CARBONATES AND EVAPORITES OF THE SURFACE PIERCING SALT DOMES OF THE GHABA SALT BASIN, INTERIOR NORTH OMAN

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Six surface-piercing salt domes of interior north Oman provide unique insights into the dynamics of the Late Neoproterozoic to Early Cambrian Ghaba Salt Basin. The salt domes are composed of numerous isolated carbonate blocks (so-called 'stringers') and associated evaporites. The salt domes possibly are an important outcrop analogue for intra-salt hydrocarbon plays in the deep subsurface (3-6 km) of the South Oman Salt Basin, which is located around 500 km to the SW of the Ghaba Salt Basin .

The salt dome carbonates include a succession of basinal laminated mudstones to peritidal thrombolites and hence comprise the same lithologies as in the South Oman Salt Basin. The individual 'stringers' in the salt domes are up to 40 meters thick with a lateral extend of several hundred meters. Salt diapirism has lead to strong deformation of the carbonate blocks. This is indicated by a number of deformation structures such as isoclinal folds, cataclasites, thrust faults and dilational breccias. Maturity analyses of solid bitumen, which occurs in laminated carbonates at pore throats and stylolites, indicate a range of burial paleo-temperatures between 100–200°C. This broad range in paleo-temperatures shows that the individual carbonate blocks were buried at least to a depth of six kilometres (assuming a geothermal gradient of 30°C/km). During the subsequent rise of the salt diapirs, intense near-surface dissolution of salt may have led to the chaotic juxtaposition of the 'stringers'. In one of the domes several outcrops are characterized by white dolomite veins displaying the so-called "zebra" fabric. A combination of XRD and SEM analyses demonstrates that these veins are associated with magnesite, siderite, fluorapatite and barite which points to a phase of hydrothermal alteration. Similarly an influence of hydrothermal alteration on solid bitumen maturation was also proposed for the South Oman Salt Basin (Schoenherr et al., in press).

The geological evolution of the carbonate stringers in the Ghaba Salt Basin is thus comparable to the evolution of the deeply buried intra-salt carbonates of the South Oman Salt Basin. The surface-piercing salt domes hence form a suitable analogue to the deep intra-salt hydrocarbon plays of the South Oman Salt Basin.

Schoenherr, J., Ralf Littke, Janos L. Urai, Peter A. Kukla 4 Zuwena Rawahi (in press): Polyphase thermal evolution in the Infra-Cambrian Ara Group (South Oman Salt Basin) as deduced by solid bitumen maturity. – Organic Geochemistry.