

# Contents

## VOLUME 1

Conference Organizing Committee xii

Conference Technical Committee xii

Sponsoring Bodies xii

Foreword xiii

*Jim Brooks*

Opening address xiv

*Jim Brooks*

General Introduction xvi

*J. R. Parker*

## **New plays in established areas: the Tertiary**

Introduction and review 3

*B. A. Vining*

Historical overview of exploration of Tertiary plays in the UK North Sea 5

*J. S. Bain*

Revision of North Sea lithostratigraphic nomenclature: Paleogene 15

*British Geological Survey*

Stratigraphic relationships of some Tertiary lowstand depositional systems in the Central North Sea 17

*B. A. Vining, N. S. Ioannides and K. T. Pickering*

Sedimentation and basin evolution in the Paleogene of the Northern North Sea and Faeroe–Shetland basins 31

*R. Anderton*

Sequence stratigraphic and depositional framework of the Cenozoic fill, Central and Northern North Sea Basin 33

*W. E. Galloway, J. L. Garber, Xijin Liu and B. J. Sloan*

Log-motif analysis of Paleogene depositional systems tracts, Central and Northern North Sea: defined by sequence stratigraphic analysis 45

*J. M. Armentrout, S. J. Malacek, L. B. Fearn, C. E. Sheppard, P. H. Naylor, A. W. Miles, R. J. Desmarais and R. E. Dunay*

Evolution of Paleogene submarine fans of the North Sea in space and time 59

*D. Den Hartog Jager, M. R. Giles and G. R. Griffiths*

Stratigraphic evolution of sand provenance during Paleocene deposition in the Northern North Sea area 73

*A. C. Morton, C. R. Hallsworth and G. C. Wilkinson*

Acquisition and processing techniques to improve the seismic resolution of Tertiary targets 85

*H. Crook, J. E. Palmer, D. J. Painter and R. C. Uden*

The role of Paleocene magmatism in the Tertiary evolution of basins on the NW seaboard 97

*R. W. England, R. W. H. Butler and D. H. W. Hutton*

Sandstone architecture of the Balder Formation depositional system, UK Quadrant 9 and adjacent areas 107

*G. Timbrell*

The geology of the Gryphon Oil Field 123

*M. St J. Newman, M. L. Reeder, A. H. W. Woodruff and I. R. Hatton*

Origin of complex mound geometry of Paleocene submarine-fan sandstone reservoirs, Balder Field, Norway 135

*A. I. Jensen, D. Bergslien, M. Rye-Larsen and R. M. Lindholm*

Paleocene reservoirs of the Everest trend 145

*S. J. O'Connor and D. Walker*

The Alba Field: evolution of the depositional model 161

*S. K. Newton and K. P. Flanagan*

## The Cretaceous

The Lower Cretaceous chalk play in the Danish Central Trough 175

*J. R. Ineson*

Complex deformation and fluidization structures in Aptian sediment gravity flow deposits of the Outer Moray Firth 185

*R. A. Downie and C. I. Stedman*

## The Jurassic: from regional models to field development; the impact of sequence stratigraphy on hydrocarbon geology

Introduction and review 191

*A. J. Fraser*

Jurassic exploration history: a look at the past and the future 195

*W. G. Cordey*

High and low resolution sequence stratigraphy in lithological prediction—examples from the Mesozoic around the northern North Atlantic 199

*F. Surlyk, N. Noe-Nygaard and G. Dam*

Sequence stratigraphy of a failed rift system: the Middle Jurassic to Early Cretaceous basin evolution of the Central and Northern North Sea 215

*R. P. Rattey and A. B. Hayward*

Sequence stratigraphic control on Middle and Upper Jurassic reservoir distribution within the UK Central North Sea 251

*A. D. Donovan, A. W. Djakic, N. S. Ioannides, T. R. Garfield and C. R. Jones*

Middle to Late Jurassic basin evolution and sandstone reservoir distribution in the Danish Central Trough 271

*P. N. Johannessen and J. Andsbjerg*

Potential reservoir and source rocks in relation to Upper Triassic to Middle Jurassic sequence stratigraphy, Atlantic margin basins of the British Isles 285

*N. Morton*

Triassic–Jurassic megasequence stratigraphy in the Northern North Sea: rift to post-rift evolution 299

*R. J. Steel*

Application of sequence stratigraphy and trace fossil analysis to reservoir description: examples from the Jurassic of the North Sea 317

*A. M. Taylor and R. L. Gawthorpe*

Jurassic thermal doming and deflation in the North Sea: implications of the sequence stratigraphic evidence 337

*J. R. Underhill and M. A. Partington*

Genetic sequence stratigraphy for the North Sea Late Jurassic and Early Cretaceous: distribution and prediction of Kimmeridgian–Late Ryazanian reservoirs in the North Sea and adjacent areas 347

*M. A. Partington, B. C. Mitchener, N. J. Milton and A. J. Fraser*

Biostratigraphic calibration of genetic stratigraphic sequences in the Jurassic–lowermost Cretaceous (Hettangian–Ryazanian) of the North Sea and adjacent areas 371

*M. A. Partington, P. Copestake, B. C. Mitchener and J. R. Underhill*

The interaction of structure and sedimentary process controlling deposition of the Upper Jurassic Brae Formation Conglomerate, Block 16/17, North Sea 387

*S. T. J. Cherry*

Miller Field: reservoir stratigraphy and its impact on development 401

*C. R. Garland*

Stratigraphic, structural and depositional history of the Jurassic in the Fisher Bank Basin, UK North Sea 415

*D. N. Clark, L. A. Riley and N. R. Ainsworth*

Evolving depositional geometries in the North Sea Jurassic rift 425

*N. J. Milton*

- Effective stratigraphical subdivision of the Humber Group and the Late Jurassic evolution of the UK Central Graben 443  
*J. Price, R. Dyer, I. Goodall, T. McKie, P. Watson and G. Williams*
- Late Jurassic plays along the western margin of the Central Graben 459  
*L. L. Wakefield, H. Droste, M. R. Giles and R. Janssen*
- Structural controls on the Late Jurassic age shelf system, Ula Trend, Norwegian North Sea 469  
*I. J. Stewart*
- The genetic sequence stratigraphy of the Hettangian to Oxfordian succession, Inner Moray Firth 485  
*K. J. Stephen, J. R. Underhill, M. A. Partington and R. J. Hedley*
- Appraisal geology of the Saltire Field, Witch Ground Graben, North Sea 507  
*B. J. Casey, R. S. Romani and R. H. Schmitt*
- Jurassic volcanic centres in the Central North Sea 519  
*K. Smith and J. D. Ritchie*
- The Middle Jurassic Vardekløft Formation of East Greenland—analogue for reservoir units of the Norwegian shelf and the Northern North Sea 533  
*M. Engkilde and F. Surlyk*

## The Triassic: recent advances, discoveries and developments

- Introduction and review 545  
*M. A. Stephenson*
- Salt control on Triassic reservoir distribution, UKCS Central North Sea 547  
*R. I. Smith, N. Hodgson and M. Fulton*
- Physical modelling of North Sea salt diapirism 559  
*P. J. Weston, I. Davison and M. W. Insley*
- Low-angle faulting in the Triassic of the South Viking Graben: implications for future correlations 569  
*R. K. Morgan and P. L. Cutts*
- Sedimentation of Upper Triassic reservoirs in the Beryl Embayment: lacustrine sedimentation in a semi-arid environment 581  
*K. P. Dean*
- F15-A: a Triassic gas field on the eastern limit of the Dutch Central Graben 583  
*J. M. Fontaine, G. Guastella, P. Jouault and P. de la Vega*
- A review of the Triassic play in the Roer Valley Graben, SE onshore Netherlands 595  
*A. M. Winstanley*
- Heavy mineral stratigraphy in the UK Trias: Western Approaches, onshore England and the Central North Sea 609  
*C. V. Jeans, S. J. B. Reed and M. Xing*
- Clay mineral stratigraphy of Mesozoic and Paleozoic red beds, Northern North Sea 625  
*J. R. Glasmann and G. C. Wilkinson*

## Permo-Carboniferous and older plays

- Introduction and review 639  
*T. J. Wheatley*
- Permo-Carboniferous and older plays, their historical development and future potential 641  
*J. Gérard, T. J. Wheatley, J. S. Ritchie, M. Sullivan and M. G. Bassett*
- Geology and hydrocarbon prospects of the Paleozoic in the Baltic region 651  
*A. P. Brangulis, S. V. Kanev, L. S. Margulis and R. A. Pomerantseva*
- Late Paleozoic plays in East Greenland 657  
*F. G. Christiansen, H. C. Larsen, C. Marcussen, S. Piasecki and L. Stemmerik*
- The case for exploration of deep plays in the Variscan fold belt and its foreland 667  
*N. J. P. Smith*

Carboniferous depositional systems of the Southern North Sea	677
<i>J. D. Collinson, C. M. Jones, G. A. Blackburn, B. M. Besly, G. M. Archard and A. H. McMahon</i>	
Structural development and hydrocarbon occurrence of the Carboniferous in the UK Southern North Sea Basin	689
<i>J. M. Hollywood and C. V. Whorlow</i>	
Interpreting the Upper Carboniferous of the Dutch Cleaver Bank High	697
<i>D. G. Quirk</i>	
Permo-Carboniferous plays of the Silver Pit Basin	707
<i>J. B. Bailey, P. Arbin, O. Daffinoti, P. Gibson and J. S. Ritchie</i>	
The evolution and hydrocarbon potential of the Northumberland–Solway Basin	717
<i>R. A. Chadwick, D. W. Holliday, S. Holloway and A. G. Hulbert</i>	
The late Carboniferous ‘Barren Red Bed’ play of the Silver Pit area, Southern North Sea	727
<i>B. M. Besly, S. D. Burley and P. Turner</i>	
The Rotliegend in northwest Germany, from frontier to fairway	741
<i>P. Burri, J. Faupel and B. Koopmann</i>	
Pseudo-reefs beneath Zechstein salt on the northern flank of the Mid North Sea High	749
<i>J. C. M. Taylor</i>	
The Caister Fields, Block 44/23a, UK North Sea	759
<i>J. S. Ritchie and P. Pratsides</i>	
Structural and sedimentological controls on diagenesis in the Ravenspurn North gas reservoir, UK Southern North Sea	771
<i>P. Turner, M. Jones, D. J. Prosser, G. D. Williams and A. Searl</i>	
Appendix: A list of common abbreviations	xvii
Index	xix

## VOLUME 2

### Irish Sea basins

Introduction and review	789
<i>R. E. Dunay</i>	
Tectonic and stratigraphic aspects of the East Irish Sea Basin and adjacent areas: contrasts in their post-Carboniferous structural styles	791
<i>D. I. Jackson and P. Mulholland</i>	
Geochemical modelling of the East Irish Sea Basin: its influence on predicting hydrocarbon type and quality	809
<i>M. Hardman, J. Buchanan, P. Herrington and A. Carr</i>	
Controls on reservoir quality in the Triassic Sherwood Sandstone of the Irish Sea	823
<i>N. S. Meadows and A. Beach</i>	
The Fleetwood Dyke and the Tynwald fault zone, Block 113/27, East Irish Sea Basin	835
<i>G. Arter and S. W. Fagin</i>	
The Kish Bank Basin, offshore Ireland	845
<i>D. Naylor, N. Haughey, G. Clayton and J. R. Graham</i>	
The tectonic history of the East Irish Sea Basin with reference to the Morecambe Fields	857
<i>R. Knipe, G. Cowan and V. S. Balendran</i>	
The use of dipmeter logs in the structural interpretation and palaeocurrent analysis of Morecambe Fields, East Irish Sea Basin	867
<i>G. Cowan, C. Ottesen and I. A. Stuart</i>	
The geology of the North Morecambe Gas Field, East Irish Sea Basin	883
<i>I. A. Stuart</i>	

## Atlantic margin exploration: Cretaceous–Tertiary evolution, basin development and petroleum geology

- Introduction and review 899  
*A. M. Spencer and O. Eldholm*
- Evolution of North Atlantic volcanic continental margins 901  
*K. Hinz, O. Eldholm, M. Block and J. Skogseid*
- The southern West Greenland continental margin: rifting history, basin development, and petroleum potential 915  
*J. A. Chalmers, T. C. R. Pulvertaft, F. G. Christiansen, H. C. Larsen, K. H. Laursen and T. G. Ottesen*
- Late Mesozoic–Cenozoic evolution of the southwestern Barents Sea 933  
*J. I. Faleide, E. Vågnes and S. T. Gudlaugsson*
- The Norwegian continental margin from the Northern North Sea to the Senja Fracture Zone 951  
*B. T. Larsen, J. Skogseid, H. Brekke, P. Blystad, O. Rise and M. Larsen*
- Mesozoic to Cenozoic plate reconstructions of the North Atlantic and hydrocarbon plays of the Atlantic margins 953  
*S. D. Knott, M. T. Burchell, E. J. Jolley and A. J. Fraser*
- Subsidence patterns in western margin basins; evidence from the Faeroe–Shetland Basin 975  
*J. D. Turner and R. A. Scrutton*
- Development of the Rockall Trough and the northwest European continental margin 985  
*R. S. White*
- The tectono-stratigraphy of the Solan Basin, west of Shetland 987  
*J. Booth, T. Swiecicki and P. Wilcockson*
- Structuring and transfer zones in the Faeroe Basin in a regional tectonic context 999  
*B. Rumph, C. M. Reaves, V. G. Orange and D. L. Robinson*
- Paleogene sequence stratigraphic framework of the Faeroe Basin 1011  
*S. M. Mitchell, G. W. J. Beamish, M. V. Wood, S. J. Malacek, J. A. Armentrout, J. E. Damuth and H. C. Olson*
- Late Paleocene to Miocene compression in the Faeroe–Rockall area 1025  
*L. O. Boldreel and M. S. Andersen*
- Preliminary observations of Neogene–Quaternary depositional processes in the Faeroe–Shetland Channel revealed by high-resolution seismic facies analysis 1035  
*J. E. Damuth and H. C. Olson*
- Seismic structure of the Hatton–Rockall area: an integrated seismic/modelling study from composite datasets 1047  
*J. Keser Neish*
- Cretaceous and Tertiary basin development west of Ireland 1057  
*P. M. Shannon, J. G. Moore, A. W. B. Jacob and J. Makris*
- Elevated palaeotemperatures prior to Early Tertiary cooling throughout the UK region: implications for hydrocarbon generation 1067  
*P. F. Green, I. R. Duddy, R. J. Bray and C. L. E. Lewis*
- Crustal extension, subsidence and inversion in NW Europe 1075  
*A. H. Ruffell and M. P. Coward*
- Evolution of the English Channel Basin 1077  
*A. H. Ruffell, M. Harvey and G. D. Wach*

## Structural styles and their evolution in the North Sea area

- Introduction and review 1081  
*I. D. Bartholomew*
- Structural models for the evolution of the North Sea area 1083  
*G. D. Williams*
- The effect of Late Caledonian and Variscan continental escape tectonics on basement structure, Paleozoic basin kinematics and subsequent Mesozoic basin development in NW Europe 1095  
*M. P. Coward*

- Regional structural evolution of the North Sea: oblique slip and the reactivation of basement lineaments 1109  
*I. D. Bartholomew, J. M. Peters and C. M. Powell*
- Mesozoic extension in the North Sea: constraints from flexural backstripping, forward modelling and fault populations 1123  
*A. M. Roberts, G. Yielding, N. J. Kusznir, I. Walker and D. Dorn-Lopez*
- Tectonic evolution and structural styles of the East Shetland Basin 1137  
*M. J. Lee and Y. J. Hwang*
- A fundamental reappraisal of the structure of the Cormorant Field and its impact on field development strategy  
*R. R. A. Demyttenaere, A. H. Shuijk and M. R. Bentley*
- The structural evolution of the Snorre Field and surrounding areas 1159  
*N. Dahl and T. Solli*
- Controls on the development and evolution of structural styles in the Inner Moray Firth Basin 1167  
*K. Thomson and J. R. Underhill*
- The structural evolution of the eastern end of the Halibut Horst, Block 15/21, Outer Moray Firth, UK North Sea 1179  
*M. J. Hibbert and D. S. Mackertich*
- Mesozoic evolution of the Jæren High area, Norwegian Central North Sea 1189  
*O. Høiland, J. Kristensen and T. Monsen*
- Extension and salt tectonics in the East Central Graben 1197  
*J. Penge, B. Taylor, J. A. Huckerby and J. W. Munns*
- Relationships between basement faulting, salt withdrawal and Late Jurassic rifting, UK Central North Sea 1211  
*D. Erratt*
- Comparison of Permo-Triassic and deep structure of the Forties–Montrose and Jæren highs, Central Graben, UK and Norwegian North Sea 1221  
*N. H. Platt and P. Philip*
- Structural styles from the Central Graben in the UK and Norway 1231  
*R. A. Sears, A. R. Harbury, A. J. G. Protoy and D. J. Stewart*
- The structure of the Norwegian Central Trough (Central Graben area) 1245  
*M. B. Gowers, E. Holtar and E. Swensson*
- Structural styles in the Danish Central Graben 1255  
*G. O. Sundsbø and J. B. Megson*
- Mesozoic structural evolution of the UK Southern North Sea: insights from analysis of fault systems 1269  
*T. J. Arthur*
- Fault reactivation and oblique-slip in the Southern North Sea 1281  
*B. C. Oudmayer and J. de Jager*

## **Fluids: migration, overpressure and diagenesis**

- Introduction and review 1293  
*A. J. Fleet and W. G. Cordey*
- Distribution of sub-surface pressure in the Norwegian Central Graben and applications for exploration 1295  
*R. C. Leonard*
- Overpressures in the Central North Sea: implications for trap integrity and drilling safety 1305  
*L. Gaarenstroom, R. A. J. Tromp, M. C. de Jong and A. M. Brandenburg*
- Deep prospects—imaging, overpressure and associated problems in the UK Central North Sea 1315  
*J. A. Henderson and M. J. N. Pepper*
- Source rock permeability and petroleum expulsion efficiency: modelling examples from the Mahakam delta, the Williston Basin and the Paris Basin 1317  
*J. Burrus, K. Osadetz, J. M. Gaulier, E. Brosse, B. Doligez, G. Choppin de Janvry, J. Barlier and K. Visser*
- Submarine gas seepage in the North Sea and adjacent areas 1333  
*M. Hovland*

- The use of natural He, Ne and Ar isotopes as constraints on hydrocarbon transport 1339  
*C. J. Ballentine and R. K. O’Nions*
- The chemical composition of North Sea formation waters: a review of their heterogeneity and potential applications 1347  
*E. A. Warren and P. C. Smalley*
- Models of burial diagenesis for deep exploration in Jurassic fault traps of the Central and Northern North Sea 1353  
*S. D. Burley*
- Silicate mineral authigenesis in the Hutton and NW Hutton fields: implications for sub-surface porosity development 1377  
*G. E. McAulay, S. D. Burley and L. H. Johnes*
- The link between petroleum emplacement and sandstone cementation 1395  
*J. G. Gluyas, A. G. Robinson, D. Emery, S. M. Grant and N. H. Oxtoby*

## Field management

- Introduction and review 1405  
*M. L. B. Miller and J. H. Martin*
- Clair appraisal: the benefits of a co-operative approach 1409  
*D. Coney, T. B. Fyfe, P. Retail and P. J. Smith*
- Prediction of large-scale communication in the Smørbukkk fields from strontium fingerprinting 1421  
*H-H. Stølum, P. C. Smalley and N-M. Hanken*
- The Embla Field 1433  
*I. A. Knight, L. R. Allen, J. Coipel, L. Jacobs and M. J. Scanlan*
- The evolution of a fractured chalk reservoir: Machar Oilfield, UK North Sea 1445  
*P. T. Foster and P. R. Rattey*
- The Bruce Field 1453  
*A. Beckly, C. Dodd and A. Los*
- Hyde: a proposed field development in the Southern North Sea using horizontal wells 1465  
*R. P. Steele, R. M. Allan, G. J. Allinson and A. J. Booth*
- Estimation of recoverable reserves: the geologist’s job 1473  
*A. F. Corrigan*
- Geological aspects of horizontal drilling in chalks from the Danish sector of the North Sea 1483  
*S. Fine, M. R. Yusas and L. N. Jørgensen*
- Beryl Field: geological evolution and reservoir behaviour 1491  
*G. Robertson*
- Clyde: reappraisal of a producing field 1503  
*P. J. Turner*
- Wyth Farm oilfield: deterministic reservoir description of the Triassic Sherwood Sandstone 1513  
*M. J. B. Bowman, N. M. McClure and D. W. Wilkinson*
- Meillon–Saint Faust gas field, Aquitaine basin: structural re-evaluation aids understanding of water invasion 1519  
*D. Haller and G. Hamon*
- The Eakring Dukeswood oil field: an unconventional technique to describe a field’s geology 1527  
*M. W. Storey and D. F. Nash*

## Core workshop

- Core workshop and discussion forum 1541  
*C. D. Oakman and J. H. Martin*
- Appendix: A list of common abbreviations xiii
- Index xv