Geophysical Research Abstracts,
Vol. 11, EGU2009-5705, 2009
EGU General Assembly 2009

Effective stress evolution during compaction of layered, visco-elastic sediments.

E. Suetnova

Institut of Earth phisics, teoretical, Moskow, Russian Federation (elena_suetnova@mail.ru)

Sedimentation and sediment compaction are the most important processes, which determined the structure of sedimentary basins fill, stress field and physical property of basin fill on the different time and space scale. Pore pressure evolution is determined by the sedimentation rate and physical and hydro dynamical property of sediments. Effective stress evolution during sediment compaction leads to decreasing of void space and fluid content in sediment. In present work we have studied porosity reduction and fluid pressure development resulting from the visco-elastic compaction of layered sediments during its accumulation and burying. Mathematical model consists of the system of partial differential equations which includes continuity equations, Darcyś law and a visco-elastic rheology law which relates the strain rate to the effective stress and to the rate of change of this effective stress. Under the assumption that permeability is a power law function of porosity, the equations become essentially non-linear. Based on the model calculations, the effect of variations in the physical properties of the sediments on the evolution of the porosity and pore pressure accompanied by compaction of the sediments was examined. Calculations with parameters that lie within the range of the available geophysical data showed that, during basin formation, the accumulation of sedimentary layers with a permeability or viscosity differing from that of the main basin fill can substantially disturbs the monotonic porosity decrease with depth and lead to the formation, deep within the basin, of layers that have a different level of over hydrostatic pressure as compared with the surrounding layers. Similar influence can make gas hydrate which may form a barrier for fluid migration.