Integrate organic and inorganic geochemical approaches to reconstructing oil-filling history, NW Junggar Basin (NW China)

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Multi-phase oil charge history is usually reconstructed by comparison of molecular signatures of the inclusion oils with reservoired oils, and by inclusion microthermometry. In this study, organic, as well as inorganic geochemical tools were integrated to provide such information in the northwestern Junggar Basin.

EPMA analyses show that the content of typical calcite trace-element (Mn, Mg, Fe) contents range from < 0.5 to > 4.0 wt.%, indicative of hydrocarbon fluid diluted by formation water continuously, suggesting that fluid source changes during the charge for petroleum moves up in oil-gas-water mixing migration phase.

A hump of unresolved hydrocarbons and a full range of unaltered *n*-alkanes present in the gas chromatograms of free and inclusion oils imply that both had been biodegraded firstly, and were charged later. In terms of biomarker parameters, it is suggested that the paleo oil is most likely sourced from all the three Permian source beds, while the current oil mainly derived from the two older source sequences. This provides another evidence for source changes.

Th data for the aqueous inclusions accompanying hydrocarbon inclusions in the Permian reservoir rocks show three populations with modes at around 30 - 50° C, 70 - 90° C, and 110° C, while in the Triassic at around 50 - 70° C, and 90 - 110° C.

Combined with the burial and oil generating history, oilfilling history is reconstructed. During Middle-Late Permian, Low-middle mature oil and gas sourced from Jiamuhe Formation (P_{1j}) migrated into Carboniferous and Permian traps. Mature oil and gas accumulation sourced from Fengcheng Formaion (P_{1f}) peaked at Late Triassic. From Early Cretaceous on, gas from the Jiamuhe Formation, with mature-overmature oil and gas sourced from Lower Wuerhe Formation (P_{2w}), propelled the pre-existing hydrocarbons to migrate toward the up-dip areas, with a common mixing of the oil and gas from different sources and/or with different maturities.

Hydrogeochemistry of formation water in the Northern Songliao Basin, China

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The Songliao basin is one of the largest Mesozoic continental rifting basins in China, dominated by Cretaceous fluvial and lacustrine strata. Based upon 2433 pressure data and 6270 water sample data around the basin, it is shown that, not only the abnormal pressures exist in the different formations and structural zones, but also the underpressure coexists with the overpressure within a single geological formation. Besides, the pressure coefficients change gradually from 1.02~1.30 in the western Central Depression to 1.05~0.5 in the eastern Central Depression, and then become 0.65~0.9 in the east Uplift zone, especially in the Quantou formation (K2q). The analysis of hydrochemistry data reveals a distinct compositional variation in the different pressured systems. Water composition is dominated by water type of NaHCO₃ but varies greatly in salinity $(1.0 \sim 20 \text{ g/L})$ and ionic ratios in the different areas. The origin of formation water may be attributed to the dissolution of silicate minerals and halite, the interplay of clay dehydration due to compaction, topographydriven meteoric water recharge as well as diagenesis alteration such as cation exchange by albitization of plagioclase, the dissolution or precipitation of calcite and gypsum. Their impacts differ greatly in the different hydrochemical and abnormal pressured environments.