

Late Neogene cooling regulated long-term decline in dissolved $\delta^7\text{Li}$ in mountain ranges

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The impact of global silicate weathering on the carbon cycle, particularly in response to the tectonic uplift of the mountain ranges (e.g., Tibetan Plateau) and global cooling during the Cenozoic, has attracted extensive attention. The continuous increase in seawater $\delta^7\text{Li}$ values was once considered strong evidence for enhanced terrestrial silicate weathering driven by the plateau's uplift. However, this interpretation remains controversial due to the complexity of source-sink processes of marine Li cycle. Terrestrial Li isotope records from the Tibetan Plateau provide a more direct approach to addressing this issue. Here, we reconstruct long-term $\delta^7\text{Li}$ records of paleo-water (7.3–0 Ma) from the northeastern Tibetan Plateau to assess their response to tectonic activity and climate change during the late Cenozoic. Our results reveal a covariant decreasing trend in $\delta^7\text{Li}$ values in both paleo-water and weathering alteration products, corresponding to global cooling and regional drying. This trend reflects weakened silicate weathering and reduced Li isotope fractionation under the influence of climate cooling and aridification. Our terrestrial records suggest that, under the influence of tectonic activity and climate cooling, chemical weathering in mountain range may have not contributed the rise in marine $\delta^7\text{Li}$ ratio.