

GEOLOGICAL SOCIETY MEMOIR NO. 29

3D Seismic Technology: Application to the Exploration of Sedimentary Basins

EDITED BY

RICHARD J. DAVIES

Cardiff University, UK

JOSEPH A. CARTWRIGHT

Cardiff University, UK

SIMON A. STEWART

BP, Azerbaijan

MARK LAPPIN

ExxonMobil Exploration Company, USA

and

JOHN R. UNDERHILL

The University of Edinburgh, UK

2004

Published by

The Geological Society

London

Contents

Preface	v
Acknowledgements	vi
3D seismic technology: are we realising its full potential?: DAVIES, R. J., STEWART, S. A., CARTWRIGHT, J. A., LAPPIN, M., JOHNSTON, R., FRASER, S. I. & BROWN, A. R.	1
Depositional systems	
Seismic geomorphology: imaging elements of depositional systems from shelf to deep basin using 3D seismic data: implications for exploration and development: POSAMENTIER, H. W.	11
Depositional architectures of Recent deepwater deposits in the Kutei Basin, East Kalimantan: FOWLER, J. N, GURITNO, E., SHERWOOD, P., SMITH, M. J., ALGAR, S., BUSONO, I., GOFFEY, G. & STRONG, A.	25
The use of near-seafloor 3D seismic data in deepwater exploration and production: STEFFENS, G. S., SHIPP, R. C., PRATHER, B. E., NOTT, J. A., GIBSON, J. L. & WINKER, C. D.	35
Structural controls on the positioning of submarine channels on the lower slopes of the Niger Delta: MORGAN, R.	45
Sea bed morphology of the Faroe–Shetland Channel derived from 3D seismic datasets: LONG, D., BULAT, J. & STOKER, M. S.	53
3D anatomy of late Neogene contourite drifts and associated mass flows in the Faroe–Shetland Basin: KNUTZ, P. C. & CARTWRIGHT, J. A.	63
Interactions between topography and channel development from 3D seismic analysis: an example from the Tertiary of the Flett Ridge, Faroe–Shetland Basin, UK: ROBINSON, A. M., CARTWRIGHT, J. A., BURGESS, P. M. & DAVIES, R. J.	73
3D seismic analysis reveals the origin of ambiguous erosional features at a major sequence boundary in the eastern North Sea: near top Oligocene: HANSEN, J. P. V., CLAUSEN, O. R. & HUUSE, M.	83
3D seismic interpretation of the Messinian Unconformity in the Valencia Basin, Spain: FREY MARTINEZ, J., CARTWRIGHT, J. A., BURGESS, P. M. & VICENTE BRAVO, J.	91
Structural and igneous geology	
3D analogue models of rift systems: templates for 3D seismic interpretation: MCCLAY, K. R., DOOLEY, T., WHITEHOUSE, P., FULLARTON, L. & CHANTRAPRASERT, S.	101
Structural evolution of a complex 3D fault array in the Cretaceous and Tertiary of the Porcupine Basin, offshore Ireland: JONES, G., WILLIAMS, L. S. & KNIPE, R. J.	117
Three-dimensional geometry and displacement configuration of a fault array from a raft system, Lower Congo Basin, Offshore Angola: implications for the Neogene turbidite play: DUTTON, D. M., LISTER, D., TRUDGILL, B. D. & PEDRO, K.	133
Initial deformation in a subduction thrust system: polygonal normal faulting in the incoming sedimentary sequence of the Nankai subduction zone, southwestern Japan: HEFFERNAN, A. S., MOORE, J. C., BANGS, N. L., MOORE, G. F. & SHIPLEY, T. H.	143
The evolution and growth of Central Graben salt structures, Salt Dome Province, Danish North Sea: RANK-FRIEND, M. & ELDERS, C. F.	149
Integrating 3D seismic data with structural restorations to elucidate the evolution of a stepped counter-regional salt system, Eastern Louisiana shelf, Northern Gulf of Mexico: TRUDGILL, B. D. & ROWAN, M. G.	165
Exploration 3D seismic over the Gjallar Ridge, Mid-Norway: visualization of structures on the Norwegian volcanic margin from Moho to seafloor: CORFIELD, S. M., WHEELER, W., KARPUZ, R., WILSON, M. & HELLAND, R.	177
Tertiary inversion in the Faroe–Shetland Channel and the development of major erosional scarps: SMALLWOOD, J. R.	187
3D seismic analysis of the geometry of igneous sills and sill junction relationships: HANSEN, D. M., CARTWRIGHT, J. A. & THOMAS, D.	199
Kinematic indicators for shallow level igneous intrusion from 3D seismic data: evidence of flow direction and feeder location: TRUDE, K. J.	209
Application at development and production scale	
Visualization and interpretation of 3D seismic in the Carboniferous of the UK Southern North Sea: LYNCH, J. J.	219
Direct visualization and extraction of stratigraphic targets in complex structural settings: JAMES, H., BOND, R. & EASTWOOD, L.	227
Locating exploration and appraisal wells using predictive rock physics, seismic inversion and advanced body tracking: an example from North Africa: PICKERING, G., KNIGHT, E., BLETCHER, J., BARKER, R. & KEMPER, M.	235
Use of 3D visualization techniques to unravel complex fault patterns for production planning: Njord field, Halten Terrace, Norway: DART, C., CLOKE, I., HERDLEVÆR, Å., GILLARD, D., RIVENÆS, J. C., OTTERLEI, C., JOHNSEN, E. & EKERN, A.	249
Seismic characteristics of large-scale sandstone intrusions in the Paleogene of the South Viking Graben, UK and Norwegian North Sea: HUUSE M., DURANTI, D., STEINSLAND, N., GUARGENA, C. G., PRAT, P., HOLM, K., CARTWRIGHT, J. A. & HURST, A.	263

Integrated use of 3D seismic in field development, engineering and drilling: examples from the shallow section: AUSTIN, B.	279
4D/time-lapse seismic: examples from the Foinaven, Schiehallion and Loyal Fields, UKCS, West of Shetland: BAGLEY, G., SAXBY, I., MCGARRITY, J., PEARSE, C. & SLATER, C.	297
New applications	
Improved drilling performance through integration of seismic, geological and drilling data: STEWART, S. A. & HOLT, J.	303
4D seismic imaging of an injected CO ₂ plume at the Sleipner Field, central North Sea: CHADWICK, R. A., ARTS, R., EIKEN, O., KIRBY, G. A., LINDBERG, E. & ZWEIGEL, P.	311
Towards an automated strategy for modelling extensional basins and margins in four dimensions: WHITE, N., HAINES, J., JONES, S. & HANNE, D.	321
Examples of multi-attribute, neural network-based seismic object detection: DE GROOT, P., LIGTENBERG, H., OLDENZIEL, T., CONNOLLY, D. & MELDAHL, P.	333
Modelling fault geometry and displacement for very large networks: LISTER, D. L.	339
Index	349