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Evolution of salt structures in relation to tectonic events

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Salt as a rather ductile material easily starts to flow under differential pressure, building underground “landscapes” overwhelming any mountain chain on the Earth. Once initialized, salt flow may evolve into an autonomous process, however, salt may also just rest within a basin over millions of years under continuous sedimentation until it is disturbed by an additional tectonic event. Here, we provide examples for the initiation and continuation of salt movement from the Central European Basin System where several thousand meters of salt had been deposited in the Late Permian. Concerning the present day distribution of salt structures, two regions are clearly distinguished: 1) in the central part of the basin more or less N-S directed salt walls dominate, while 2) at the present day margins, especially the southern one, the salt walls are directed NW-SE. Concerning the primary initiation of salt movement, the N-S direction is related to Triassic extension, while the NW-SE direction reflects localized inversion during the latest Cretaceous. Here, we will elucidate the spatiotemporal evolution by two local examples: 1) The Glueckstadt Graben is the deepest Triassic Graben structure within the Central European Basin System. Starting from an initially narrow zone, salt movement was initiated and accumulated in rafting, but soon started to decay. However, during time the area was repeatedly affected by extension events reactivating salt movement which still continues. As a result, the originally narrow Graben structure extended and the salt movement appears as a wave like progression beyond the original boundaries of the Graben, with active, also triggered, salt tectonics. 2) The other example is from the present day southern margin of the basin in front of the Harz Mountains, where deep reaching faults and flexures developed during basin inversion. In this case the overlying deposits were folded and behaved in an elasto-plastic manor. On the other hand, the salt acted almost viscose, so that the cover could deform like a plate above a viscous layer, independently from the deeper crust. In this case, the salt

acted more in a passive way, filling the space generated by folding the cover due to developing horizontal pressure gradients under differential loading. Considering the effect of salt during deformation requires in addition to consider the original thickness of the salt layer, in the areas under consideration this has been several thousand meters.