Enrichment of ^{13}C in ejecta from mud volcanoes in northern Tianshan fold belt, Xinjiang, NW China

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The carbon isotopes of gas CO_2, dissolved inorganic carbon (DIC) and carbonates from four mud volcanoes in the northern Tianshan fold zone were investigated for carbon cycling in the mud volcanic systems. Experiment results show that the $\delta^{13}C$ values in CO_2, DIC and carbonates range 13.9～32.1‰, 16.9～33.3‰, and -5.0～15.6‰, respectively. The ^{13}C enrichment in CO_2 could be attributed to carbon isotope fractionation during partially reduction of the CO_2 by methanogenic bacteria. The abnormally positive $\delta^{13}C$ values in the DIC may be mainly resulted from carbon isotope fractionation in the process of CO_2-water-rock interactions. The relatively less positive $\delta^{13}C$ values of the carbonates could result from mixing of carbon isotope from carbonate precipitation in the water and carbonate minerals in the host rocks. Thus reduction of CO_2 through methanogenic bacteria could be the main origin for the ^{13}C enrichment of ejecta in the mud volcanic systems.