Carbon and oxygen isotopes of foramnifera respensed to climate changes in Dongsha area, northern South China Sea

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The South China Sea (SCS) is located at the junction of three tectonic plates: the Eurasian, the Pacific and the Indian-Australian. Two gas hydrate drilling expeditions have been done in the SCS according to the geological, geophysical and geochemical abnormities. The first Chinese gas hydrate expedition (GMGS1) was completed in the Shenhu Area in 2007, and the second Chinese gas hydrate expedition (GMGS2) was completed in the Dongsha Area in 2013. The GMGS2 drilled region is a very active area of methane flux, and gas hydrate is common in the first 200 meters below the seafloor (Zhang et al., 2014). Foraminifera are promising indicators for methane-rich environments. Two gravity cores, 1,375 cm long at Site 973-4 (with water depth of 1,666 m) and 935 cm long at Site 973-5 (with water depth of 2,998 m) respectively, were recovered from cold methane seeps in the Dongsha area. Total carbon and sulfur anlynasis of both sites demonstrates their depths of sulfate methane interface. Authigenic framboid pyrites also testify the activities of methane fluids from deep sediments in Dongsha area. Some foraminifera in the two core were selected to test their carbon and oxygen isotopes. Carbon isotopes of *Uvigerina* spp.at Site 973-4 varies from -0.40‰ to -2.26‰, the counterparts at Site 973-5 varies from 0.25‰ to -2.24‰, and carbon isotope values of planktonic *Pulleniatina obliquiloculata* ranged from 0.40‰ to -1.15‰ at Site 973-4. The value of Site 973-4 indicates that bottom water warming will decrease the stability of gas hydrates, while both sites shows that drops of sea level also promoted the activities of the cold seep. Although there existed sustainable cold seep activities in Dongsha area, the activities has been attenuated since Holocene, because sea level rises will increase the instability of gas hydrates and depress the upwelling of methane fluids. Unlike those at shallow slope sites, the leakages of methane at both Site 973-4 and Site 973-5 were mainly controlled by sea level drops rather than bottom water rises. Negative deviation of carbon isotope values of infauna in the warming event indicated warming bottom water destabilized gas hydrates. Sea level fluctuations also played an important role in the instability of gas-hydrate accumulations. Rising sea levels might stabilize gas-hydrate accumulations and thus depress the upwelling of gases. Simultaneous negative excursions of both benthic and planktonic foraminifera at ~42 ka B.P. were interpreted as a rapid and voluminous leakage of gases; however, unlike the upper slope site, the 1,666-meter-deep site was more subject to sea-level fluctuations than to bottom-water warming.