An estimation of the methane flux from the seafloor reaching the atmosphere

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The effect of massive methane release from the methane hydrate on the global warming depends on the amount of methane reaching the atmosphere. In this study, a one dimensional numerical model predicting both the methane bubble evolution and the methane concentration in the seawater was developed to estimate the ratio of methane released to the atmosphere under the condition of continuous methane input from the seafloor to the water column. The most of the methane bubble released into the atmoshpere (i.e., the methane release ratio is 80 % or more) needs more than 90 % of the methane saturation fraction in the water column. At the timing when the methane bubble begins to reaches the atmosphere, the methane saturation fraction in the water column is much lower than 100 %. We compared between the minimum methane input from the seafloor for the methane reaching the atmosphere and the methane amount in the sediment as methane hydrate assuming with typical hydrate fraction of 3 %. In the most case, our results suggest that the minimum methane input is larger than the methane amount in the sediment. We found the massive methane bubble released from the seafloor does not reach the atmosphere directly but dissolved into the seawater except localized faults with high hydrate fraction. For PETM, the atmospheric methane directly derived from the typical hydrate layer did not cause the global warming. Even if the typical methane hydrate layer were collapsed by the globalwarming due to human activities, methane would not reach the atmosphere.