Late Eocene travertine in the SE Tibet and cyclical change in its isotopic composition implying the monsoon climate

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The Asian monsoon is the most dominant monsoon system in the world but when and how it was established is still under the debate. Recently, its onset during the late Eocene was suggested (Licht et al., 2014) but little geological evidence in the low-latitude region hinder the reliable evaluation of the past climate pattern. In this study, we investigated the sedimentary environment of the late Eocene limestone in the Jianchuan basin by the microfacies and carbon and oxygen isotope analyses. We identified six lithofacies (laminated bindstone, oncoidal grainstone, calcareous conglomerate, wackestone, lime-mudstone, and bafflestone) and the limestone appears regular lamination and encrusted waterweed, which are unique features of travertine. The high $\delta^{13}C$ and low $\delta^{18}O$ values strongly support the travertine origin and disagree with the previous interpretation of lacustrine carbonate. The high $\delta^{13}C$ values resulted from a large proportion of isotopically depleted fraction from endogenic CO_2. Furthermore, high-resolution isotopic analysis for the laminated travertine confirms a seasonal pattern that is consistent with the laminated texture observed in the modern travertine. The isotopic pattern of the travertine also indicates humid summer and dry winter in the late Eocene, which are the same as the modern monsoonal climate regime.

Keywords: travertine, late Eocene, Asian monsoon, Jianchuan basin

