mudrock Li record complementarily couples with that of benthic foraminifera and shows similar variability with the benthic stable isotope (e.g., C, O, Li) and atmospheric CO_2 records. We therefore conclude that Qaidam Basin climate over the middle-late Miocene was controlled by global climate instead of Tibetan uplift, and lithium isotopes are effective proxies in tracing Cenozoic climate.