9:45 **B.M. Durand:** Geochemical Relationship Between Petroleum and Coal

10:30 **J.A. Masters:** Overthrust Problem—As Exemplified in Western Canada

11:15 **A. Perrodon, R. Curnelle:** Geodynamics of French Oil Basins

12:00 **D. Leythaeuser, F.J. Altebäumer, R.G. Schaefer, M. Radke, A.S. Mackenzie:** Effects of Deep-Seated Igneous Intrusions in Northwest Germany on Generation of Hydrocarbons in Lower Jurassic Source Strata

WEDNESDAY AFTERNOON, JULY 18

CASE STUDIES II
Presiding: **M.T. Halbouty, J. Masters**

2:00 **J. Brooks, C. Cornford, A.D. Gibbs, J. Nicholson:** Geologic Controls on the Occurrence and Composition of Tertiary Heavy Oils, Northern North Sea

2:45 **R. Leonard:** Generation and Migration of Hydrocarbons on Southern Norwegian Shelf

3:30 **J.C. Goff:** Hydrocarbon Habitat of East Shetland Basin and North Viking Graben of Northern North Sea

4:15 **J.F. Dewey, A.W. Bally:** Wrap-Up and General Discussion

Abstracts

BERNOULLI, DANIEL, Geological Institute of University, Basel, Switzerland

Sedimentary Evolution of Passive Margins of Mesozoic Tethys

The Alpine mountain chains of the Circum-Mediterranean area and the Near East are the result of oblique convergence between Africa and Eurasia. This convergence was, from the Late Triassic to Early Cretaceous, preceded by an oblique divergence during the opening of the Jurassic-Early Cretaceous Atlantic-Tethyan ocean. Rifting and spreading of this ocean are discordantly superimposed onto the preexisting late Paleozoic paleogeography of Pangea and the paleo-Tethys. Kinematic considerations suggest that in the Alpine-Mediterranean area the opening of Tethys was dominated by sinistral transform movements.

Whereas, in the central Atlantic and western Mediterranean area, Late Triassic to Early Jurassic rifting occurred in a continental environment and was accompanied by alkaline volcanicity and evaporite deposition, east of the central Mediterranean the zones of rifting which eventually led to the opening of the oceanic Tethys did not follow the complex pattern of Triassic seaways, but occurred across the marine carbonate belts of the Gondwanian margin of paleo-Tethys. As a consequence, there are hardly any siliciclastic sediments associated with the Early Jurassic phase of rifting, and evaporite deposits of Jurassic age are conspicuously lacking along the rift zone. Depositional geometry of the synrift sediments, at places, suggests listric normal faulting as a possible mechanism of crustal thinning, and the resulting pattern of tilted fault blocks compares very well with that found along undeformed margins, e.g., the Cretaceous Iberian or Armorican margins. In the Tethys, this rifting phase initiated a new paleogeography along the developing continental margins with Bahamian-type carbonate platforms, submarine plateaus, basins, and marginal highs. With the onset of spreading in the oceanic areas, subsidence rates decreased and were more evenly distributed over the margins; during this stage, subsidence apparently followed a curve of exponential decay. Sedimentary facies of the distal continental margins were then determined by increasing water depth and basin-wide paleo-oceanographic events. This general paleotectonic reconstruction of Tethyan margins is confirmed by comparable sedimentary facies in undeformed margins of the Mesozoic central Atlantic.

In the Mid-Cretaceous, plate motions in the Atlantic-Tethyan system changed drastically, and sinistral and opening movements in the Mediterranean were replaced by dextral and compressive ones leading to the complete elimination of the oceanic Tethys between the Late Cretaceous and late Eocene.

BONDI, H., K.C.B., F.R.S.

Science, Policy, and Research

Abstract not available.

BROOKS, J., Britoil PLC, Glasgow, Scotland, C. CORNFORD, IGI Ltd., Blair Mill, Dalry, Ayrshire, Scotland, and A. D. GIBBS and J. NICHOLSON, Britoil PLC, Glasgow, Scotland

Geologic Controls on Occurrence and Composition of Tertiary Heavy Oils, Northern North Sea

The United Kingdom North Sea contains a wide variety of reservoired oils, including large accumulations of heavy and heavy-medium (API < 25°) crudes trapped in Paleocene and lower Eocene sand bodies. Typically, these pools lie at depths of less than 6,000 ft (1,900 m), and they are characterized by having undergone extensive post-accumulation modifications. One of the prime causes of such changes is bacterial biodegradation, acting under temperature-critical control. Biodegraded heavy oils are notably common in the Tertiary of UKCS quadrants 3 and 9. All of these known accumulations appear to have been sourced from the Kimmeridge Clay Formation.

This paper reviews what is now known of the origin and distribution of these potentially important heavy oils and to analyze main controls on their accumulation and alteration. Tectonic deformation of the Tertiary sequence is of no small significance, and several heavy oil accumulations can be viewed as structurally trapped. Structural deformation has been a primary and highly important control in migration and eventual trapping, and this control can be confirmed as deep seated. An overview of basin development provides dynamic models both for migration and trapping and for understanding the movement of bacterially contaminated water into oil accumulation.

CHENET, P. Y., L. MONTADERT, and I. MORETTI, Institut Français du Pétrole, Rueil-Malmaison, France

Structure and Evolution of Some Continental Rifts—Consequences for Their Thermomechanical Behavior

Continental rifts are attractive basins for hydrocarbon exploration, because they presently furnish 10% of the world hydrocarbon production, yet cover only 5% of the Earth's surface.

The evolution of the rifts where volcanism is of reduced importance will be emphasized through present examples such as the Suez rift (Egypt), the rifts beneath the Bay of Biscay, and other Atlantic-type continental margins.

The continental rifts, typically 50-100 km (30-60 mi) in width, are tectonically characterized by the extension and thinning of the continental crust together with subsidence in the central part of the rift. The superficial structure consists mainly of tilted blocks bounded by listric normal faults. Continental extension may reach 50% of the crust's original horizontal length, and even more depending on the amount of dike intrusions from the mantle. The thinning of the crust may reach much higher rates, perhaps 300% or more where oceanic floor is formed in the central part of the rift. The subsidence in the rift trough is characterized by the alternation of rapid downward movements over a period of a few million years and periods of relative stagnation. Meanwhile, the shoulders of the rift may uplift after the beginning of normal faulting in the main troughs.

Heat flow is higher generally in the rifts than in the surrounding areas.

This evolution is the consequence of an initial thermal perturbation in the deep asthenosphere. The evolution of the lithosphere-asthenosphere system is studied by means of a thermomechanical model with the hypothesis of a non-newtonian rheological behavior of the lithosphere as a function of the depth. The vertical movements of the continental crust, the thinning of the lithosphere, the stresses, and the gravity anomalies in the thermal regime are given as a function of time during rifting.

CORNELIUS, C., Veba Oel, Gelsenkirchen-Buer, West Germany

Heavy and Tar Sand Oil Deposits of Europe

Abstract not available.