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Significance of continental surface erosion and weathering in modulating the greenhouse gas CO_2 level during the Quaternary glacial periods: An integration of sedimentary records in tropical marginal seas

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Here, we present comprehensive records of continental surface erosion and weathering, terrestrial supply, hydrological dynamics, marine productivity, and organic carbon burial in the distal Arabian Sea, Bay of Bengal, southern South China Sea, and Philippine Sea during the Quaternary. These records exhibit noticeable variations in the abovementioned indicators over orbital timescales. During glacial periods, the enhanced Himalayan and Tibetan highland surface erosion and activation of deep-sea channels significantly increased inputs of terrigenous detritus, nutrients, and organic carbon into the Arabian Sea and Bay of Bengal, whereas strengthened chemical weathering of unconsolidated sediments on the exposed continental shelves and organic matter preservation occurred in the South China Sea and Philippine Sea. Conclusively, our integrative proxies in the study area demonstrate, for the first time, pronounced glacial burial pulses of organic carbon (~1.12 × 10^{12} mol/yr), dominantly originating from the highland surface erosion and marine productivity [1]. Together with the increased silicate weathering on the exposed tropical continental shelves [2] and in the tropical volcanic arcs [3], the enhanced burial flux of organic carbon in the tropical marginal seas, therefore, highlights that tropical regions were an important contributor (~1/4) to the decrease in the greenhouse gas CO_2 concentration during glacial periods and thus caused significant negative feedback on the global climate.

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