Shortening of Salt Diapirs and Minibasins in Both Passive Margin and Convergent-Margin Settings

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Foldbelts detached on salt are relatively simple when there is no salt movement prior to shortening. Symmetrical saltcored folds, with or without reverse faults, are highly elongate and have a regular wavelength. However, the presence of preexisting diapirs and minibasins produces anomalous structural styles because of the associated strength anisotropy. The weak diapirs localize contractional strain, whereas the strong minibasins remain largely undeformed.

In a physical model, elliptical minibasins separated by a polygonal array of deep silicone ridges, with diapirs at the ridge intersections, were shortened laterally. The diapirs were squeezed, the deep salt ridges formed contractional structures with variable orientations, and the minibasins simply translated, sometimes with a minor component of vertical-axis rotation. Structural styles vary rapidly along strike, and there can be elements of strike-slip or extensional deformation depending on the ridge orientation and the differential translation of minibasins. If the preexisting pattern of diapirs and minibasins is more linear, then contractional structures have more consistent trends. Squeezing of salt walls creates strain gradients that result in vertical welds with remnant diapirs at the weld terminations. In all cases, squeezed diapirs typically extrude allochthonous salt, and structural asymmetry is more pronounced if shortening occurs after minibasins touch down because salt welds are stronger, frictional detachments.

Examples of foldbelts with preexisting diapirs and minibasins occur in deepwater settings of passive margins, such as the northern Gulf of Mexico, offshore Brazil, offshore Angola, and offshore Morocco. Other examples are found in convergent-margin foldbelts such as the Flinders Ranges of South Australia, the Sierra Madre Oriental foreland basin of northeastern Mexico, and the Atlas Mountains of Morocco.