Impact of methane seepage dynamics on abundance of benthic foraminifera in gas hydrate bearing sediments: New insight from the South China Sea

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Stable isotopic ratios of the carbonate tests of benthic foraminifera are widely used to reconstruct seepage of submarine methane-rich fluid in the geological past. However, gaps in our fundamental knowledge of the ecology of benthic foraminifera at cold seeps, especially their prosperity and/or decline during methane seepage events hinder the utility of benthic foraminifera as a proxy for reconstruction of paleo-methane emissions and the influence of redox zonation on the local fauna. To better understand the impact of methane seepage on the abundance of benthic foraminifera, we use geochemistry and foraminiferal assemblages of sediments sampled from a well-characterized seepage area on the northern South China Sea. Our results reveal that seepage duration and intensity affect benthic foraminifera. It appears that species like *Uvigerina*. app tolerating eutrophic conditions thrive at conditions of excess methane expelled into bottom waters, owing to blooms of aerobic methane-oxidizing bacteria. In contrast, persistent and intense release of methane leads to bottom water oxygen depletion and the absence of benthic foraminifera. This study provides (1) the means to understand the dynamics of methane seepage and (2) new insight for possible constraints from foraminifera as paleoceanographic proxy including mechanism of mass extinction in geological time.