

**AAPG International Conference  
Barcelona, Spain  
September 21-24, 2003**

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**Why conventional basin modelling of fluid flow, overpressure and porosity doesn't work**

Basin modelling of porosity and fluid pressure development in sedimentary basins almost exclusively hinges on relationships between porosity and effective stress. Such modelling results in elevated porosity in overpressured rocks. However, observations of pore pressure vs. porosity relationships in shales offshore Norway demonstrate that highly overpressured formations have as low porosities as their normally pressured counterparts.

To further investigate the origin of the high overpressures encountered offshore Norway, basin modelling of porosity and pore pressure history was performed. This modelling was based on effective stress vs. porosity relationships. Also, modelling of porosity reduction by stress - insensitive (chemical) processes were performed.

Modelling with porosity vs. effective stress relationships demonstrated that today's porosity and pore pressures could be reproduced by the modelling. However, the modelled historical development of porosity and pore pressures in overpressured formations with low porosity were quite disturbing: the paleo - porosities were unrealistically low, and the pore pressures were close to the lithostatic values throughout the whole burial history.

Modelling of stress - insensitive (chemically) driven porosity reduction also resulted in a satisfactory fit between present day observations and modelling results. In addition, this modelling resulted in modelled porosity and pore pressure histories in consistence with present day observations.

It is concluded that the combination of high fluid pressures and low porosities cannot result from stress - sensitive compaction, irrespective of lithology. Basin modelling of compaction solely based on porosity vs. effective stress relationships should therefore be terminated, and substituted by modelling which also includes stress - insensitive processes for porosity reduction.