Depositional Model of Falher Conglomerates, Elmworth Area, Alberta

A detailed sedimentological study has been conducted on cores from the subsurface Elmworth area, Alberta. Characteristic vertical sequences of the Falher A and B units show coarsening-upward sandstone to conglomerate sequences. Ideal cycle is a shallow-marine to beach progradation. The major sedimentary environments recognized in the Elmworth area are wave-dominated coastal environments which prograded to the north. Falher sediments are interpreted to have been deposited in beach, nearshore, shallow-marine, and coastal-plain environments. On the basis of the interpretation of depositional environments, a depositional model is proposed to explain the sedimentary motifs of Falher sediments. The model consists of shingle ridges, spits, lagoon, coastal plain, and fluvial channels. In this study, most Falher sediments, conglomerates in particular, are interpreted to be transported southeastward by longshore currents and deposited along shoreline in the Elmworth area. These shingle ridges prograded to the north and some spits were developed. Even though some channels were recognized in the study area, the local drainage system during Falher deposition seems to have been poorly developed. It is very unlikely that this system could transport the great amounts of sediments, particularly conglomerates. In considering the distribution and volume of Falher sediments, these channels might contribute part of sands, but not the large amounts of pebbles that are present in the Elmworth area.

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Geochemical Correlation of Crude Oils, Gulf of Suez Region, Egypt

A chemical correlation has been made for oils produced from strata ranging in age from Carboniferous to middle Miocene. The correlation parameters used are carbon isotope ratios of $C_{15}+$ fractions, difference between carbon isotope ratios of $C_{15}+$ saturates and aromatic fractions, and the ratios of pristane/phytane, pristane/normal heptadecane, phytane/normal octadecane, and (pristane + normal heptadecane)/(phytane + normal octadecane).

The values of (pristane + normal heptadecane)/(phytane + normal octadecane) and carbon isotope ratios of $C_{15}+$ fractions are found to be the most useful in oil-oil correlation. However, the difference between carbon isotope ratios of $C_{15}+$ saturates and aromatic fractions can be used to differentiate the different producing strata. The other parameters are affected in different magnitudes by depth and age of the producing formation.

It was found that the analyzed oils most likely have stemmed from a common or very similar source rock of marine origin.

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Shallow Thermal Anomaly Over San Sebastian Oil and Gas Field, Eastern Tierra del Fuego

Low thermal diffusivity of peat and soils overlying parts of the oil and gas province of the eastern Magellan basin has resulted in a small number of unusually shallow (<2 m) relative heat-flow determinations. The values are in agreement with the single published heat-flow value for Tierra del Fuego of 2.3 HFU and with deep bottom-hole temperature measurements located in coincidence with the shallow determinations. They are furthermore consistent with local surface air-temperature measurements obtained for a period of 1 year prior to the field work. Compared with that for similar tectonic provinces (post-Precambrian, nonorogenic), the heat flow in eastern Tierra del Fuego appears to be about 0.5 HFU greater than might be expected. Maturation level estimates based on burial history of sediments in the area suggest considerable lateral migration (>100 km) of hydrocarbons from deeper in the Magellan basin. A model is explored whereby the same mechanisn for transport of the hydrocarbons, namely, deep ground-water movement can also explain the heat-flow results. The dramatic 10-HFU decrease in relative surface heat flow observed across the southwestern edge of the San Sebastian oil and gas field is of similar magnitude as other thermal anomalies reported to be in close association with hydrocarbon accumulations.

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Depositional and Diagenetic Model for Brine Related Stratiform Mineralization: Atlantis II Deep, Red Sea

Genetic models of many massive sulfide deposits postulate deposition of metalliferous sediment by venting of high-salinity hydrothermal fluids onto the sea floor. The Atlantis II deep, Red Sea, is a currently active modern example of such a process. Areal extent of the brine pool in the Atlantis II deep exerts primary control on the distribution of metalliferous sediment. The presence of a density-stratified brine pool allows dispersion of undiluted metal-rich brine to all parts of the deep. Currently, brine vents in the Southwest basin, advects vertically to the density interface between the brine pool and overlying sea water, and then flows laterally along the interface. The lower brine mass is isolated from oxygenated sea water, allowing base metal sulfides to precipitate in areas distal from the site of venting. The metalliferous sediments are extremely fine grained with interstitial water contents in the uppermost sediments of greater than 98% by weight. Sedimentation rates inside the brine pool are in excess of 100 cm/1,000 years. High salinity, high temperature, and high trace-metal content of the brine produce a toxic environment which ensures that the finely laminated sediments are not disturbed by bioturbation. However, metalliferous sediment deposited in the area of active brine venting is highly disturbed, with common features of soft sediment deformation. Heterolithic and homolithic breccias occur, some of which are metalliferous turbidites dislodged, by tectonic activity, from steep graben walls flanking the deep. Influx of new brine causes further disruption and deposition of epigenetic minerals in veins which cut unlithified metalliferous sediment.

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Late Mississippian–Pennsylvanian Orogenic Movements of West Canadian Platform and Adjacent Areas—Their Role in Sedimentation and Hydrocarbon Accumulation

Important, though not too evident, structural changes took place near the end of the Paleozoic Era along the western edge of the North American craton. They roughly correspond to the orogenic phases in geosynclinal areas all around the continent: "Appalachian orogeny," "Antler orogeny," "Cariboo orogeny." The style was block-faulting (with predominantly normal faults) forming platform edges and grabens, surrounded by shallower troughs. The result is a network of rift valleys along the

western edge (north-south) and across the platform (east-west), which was itself broken into tilted blocks. Those grabens extending across the continental margin and normal to it, are aulacogens, opening into the geosyncline to the west. All these fractures are rejuvenated, Precambrian basement features. The Liard Plateau in northeastern British Columbia, the Peace River basin in northwestern Alberta, and the Big Snowy trough in central Montana are part of this system, which exhibits analogies with the Ancestral Rockies area farther south (e.g., Paradox-Eagle-Laramie basins, and the Anadarko basin).

Sediments are a mixture of easterly derived fine clastics (shales), coarser clastics with possible sources both from the craton and the Cordilleran belt, and some locally formed carbonate rocks. Chemical sediments, reefal buildups, and coarse, locally derived clastics, are unknown in the British Columbia, Alberta, and Montana area. The thickness of this Mississippian-Pennsylvanian series is usually 100 to 200 m (maximum 700 m).

Excellent hydrocarbon source rocks and reservoirs are present, but their extent and quality are erratic. The petroleum habitats are further complicated in many places by the fact that the whole structural system has been reactivated during the Cordilleran orogeny. Some of the north-south oriented features became reverse faults, whereas most of the east-west aulacogens have undergone some strike-slip movement. In both situations, drape-over folding has resulted. Some earlier formed hydrocarbons may have remigrated and dispersed. Analysis of the remodeled structural pattern in conjunction with the upper Paleozoic reservoir geometry is the main challenge of present exploration on this ancient edge of the North American craton.