Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Instability of methane hydrate stability zone in permafrost deposits[1] DMITRIY LYUBIMOV, Perm State University, Perm, Russia, EKATERINA KOLCHANOVA, TATYANA LYUBIMOVA, Institute of Continuous Media Mechanics UB RAS, Perm, Russia, OLEG ZIKANOV, University of Michigan-Dearborn, Dearborn, MI, USA — As a part of a broad study of the dynamics of natural deposits of methane hydrates, we analyze the instability of the interface between the hydrate-bearing zone and the underlying gas-saturated layer. Conditions of Arctic permafrost with temperature below the ice melting point are considered. The physical model includes the Darcy filtration of gas, conduction and convection heat transfer, and the dynamic boundary conditions including the hydrate dissociation at the interface. The method of linear stability analysis is used. It is found that the system is stable and, thus, can exist only at relatively small thicknesses of both layers and at low-to-moderate permeability of the sediments. At larger thicknesses and higher permeability, the interface between the two layers is unstable to monotonic perturbations. The results do not support the hypothesis that the interface instability may lead to accelerating self-sustained dissociation of natural methane hydrates in the conditions of increasing global temperature.

[1]The work is supported by CRDF (grant RUP1-2945-PE-09) and by RFBR (grant 09-01-92505).

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Date submitted: 04 Aug 2011 Electronic form version 1.4