Geophysical Research Abstracts
Vol. 19, EGU2017-11281, 2017
EGU General Assembly 2017

Folding and fracturing of rock adjacent to salt diapirs

Mark G. Rowan
Rowan Consulting Inc., Boulder, CO, United States (mgrowan@frii.com)

When John Ramsay wrote his groundbreaking book in 1967, deformation around salt diapirs was not something he covered. At the time, most geologists considered diapirs to form due to density inversion, rising through thick overlying strata due to buoyancy. In doing so, salt was thought to shove aside the younger rocks, shearing and fracturing them in drag folds and supposedly producing “salt gouge”. Even after it was realized that the majority of diapirs spend most of their history growing at or just beneath the surface, the relative rise of salt and sinking of minibasins were (and are) still thought by many to be accommodated in part by shear and fracturing of rocks in a collar zone around the salt.

There are two arguments against this model. The first is mechanical: whereas halite behaves as a viscous fluid, even young sediment deforms as a brittle material with layer anisotropy. Thus, the salt-sediment interface is the outer margin of an intrasalt shear zone caused by viscous drag against the diapir margin. The velocity of salt flow decreases dramatically toward the edge of the diapir, so that the outermost salt effectively doesn’t move. Hence, no shear or fracturing is expected in surrounding strata.

The second and more important argument is that empirical field data do not support the idea of drag folds and associated deformation. Certainly, strata are typically folded and thinned adjacent to diapirs. However, stratal upturn is generated by monoclinal drape folding of the diapir roof over the edge of the rising salt, and thinning is caused by deposition onto the bathymetric highs formed by the diapirs, often supplemented by roof erosion and slumping. Halokinetic sequences observed in numerous salt basins (e.g., Paradox Basin, La Popa Basin, Spanish Pyrenees, Sivas Basin, Zagros Mountains, Kuqa Basin) contain no diapir-parallel shear zones and minimal thinning and fracturing caused by diapir rise. Even megaflaps, in which strata extend for kilometers up the sides of diapirs, have very little internal deformation. Instead, what faults are present around diapirs are related to drape folding (radial and diapir-parallel faults) or regional tectonics (extensional, contractional, strike-slip, and salt-evacuation faults).