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Geological results of a hydrocarbon exploration campaign in the southern Upper Rhine Graben (Alsace Centrale, France)¹

by

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Abstract

Between 1970 and 1990 an association of Shell Française S.A. and SNEA(P)* carried out exploration for a Mesozoic play in the French part of the Upper Rhine Graben, between Strasbourg and Mulhouse. Originally, the prime exploration objectives were Triassic sandstone and carbonate reservoirs in fault- and dip-bound traps; in the late phase of the venture, the exploration efforts were mainly directed towards reservoirs of the Grand Oolithe.

Between 1970 and 1990 the Association acquired some 1700 km of seismic lines, and drilled 7 wells to the Mesozoic, two of which reached the Basement.

Geological results, comprise information on the stratigraphic and lithologic development of the Triassic, Jurassic and Paleogene in the central part of the Alsace, and on the structure of the Graben fill down to the top of the Basement. They are illustrated by a series of interpreted seismic cross sections, summary logs of the wells drilled and log correlations of the Mesozoic strata encountered.

The structural development is characterised by subsidence and block faulting during the Paleogene and Early Neogene: Faulting started during the deposition of the Saliferous formations (M. Eocene to Early Rupelian („Latdorfian“)) and after a period of quiescence in the middle Oligocene (Gray Series), it reached its highest intensity in latest Chattian to Aquitanian time; this triggered movements of the Paleogene salt as from the latest Chattian, which culminated in the extrusion of diapirs in the Mulhouse Salt Basin. The faulting was followed in the latest Aquitanian and Burdigalian by uplift of the southern

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⁴ Both authors were involved in Shell's exploration campaign in the Alsace, especially during the first, most active decade, M.C. as the geologist responsible for the venture with S.F. in Paris, M.L. in Shell's head offices in The Hague more in the role of a critical spectator. M.C. has done most of the original geological studies and interpretations; M.L. re-interpreted many of the data and compiled the present paper.

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part of the graben and the adjacent highs, which caused erosion of up to 1 - 1.5 km of Early Neogene and older strata in the Graben. As from the Late Burdigalian, the uplifted southern part of the Graben was overlapped from north and south by younger Neogene strata, ranging in age from Late Burdigalian in the Swiss to Alsatian Jura and the Badish Kaiserstuhl Mountains, to Late Miocene („Pontian“) in the Sundgau and the northern Alsace, and Late Pliocene in the larger part of the area discussed. Quaternary subsidence amounted to 100-300 m only.

The wells drilled encountered hydrocarbon shows only. It is concluded that the reasons for the absence of hydrocarbons in economically producible quantities are:

- the difficulty in charging the Lower Triassic (M. Buntsandstein) reservoirs (originally the prime target) from the Lower Jurassic (Toarcian) source rock, and the absence of deeper (Late Paleozoic) source rocks,
- the large distance - c. 100 m - between the top of these reservoirs and the first reliable seal;
- the variability of the reservoir quality of the Grande Oolithe (the secondary objective) changing from moderate to none within the area, and, above all,
- the unfavourable temporal relation between the main phase of hydrocarbon generation during maximum burial in the Aquitanian, and the final structural development completed only after the Burdigalian uplift.

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