

Extremely negative carbon isotopes of authigenic carbonates and implication for gas hydrate, northern South China Sea

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Extremely negative $\delta^{13}\text{C}_{\text{carb}}$ low to -57.89‰ VPDB are identified in the authigenic carbonates selected from the drilling cored sediments in northern South China Sea during the GMGS2 Expedition in 2013 (Zhang et al., 2014). Total 32 sediment samples were selected from the hydrate-containing site GMGS2-08 at the holes of B, C, E, F from the depth 0-90 mbsf. Carbonates and pyrites are identified widely as authigenic minerals within the sampled sediments, while gypsum occurs occasionally. Most of authigenic carbonates shows an irregular bulk concretion in size of 300-800 μm consisted of aragonite needles in about 3 μm wide and 30 μm long. The identified carbonates distribute mainly in three depths: 0-13 mbsf, 58-61 mbsf and 84-85 mbsf. The values of $\delta^{13}\text{C}_{\text{carb}}$ show a extremely negative range of -38.36‰ to -57.89‰ VPDB except 3 samples having the values of -1.99‰ to -6.82‰ VPDB, which means that most of the identified carbonates precipitated by the processes of anaerobic oxidation of methane (AOM). The carbonates at the upper part of the sediment column are similar as the reported Jiulong methane reef with the similar value of $\delta^{13}\text{C}_{\text{carb}}$ in northeastern South China Sea (Han et al., 2008), however, the carbonates in the middle and the lower parts of sediment column are recognized at the first time. Thus, several AOM derived carbonate-rich layers at the site GMGS2-08 imply that there should be several times of AOM domination in Cenozoic, during which the methane seepages and gas hydrate dissociation might happen in northeastern South China Sea.