

Accepted Manuscript

Kilometer-scale fault-related thermal anomalies in tight gas sandstones

Patrick Wüstefeld, Ulrike Hilse, Volker Lüders, Klaus Wemmer, Bastian Koehrer,
Christoph Hilgers



PII: S0264-8172(17)30174-5

DOI: [10.1016/j.marpetgeo.2017.05.015](https://doi.org/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

Please cite this article as: Wüstefeld, P., Hilse, U., Lüders, V., Wemmer, K., Koehrer, B., Hilgers, C., Kilometer-scale fault-related thermal anomalies in tight gas sandstones, *Marine and Petroleum Geology* (2017), doi: 10.1016/j.marpetgeo.2017.05.015.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Kilometer-scale fault-related thermal anomalies in tight gas sandstones

Patrick Wüstefeld ^a, Ulrike Hilse ^a, Volker Lüders ^b, Klaus Wemmer ^c, Bastian Koehler ^d, Christoph Hilgers ^e

^a Reservoir-Petrology, EMR | Energy and Mineral Resources Group, RWTH Aachen University, Aachen, Germany

^b Helmholtz Zentrum Potsdam GFZ, German Research Center for Geoscience, Potsdam, Germany

^c Geoscience Center of the University of Göttingen (GZG), Göttingen, Germany

^d Wintershall Holding GmbH, Kassel, Germany

^e Institute of Applied Geosciences, Structural Geology & Tectonics, Karlsruhe Institute of Technology, Karlsruhe, Germany

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 ($VR_{rot} \sim 4.66$) 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 ($T \sim 250^\circ\text{C}$) close to lithostatic fluid pressure ($P \sim 1000$ bars), together with authigenic chlorite growth in mineralized extension fractures, demonstrate that coalification was not subject to

Download English Version:

<https://daneshyari.com/en/article/5781978>

Download Persian Version:

<https://daneshyari.com/article/5781978>

[Daneshyari.com](https://daneshyari.com)