



AAPG Copenhagen section Geoscience Lecture

Invitation to AAPG Copenhagen meeting featuring a series of lectures covering recent work on the Chalk followed by a reception with drinks and snacks.

Date: September 28th 2011

Time: 16:00

**Venue: Dept Geography and Geology, University of Copenhagen, Øster
Voldgade 10, 1350 Copenhagen-K**

Agenda

16:00 - 16:30 Reception with drinks

16:30 - 18:00 Lectures – See attached abstracts

18:00 - 19:00 Reception with drinks and snacks

Lectures

Finn Surlyk (IGG) - *Palaeoceanography of the chalk and the influence of bottom currents on reservoir quality*

Kresten Anderskov (IGG) - *The deposition of chalk - and its influence on reservoir properties and palaeoceanographic reconstruction*

Ole Vejbæk (Hess) - *Modelling un-equilibrated oil saturations in the South Arne Field.*

Ida Lykke Fabricus (DTU) - *Diagenesis of chalk*

Palaeoceanography of the chalk and the influence of bottom currents on reservoir quality

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Depositional models of subsurface siliciclastic reservoir units are normally produced at an early stage of hydrocarbon exploration as exemplified by the Jurassic Brent Group in the North Sea. In contrast, only very little has been done along these lines for the Upper Cretaceous – Danian Chalk Group and virtually all studies are focused on specific fields. There is thus a lack of an overall understanding of the depositional system. In recent years there has, however, been much emphasis on the recognition in seismic data of the effects of commonly strong and persistent bottom currents which exerted a major influence on chalk deposition. Seismic data allow identification of drifts, moats, channels and levees on a variety of scales, interpreted as formed by mainly contour-parallel bottom currents. These features are extremely widespread and can almost be considered a norm rather than exception. The currents have caused highly differential rates of deposition over short lateral distances, sorting of the pelagic debris in zones parallel to the current axes, formation of hardgrounds and major hiatuses. They have thus exerted a major influence on reservoir quality. It is hypothesized that waxing and waning of the bottom currents over tens to hundreds of thousands of years may be a reason for the stratigraphic distribution of commonly thin chalk reservoir levels.

The deposition of chalk - and its influence on reservoir properties and palaeoceanographic reconstruction

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Whereas the palaeoceanographic interpretation of large-scale depositional structures in chalk has advanced significantly during the past decade, interpretations of chalk facies are commonly relatively simplistic and spatial patterns are typically described as chaotic and non-predictable. In this talk, recent progress in chalk sedimentology, key questions, and potential research projects are discussed.

Modelling un-equilibrated oil saturations in the South Arne Field.

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The South Arne Field presents yet another example of a North Sea chalk field with an oil distribution strongly affected by fluid dynamics already at production start. The oil saturation variation in the South Arne Field is effectively modeled with a free water level (FWL) surface, the height above which defines the capillary pressure of oil versus water. This FWL is in the shape of an elongated dome with a relief in the order of 200m corresponding to a smooth slightly lower amplitude version of the field structure itself. The dip of the FWL exceeds 100m/km locally. Nevertheless oil flows just as readily as in other chalk fields.

Partial to full pre-production imbibition has been identified and modeled in some flank areas. This provides an explanation for why these parts produce water while other areas at similar saturation and porosity levels flow oil owing to drainage conditions. Identification of degree of imbibition is thus of paramount importance for optimal well placement and prediction of performance.

Geological time scale reservoir simulation in 2-D is successfully deployed to closely replicate oil saturation distribution and geometry of the FWL surface. This modelling shows the dis-equilibrium to reflect geological time scale processes and greatly improves the understanding and ability to predict the saturation distribution.

Diagenesis of chalk

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Chalk diagenesis is a controversial issue. Authors disagree on the role of recrystallization, the role of pressure dissolution, the role of silica, the role of clays, the role of organic matter, the role of wettability, the role of pore fluids, the role of temperature, the role of pore pressure, the role of stress. A reason for this interesting state of affairs is that the issue of diagenesis lies on the crossroads of several geological disciplines, so that theories founded in one geological discipline proves wrong when seen from the point of view of another geological discipline. In the talk I will try to map out what we know about chalk diagenesis and attempt to point out poorly supported claims.