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Porous media consolidation due to gas-gydrate dissosiation

O.Y. Izvekov
Moscow institute of physics and technology, Moscow, Russia (izvekov_o@inbox.ru)

Gas-hydrates are perspective sources of hydrocarbons. Fortunately gas-hydrates development is accompanied by some difficulties connected with gas-hydrates dissociation. One of them is strength deviation of rock. When gas-hydrates fasten grains of skeleton together elastic solid skeleton can transform to granular or visco-plastic media due to gas-hydrates dissociation. Consequences of these phenomena can be disastrous and can have a form of borehole instability, reservoir consolidation, and dramatic decline of permeability. Adequate model of these phenomena should combine approaches of visco-plastic media mechanics, theory of phase transformation and multiphase flow.
In this work gas-hydrates dissociation is described by scalar parameter of dissociation level. The state of constitutive equations of porous medium with gas-hydrates is completed by law governing the evolution of this dissociation parameter. A one-dimensional problem of porous medium consolidation due to gas-hydrates dissociation under external stress is considered. It is assumed that skeleton is initially elastic and has visco-plastic behavior when dissociation parameter achieves critical value. A relaxation reduction of permeability and porosity in visco-plastic state is considered.