# Stochastic Monte-Carlo Simulations of Overpressure Probability Distribution in the Halten Terrace Area, Offshore Norway

Lothe, Ane Elisabet, and Are Tømmerås, SINTEF Petroleum Research, Trondheim, Norway

It is a challenge to quantify the uncertainties in the pore pressure simulations on basin scale. Mainly, because there are many geological processes that control pressure generations and dissipation and the lateral fluid flow in a sedimentary basin that are still not well understood. The technique presented here can provide important constraints when planning drilling operation in new parts of a basin.

The study utilizes a seismic dataset from the Halten Terrace, offshore Mid-Norway. A fault map at the top of the reservoir unit (top Garn Formation) was constructed and is used to define the pressure and stress compartments. The pressure distribution and lateral pressure variance were simulated for the reservoir during the last 90 Ma. Depth-converted maps were used to construct the burial history to the reservoir unit. The porosity-depth relation of the shales was used to model mechanical compaction and a kinetic model for quartz cementation was used to estimate chemical compaction of sand. The transmissibilites across fault zones depends on the throw and width of the fault zones. Griffith-Coulomb and frictional sliding criteria are used to simulate hydraulic fracturing from the top points of the overpressured compartments.

To assess the uncertainties, more than 3000 runs with stochastic Monte-Carlo approach has been carried out. The results have been weighted to measured pressures from wells. Probability maps show the calculated uncertainty of the pressures in different parts of the basin. Also pressure probability estimates in certain compartments are shown e.g. present-day overpressure in the Kristin Field is estimated to 42.8 +/-3 MPa.