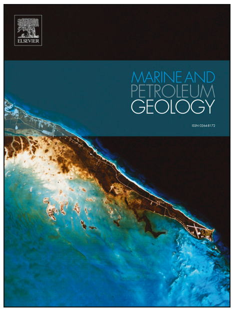

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PII: S0264-8172(17)30174-5

DOI: 10.1016/j.marpetgeo.2017.05.015

Reference: JMPG 2907

To appear in: *Marine and Petroleum Geology*

Received Date: 18 January 2017

Revised Date: 19 March 2017

Accepted Date: 7 May 2017

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Keywords: Thermal anomaly; Diagenesis; Geothermometers; Stable isotopes; Reservoir outcrop analog; Upper Carboniferous; Lower Saxony Basin; Tight Gas Sands

ABSTRACT

Upper Carboniferous sandstones make one of the most important tight gas reservoirs in Central Europe. This study integrates a variety of geothermometers (chlorite thermometry, fluid inclusion microthermometry and vitrinite reflection measurements) to characterize a thermal anomaly in a reservoir outcrop analog (Piesberg quarry, Lower Saxony Basin), which is assumed responsible for high temperatures of circa 300°C, deteriorating the reservoir quality entirely. The tight gas siliciclastics were overprinted with temperatures approximately 90 – 120° C higher compared to outcropping rocks of a similar stratigraphic position some 15 km to the West. The local temperature increase can be explained by circulating hydrothermal fluids along the fault damage zone of a large NNW-SSE striking fault with a displacement of 600 m in the East of the quarry, laterally heating up the entire exposed tight gas sandstones. The km-scale lateral extent of this fault-bound thermal anomaly is evidenced by vitrinite reflectance measurements of meta-anthracite coals (VR_{rot} ~ 4.66) and the temperature-related diagenetic overprint. Data suggest that this thermal event and associated highest coalification was reached prior to peak subsidence during Late Jurassic rifting (162 Ma) based on the K-Ar dating on the <2 µm fraction of the tight gas sandstones. Associated stable isotope data from fluid inclusions, hosted in a first fracture filling quartz generation (T ~ 250°C) close to lithostatic fluid pressure (P ~ 1000 bars), together with authigenic chlorite growth in mineralized extension fractures, demonstrate that coalification was not subject to