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A new negative feedback mechanism for balancing Tibet uplift-driven CO₂ drop: Evidence from Paleogene chemical weathering records in the northern Tibetan Plateau

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The CO₂ degassing by plate tectonic process has long been thought to be balanced by weathering of silicate rocks on continents, keeping the Earth a relative stable global carbon cycle and temperature suitable for life creation, survival and evolution. The uplift of the Tibetan Plateau (TP) is hypothesized to enhance erosion and silicate weathering and organic carbon burial, thus cool the global temperature. However, the imbalance resulting from accelerated CO₂ consumption by uplift of the TP and a relatively stable CO₂ input from volcanic degassing during the Cenozoic should have depleted atmospheric CO₂ within a few million years; therefore, a negative feedback mechanism must have stabilised the carbon cycle. Here, we present the first almost complete Paleogene silicate weathering intensity (SWI) records from continental rocks in the northern TP, based on detailed volcanic ash and paleomagnetic dating of two continuous Cenozoic sections in the Xining and Qaidam Basin in NW China. They show that the Paleogene silicate weathering in this tectonically inactive area was modulated by global temperature. These findings suggest that Paleogene global cooling was also strongly influenced by the temperature feedback mechanism that regulated silicate weathering rates and hydrological cycles and maintained a nearly stable carbon cycle. It acted as a negative feedback through decreasing CO₂ consumption resulting from the lower SWI and the kinetic limitations in tectonically inactive areas that followed the global cooling. This means that the enhanced erosion and silicate weathering by the uplift of the south and central Tibetan Plateau, thus accelerated CO₂ consumption, must be compensated by reducing CO₂ consumption of the rest vast continents through their reduced silicate weathering from cooling.