



Compaction creep by pore failure and pressure solution applied to a carbonate reservoir

Daniel Keszthelyi, Bjørn Jamtveit, and Dag Kristian Dysthe

Physics of Geological Processes, University of Oslo, Oslo, Norway (daniel.keszthelyi@fys.uio.no)

The Ekofisk field in the Norwegian North sea is an example of a compacting carbonate reservoir with considerable seafloor subsidence due to petroleum production. Previously, a number of models were created to predict the compaction using different phenomenological approaches. We present a different approach, based on microscopic mechanisms with no fitting parameters. We create a time-dependent micromechanical model combining pore failure and pressure solution creep in presence of a oil-water mixture pore fluid. Then we use a statistical mechanical approach to scale it up to macroscopic scale and predict strain rate at core scale and at reservoir scale. The model is able to reproduce the magnitude of the observed subsidence making it the first microstructural model which can explain the Ekofisk compaction.