Viscosity estimates of salt in the Hormuz and Namakdan salt diapirs, Persian Gulf

SOUMYAJIT MUKHERJEE, CHRISTOPHER J. TALBOT and HEMIN A. KOYI

Abstract
The parabolic surface profiles of the Hormuz and Namakdan salt diapirs in the Persian Gulf suggest that they have been extruding with Newtonian viscous rheologies for the last 104 years. We derive velocity profiles for these diapirs, neglecting gravitational spreading and erosion/dissolution while assuming incompressible Newtonian rheology of the salt. Fitting known rates of extrusion at specific points in its elliptical cross-section, the dynamic viscosity of the salt of the Hormuz diapir is found to range between $10^{18}$ and $10^{21}$ Pa s. Approximating its sub-circular cross-section to a perfect circle, the range of viscosity of the salt of the Namakdan diapir is obtained as $10^{17}$–$10^{21}$ Pa s. These calculated viscosities fall within the range for naturally flowing salts elsewhere and for other salt diapirs but are broader than those for salts with Newtonian rheology deforming at room temperatures. The salts of the Hormuz and Namakdan diapirs are expected to exhibit a broader range of grain size, which matches the limited existing data.