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East Asian monsoon intensification promoted weathering of the magnesium-rich southern China upper crust and its global significance

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The Oligocene-Miocene boundary climatic reorganization linked to the northward migration of the East Asian monsoon into subtropical China is a potentially important but poorly constrained atmospheric CO_2 consumption process. Here, we performed a first-order estimate of the difference in CO_2 consumption induced by silicate chemical weathering and organic carbon burial in subtropical China related to this monsoon intensification. Our results show that an increase in long-term CO_2 consumption by silicate weathering varies from 0.06 to 0.79×10^{12} mol·yr^{-1} depending on erosion flux reconstructions, with an ~60% contribution of Mg-silicate weathering since the late Oligocene. The organic carbon burial flux is approximately 25% of the contemporary CO_2 consumption by silicate weathering. The results highlight the significant role of weathering of the Mg-rich upper continental crust in East China, which would contribute to the rapid decline in atmospheric CO_2 during the late Oligocene and the Neogene rise in the seawater Mg content. If this climatic reorganization was mainly induced by the Tibetan Plateau uplift, our study suggests that the growth of the Himalayan-Tibetan Plateau can lead to indirect modification of the global carbon and magnesium cycles by changing the regional hydrological cycle in areas of East Asia that are tectonically less active.