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## Intense deformation of the caprock on salt extrusions in the Iranian Zagros Mountains – Insights from geological mapping and analogue modeling

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The Zagros fold-and-thrust belt in Southern Iran is famous for its spectacular outcrops of salt diapirs. Most of these diapirs already existed prior to the onset of the Zagros orogeny, but tectonic shortening caused their reactivation and extrusion of the salt. Thus, the diapir exposures often provide access to intense internal deformation of the Hormuz salt series and its entrained interlayers. However, highly soluble evaporites (mainly halite) were already dissolved in many of the exposures leaving behind degraded ‘caprock’, which is built of a multi-compositional residuum of less soluble minerals and rocks. Based on geological field studies on two iconic salt diapirs in Southern Iran, the Karmostaj (Gach) and the Siah Taq diapir, we ascertained that the caprock is also intensively deformed. The accessible part of the caprock is roughly 200 m thick and consists of a fine-grained, laminated gypsum containing fragments of brecciated carbonates and siliciclastics. Especially in the down- and mid-slope regions of the salt exposure, this mixture is sheared and folded, but also dissected by thrust faults. Since such deformation processes in the caprock were not described before, there is a lack in explanations for the timing, the depth of formation and the structural evolution of these structures. For instance, it is unclear if the ductile shearing of the relatively competent gypsum matrix and the brecciation of the clasts took place near the surface or in larger depths (a few hundreds of meters), where confining pressure is higher.

In this study, we want to classify the observed structures in the caprock, characterize deformation mechanisms and differentiate typical deformation domains. Based on that, we speculate about the timing and structural evolution of the caprock deformation and suggest that three scenarios can be imagined: (1) Pre-extrusion deformation: The caprock exposed today was buried by a thicker caprock package and, therefore, is compacted and mechanically strong. With the onset of the Zagros orogeny, tectonic shortening of the buried diapir caused lateral deformation before the salt extrusion. (2) Syn-extrusion deformation: The caprock is relatively young and was mechanically weak after its formation. Thus, it was deformed during diapir extrusion and, then, solidified during degradation of the salt. (3) Post-extrusion deformation: The caprock was mainly formed after salt extrusion, but it remained relatively immobile. The caprock matrix is occasionally weakened by the infiltration of meteoric water, and continued to be deformed due to gravitational

gliding even after the dissolution of the rock salt. In order to test these hypotheses, we intend to carry out analogue experiments in which we try to model a squeezed diapir. In a parameter study, the thickness and the material of the covering layer simulating the caprock will be varied to assess possible differences in the deformation patterns.