Localizations of methane hydrate in marine sediments are controlled by the combination of the temperature and pressure conditions (which define the solubility profile) and an adequate supply of methane. The base of the hydrate stability zone (HSZ) in marine sediments corresponds with the depth where the local temperature and pressure conditions coincide with the conditions for three-phase equilibrium between water, free gas, and hydrate.

The effect of thermal regime of sedimentation on hydrate accumulation is analyzed using numerical simulation in terms of the model including coupled processes of sediment heating, viscoelastic compaction, and upward movement of porous fluids, and accumulation of gas hydrates from dissolved methane during sedimentation. Model calculations were performed using representative parameters of the system with different thermal conditions of sedimentation.

It is numerically shown that the resulting volume of hydrate depends on the methane solubility profile, dimensionless filtration rate and time. Comparative calculations show that, for the same final thicknesses of sediments, an increase in the temperature gradient in sediments leads to hydrate concentration decrease with reducing the thickness of the HSZ and changing the gradient of methane solubility. These results can be accounted for by the fact that, the hydrates are accumulated in thinner HSZ for a less time during the history of marine sedimentation, leading to a smaller volume of hydrates in pores in spite of higher methane solubility gradient. The results are useful for analysis of marine gas hydrate observations from geothermal point of view, because emphasize the complicated effect of geothermal gradient.