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Faulting and Fluid Flow Though Salt

Salt mines in Nova Scotia, Brasil, and the UK contain abundant evidence of normal, reverse and strike-slip faults cutting through halite and even more ductile potassium salts. Natural open fractures, up to 5 cm in width, have been encountered in Aptian halite from the Petromisa Mine in the Sergipe-Alagoas Basin at 300m depth, which are filled with overpressured methane gas.

Fluid flow has been registered for 3 years in a fault seep at the Boulby Mine, England, where 800,000 m^3 of brine have been produced. H_2S, methane and Carboniferous oil are also produced from fractures. These are probably reservoired in dolomite rafts of the Zechstein 1 and 2 cycles. Thrust faults (with 20m displacement) cut Zechstein dolomite layers and propagated into surrounding evaporite layers. Fluid pressures greater than lithostatic pressure developed, with horizontal hydraulic fractures filled with evaporite minerals. Crack-seal vein textures filled with carnallite fibres indicate incremental opening of fractures, whereas other veins opened more rapidly and are filled with, euhedral sylvite and halite crystals up to 5 cm in diameter.

Faults occur at tops of diapirs and outcrop, borehole and seismic data indicate the top salt offsets up to several hundred metres.

This evidence indicates that salt diapirs are often subjected to high strain rates, and the halite and potassium salt are faulted and fractured with high fluid pressures in open fracture networks within the evaporites. Faults cut through most of the evaporite sequence, which is up to several hundred metres in thickness, and transported gas and fluids from underlying mature source rocks indicating that salt is not always the perfect fluid seal.