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An assessment of East Asian Summer Monsoon precipitation near the Paleogene-Neogene boundary using fossil wood substrates

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The East Asian Summer Monsoon (EASM) system is the source of >75% of total precipitation that falls over southeastern Asia every year. Models suggest that monsoon strength and variability may increase simultaneously with rising CO_2 levels over time; however, quantitative data for this relationship in the geologic record is lacking. Here we present new high-resolution carbon isotope ($\delta^{13}C$) data from mummified fossil wood samples recovered from Nanning Basin, Guangxi, China from the late Oligocene (28.1 – 23.0 Ma), in order to quantify monsoon precipitation during the last time CO_2 levels were comparable to modern (>400 ppmv). These data show, on average, ~2.5 times more precipitation falling during the summer than winter with rainfall rates ranging from 4-7 mm/day during the summer rainy seasons. These values suggest that the overall strength of the monsoon near Paleogene-Neogene boundary was similar in strength to the monsoon seen in southeastern Asian today. Further, these data reveal low year-to-year variability, signifying a stable monsoon system under elevated CO_2 conditions. Analysis of seasonal and daily rainfall rates near Paleogene-Neogene boundary provides the first quantitative measure of EASM precipitation seasonality at annual resolution. Understanding of past EASM dynamics can provide valuable insight on potential impacts of elevated CO_2 levels on seasonal precipitation variability across southeastern Asia.