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Climate of the Late Palaeozoic – Insights from climate modeling and its implications for source and reservoir rocks

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Numeric climate modeling using the CCM3.7 as well as the PLASIM model of medium complexity (Fraedrich et al., 2005) has been conducted on the basis of a modified Pangaean palaeogeography (Schneider et al. 2006; Roscher & Schneider 2006). The purpose of this approach was to simulate Palaeozoic climate systems which might have contributed to either source rock or reservoir rock formation and their regional distribution during Carboniferous (340 Ma) and Permian (260 Ma) times.

These time slices mark distinct palaeogeographic and/or plate tectonic phases. The palaeogeography at 340 Ma is marked by an open equatorial seaway which finally closed at about 320 Ma. The shift from the Late Palaeozoic icehouse to the following warmhouse stage started at about 290 Ma ago, and the maximum aridity on central Pangaea was reached during the Middle Permian at about 260 Ma. The Carboniferous and Mid-Permian palaeogeographic reconstructions were transformed into digital grids which have a 2.8˚x2.8˚ (T42) resolution, suitable for high-resolution climate modeling.

In order to be able to compare the model data with geologic climate indicators, the absolute values of temperature and precipitation were coded to relative climate indicators according to the Köppen-Geiger classification (cf. Heyer, 1993). Computational results and palaeo-occurrences of geological climate indicators reveal a good agreement. A comparison between results from CCM3.7 and PLASIM runs are given.

Typical reservoir rocks can for example be related either to continental climates of arid zones (terrestrial sandstones) or to the marine realm of the tropics (reefs) which reveal distinct relationships with climatic processes. We show how numerical information from climate modeling can be used for prediction of the potential palaeo-distribution of reservoir rocks.

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