MODELLING THE LATE CARBONIFEROUS HYDROCARBON SYSTEMS IN THE DUTCH PART OF THE SOUTHERN NORTH SEA BASIN

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The development of hydrocarbon systems in the West Netherlands Basin and Roer Valley Graben was quantitavely modeled, using forward modelling of subsidence, heat flow, compaction and hydrocarbon generation and migration. The investigated basins overly the Late Carboniferous Compine Basin, and result from multiple Mesozoic rifting events. During the Late Cretaceous and Early Tertiary the basins were inverted as a result of Alpine compression. The inversion had a major impact on the hydrocarbon systems: temperatures decreased, freshwater infiltrated, causing biodegradation, active faulting allowed hydrocarbons to escape the surface, and horizontal compaction caused an increase of overpressure. At present, the two major exploration objectives in the West Netherlands Basin are oil and gas reservoirs in Upper Jurassic and Lower Cretaceous sandstones and gas accumulations in Lower Triassic sandstones. In the Roer Valley Graben hydrocarbon accumulations only occur in the western part, in Lower Triassic sandstones. The two generally accepted source rocks are Lower Jurassic oil-prone marine shales and Westphalian gas-prone coal deposits. Gas geochemistry points to the presence of important marine source rock intervals in the Namurian. These source rocks have been drilled in the southern part of the Roer Valley Graben. However, it is still generally assumed that there is no potential for oil and gas accumulations generated from these source rocks, because of early coalification. This is confirmed by the vitrinite reflectance of the overlaying coal-bearing Westphalian strata. In this quantitative modeling study the preservation potential of hydrocarbons generated from Namurian source rocks is evaluated, as well as their migration-, trapping- and cracking history.