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Deepwater methane seepage in the South China Sea triggered by low sedimentation rates

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Compared to the growing evidence of what drives methane seepage along upper continental slopes, our understanding of the factors controlling seepage in deep-marine environments is insufficient; this limitation is partly caused by the lack of constraints on the history of seepage in deep-sea settings. Here, we use uranium-thorium and radiocarbon dating of seep carbonates and bivalve shells sampled from cores taken in the Qiongdongnan Basin of the South China Sea (~1700 m water depth). The carbonate and shell ages indicate two episodes of methane emission, one period during Marine Isotope Stage 5e (~133,000 to 121,000 years ago), and another period after the Last Glacial Maximum (~19,000 to 3,000 years ago). This chronology suggests that the episodicity of methane seepage in the deep-sea is triggered by changes in sedimentation rates. During periods of increased deposition, changes in gas pressure due to the gradual thickening of the gas hydrate stability zone result in the closure of fractures and, thus, reduced methane release. Vice versa, methane seepage increases when sedimentation rates decline and hydraulic fracturing regains momentum. On Quaternary time scales, deepwater gas reservoirs were more sensitive to changes in sedimentation than they were to warming or sea level fall. The deep-sea reservoir of methane hydrate should therefore be considered separately when estimating the impact of hydrate stability on climate change.