

Extension and inversion of domino-style basement fault systems with pre-extensional salt

Abstract. *In a pre-rift salt system, the evaporitic unit can act as strain localizer decoupling supra- and subsalt deformation. If the rift is later inverted, the inherited configuration and the continuity of salt layer will control the contractional deformation. In this MSc. Project, a domino-style basement fault system was simulated by scaled sandbox models with pre-extensional polymer layer, equivalent to salt in nature, in a rig with four angled metal plates. Different sand pack configuration with thickness variations in pre-kinematic overburden and salt unit were analyzed during extension and subsequent, inversion.*

During extension, deformation progressed from extensional forced folds to fault-propagation folds above major basements faults. Development of fault welds coupled the system transmitting deformation into overburden. As result, major faults were propagated upwards and different salt structures were developed at basins edges (inflated areas, reactive diapirs, listric growth faults or salt rollers) depending on thickness of pre-kinematic overburden and thickness of polymer layer. Moreover, during extension, the progressive sedimentation of syn-kinematic sand pack caused polymer migration to internal and external basin margins and the development of primary welds below hanging-wall depocenters. Both, fault welds and primary welds controlled depocenter migration.

During inversion, fault welds were contractionally reactivated and basins were arched and uplifted. Footwall shortcuts were developed below the polymer layer as response to higher angles of pre-existing faults. These shortcuts were not propagated upwards and the contractional deformation was absorbed by the ductile layer. Instead, deformation was transmitted into the overburden in different shortened salt structures (thrusts nucleated at reactive diapir pedestals, listric fault inverted, squeezed diapir, new primary weld or salt-detached thrusts), depending on inherited extensional geometries, thickness of salt and thickness of the overburden.

The experimental results were compared with different natural examples from the North Sea, which is a classic area of pre-rift salt.