

Estimation of decrease in global methane hydrate inventory associated with global warming

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Large amounts of methane hydrate are trapped in the sediments along the continental margins, owing their stability to low temperature and high pressure conditions. Increase in temperature due to global warming could destabilize methane hydrate and cause a release of methane into the water column. Released Methane (and/or carbon dioxide from methane oxidation) would affect climate and global biogeochemical cycle. However, the amount of released methane due to decomposition of methane hydrate is poorly constrained.

In this study, we calculated the global changes in gas hydrate stability zone (GHSZ) volume and methane hydrate inventory associated with potential future climate change. A series of potential future climate change experiments are under taken using the Model for Interdisciplinary Research on Climate (MIROC), an atmosphere-ocean coupled general circulation model (AOGCM), with resulting seafloor temperature changes applied to a simple methane hydrate inventory model based on Pinero et al (2012).

Our model predicts GHSZ volume along the continental margins has decreased by 30(14) % under the condition of 4(2) \times CO₂. The methane hydrate inventory is decreased from present 550 Pg of C to 200(380) Pg of C under the condition of 4(2) \times CO₂.

Reference

Pinero, E.; Marquardt, M.; Hensen, C.; Haeckel, M.; Wallmann, K. Estimation of the global inventory of methane hydrates in marine sediments using transfer functions. *Biogeosci.* 2013 10 959-975.

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