3D NUMERICAL MODELING OF ORTHOGONAL AND OBLIQUE-SLIP FAULTS

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One of the major assumptions of 2D cross section restoration and balancing techniques is that the direction of the section has to be parallel to the direction of extension, which is not always known. This technique helps to evaluate the importance of oblique extension on basin geometry using a 3D numerical solution that incorporates inclined simple shear to dip-slip and oblique-slip extensional faults. The model can handle slip of any direction and magnitude, simulating orthogonal, oblique and even strike-slip movements on listric and planar border faults. Fault planes are modeled as continuously curved listric surfaces varying laterally in space. The deformation process may be viewed as pulling away the hanging wall from the footwall (at any direction) and then allowing the hanging wall to collapse (subside) to fill the potential void. Some key features of synthetic oblique-slip faults systems are discussed as an analogue to the seismic signature of natural oblique-slip fault systems. Dramatic changes in rollover geometry are observed in oblique-slip simulations, especially where significant lateral variations in fault geometry occur, leading to synthetic examples of 2D oblique-slip cross sections, which are compared with 2D seismic lines from NE Brazil, where oblique-slip faults are interpreted. Key 3D synthetic models of transfer faults, extensional folds, releasing and restraining bends were observed by simulating lateral variations on the fault trace at the surface, near surface dip, as well as flat-ramp simulations on fault geometry of border rift faults, where oblique-slip fault displacement has occurred.