Public Abstract
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ABSTRACT

Substrate limitation has been proposed as an explanation for 13C enriched methane production from endoevaporite microbial communities in hypersaline environments. To test this possibility, methane production rates and ?13CCH4 values produced from sediment and evaporite crusts from Guerrero Negro, Baja California Sur, Mexico and the Atacama Desert, Chile were determined in order to confirm any decreased stable carbon fractionation during methanogenesis. As observed previously, the dominant substrate used during methanogenesis was determined to be the noncompetitive substrate trimethylamine (TMA).
Incubations of sediment or evaporite crust from hypersaline sites with salinities between 80 ppt and 160 ppt and organic carbon concentration <1% produced ?13CCH4 values from -44.5‰ to -28.0‰, values that fall outside the reported biogenic range of -110‰ to -50‰. It was hypothesized that increasing substrate concentrations, either in the form of TMA or dried microbial mat material, would alleviate substrate limitation effects on fractionation and shift ?13CCH4 values to lower values commonly observed in methane. TMA addition resulted in ?13CCH4 values from -91.8‰ to -67.2‰, and addition of microbial mat resulted in ?13CCH4 values from -66.0‰ to -41.7‰. These values mostly fell within the biogenic range as hypothesized, an observation from which we conclude that organic matter availability does affect fractionation during methanogenesis.