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Stress regime evolution in small-scale experiments of inversion and transpression of rifted sedimentary basins

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Small-scale inversion-transpression experiments of pre-existing graben and horst blocks demonstrate that pre-existing faults and the geometry of the interlayering of ductile and brittle materials, can strongly control the spatial and temporal variations of the stress regime in the deforming domain.

The applied transpression yielded the following structure generation : (1) new faults were created with a reverse sense of movement with their strike parallel to the graben axis; (2) Riedel (R type) faults, compatible with applied horizontal strike-slip deformation, developed in the more advanced stage of evolution; (3) the reactivation of the graben normal faults. This general sequence of fault generation-reactivation, can be explained by changes in the stress regime through time. These changes involves the permutation of the minimum and intermediate principal stress axes and also a progressive rotation, in the horizontal plane, of the axis of maximum compressive stress. Experiments with no pre-existing structures do not reveal any temporal change in the stress regime through time. Instead only one generation of structures developed.