Salt tectonics in the Subalpine Chains of SE France, from rifting to Alpine shortening.

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The understanding of the evolution of salt structures in passive margins has increased significantly in recent decades, largely driven by advances in seismic reflection imaging in offshore passive margin salt basins. This has provided a new perspective with which to view analogous settings in outcrop. The Subalpine Chains of southeast France is one of these places. This region has undergone a complex tectonic history involving Early to Middle Jurassic rifting related to the opening of the Ligurian Tethys, Late Jurassic to Late Cretaceous passive margin subsidence, and Late Cretaceous to Miocene Alpine shortening. The structures and stratigraphic variations in the area strongly suggest that all of these have provided driving mechanisms for, or been associated with, halokinesis.

This study investigates the role that salt has played in the tectonic evolution of the Subalpine Chains since its deposition in the Triassic using field observations, structural cross sections and drone photography. The period of Early-Middle Jurassic rifting was associated with reactive salt rise, and halokinesis continued during the subsequent passive margin phase driven by sedimentation in the Vocontian basin. Triassic salt reached the sea bed to form salt glaciers during the Aptian-Albian when salt rise outpaced sedimentation rate.

Later, during Alpine shortening, SW directed compression was partly partitioned as sinistral strike-slip deformation along a pre-existing salt wall, forming the Rouaine-Daluis fault system. There is a discrepancy between the amounts of thin skinned shortening northwest and southeast of the strike slip system which can probably be attributed to the interplay of Jurassic Provence carbonate platform geometry, subsurface salt distribution and basement architecture. In the thin skinned domain of the Digne arc, salt diapirs and walls, formed during the rifting and passive margin phases, such as those at Chasteuil and Crête du Teillon, were tightened and displaced up the slope of the Provence Platform margin. Alpine shortening also squeezed salt to surface to form canopies such as the diapir at Gévaudan.

Halokinesis has influenced, and has been influenced by the tectonic history of the region. While previous regional shortening estimates have acknowledged the role of Triassic salt as a decollement layer, they do not account for the presence of salt walls and diapirs during Alpine shortening. Consequentially, the amount of strain in the Digne arc has likely been underestimated.