Geophysical Research Abstracts
Vol. 16, EGU2014-12983, 2014
EGU General Assembly 2014

Seismic geomorphology of the Danish Chalks, offshore, North Sea

Florian Smit (1), Frans van Buchem (2), and Ingelise Schmidt (2)

(1) Aarhus University, Department of Geosciences, Aarhus, Denmark (floriansmit88@gmail.com), (2) Maersk Oil, Exploration Department, Copenhagen, Denmark (frans.vanbuchem@maerskoil.com)

The Upper Cretaceous and Lowermost Paleocene chalk deposits of the North Sea Basin constitute a unique phase in the evolution of carbonate facies, through the rock-forming dominance of fine grained calcareous plankton, particularly coccolithophorids. These planktonic organisms were deposited over extensive areas and very often laid down as laterally extensive, regular dm-scale bedded packages, that locally may reach a thickness of up to 1250 m. In the Danish Graben, the depositional conditions for the chalk sedimentation changed dramatically during the middle of the Upper Cretaceous. At this time the basin topography was inverted, radically changing the position of the depocenters and the ocean floor morphology. In uplifted areas local erosion and long phases of non-deposition occurred, whereas in areas of subsidence thick packages of chalk accumulated. Along the newly created highs, mass waste deposition took place at the deca-kilometre scale. In this presentation we will document evidence for the tectonic inversion, and pay particular attention to the rich pallet of geomorphological features that characterise this tectonically active period.

This study benefitted from a recently re-processed 3D seismic dataset (6000 km^2), and a regional well-log and biostratigraphic dataset. In addition, the seismic interpretation applied advanced seismic interpretation software (PaleoScan^{TM}), which uses a patented model grid that links up seismic points and honours interpreted horizon constraints resulting in a seismic Relative Geological Time model. Standard seismic attributes, displayed upon horizons from a 3D RGT model of the chalk package, have shown to be very effective in the illustration and interpretation of complex chalk depositional features.

Special attention has been focussed on mass waste deposits around inverted structures and salt diapirs. Several different mass waste complexes have been documented in 3D, illustrating a number of typical features such as sediment creep, slumping, debris avalanches, olistoliths, debris flows and mudflows. Also traction current sedimentary features had a prominent role in the depositional system and left several thalwegs of different aspect ratios. Together these features present a very dynamic picture of chalk sedimentation. The importance of improving our ability to predict these heterogeneities is indeed essential for the exploration and production of hydrocarbons in this prolific petroleum province.