Joint corridors of flexural-rebound folds along extensional faults of south-eastern Utah: high-permeability pathways in sandstone reservoirs

Kei Ogata, Alvar Braathen, Kim Senger, Elizabeth Petrie, Jan Tveranger, James Evans

We investigate joint corridors in sandstones of the Jurassic Entrada and Curtis Formations of the northern Paradox Basin, Utah. These joint corridors (swarms) are tabular to lenticular zones of concentrated sub-parallel fracturing. They show horizontal widths of 1-10 m, vertical heights of 2-3 to <100 m, and lengths commonly exceeding hundreds of meters. These corridors could strongly influence the fluid circulation in the subsurface.

Joint corridors are located in the footwall of km-scale normal faults with significant throw. They trend perpendicular to the faults along the axial zones of very gentle, transverse fold systems, caused by fault-related flexural rebound. The corridors decrease in intensity and ultimately terminate away from the faults.

The corridors mainly consist of joints with a variable distribution of bed-confined and through-going fractures. Near the faults, where the corridors are at the widest, they consist of dense networks of long joints connected by shorter shear fractures. As the corridor tips out away from the fault, only a few larger joints are present. Joints and joint corridors share the common characteristic of being bleached, (*i.e.* hematite grain-coating has been removed by CO_2-charged fluids). Bleaching is also observed inside of what is interpreted as exhumed traps, and extending upward along joints into the overlying cap rock.

We hypothesize that joint corridors developed along the hinge of anticlinal folds represent preferred pathways for fluid migration perpendicular to the main faults; thereby potentially connecting localized reservoirs at different structural levels. This is facilitated by: 1) outer arc extensional regime maintaining fractures open, 2) main normal faults acting as flow barriers (*e.g.* clay invasion), and 3) focused buoyant flow into crestal zones of anticlines.