# C-31 SELF-CONSTRAINED COMPUTER MODELS OF FAULT-RELATED FOLDING

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A great contribution in the study of fault-related folds in foreland belts derives from kinematic and geometric models. This technique proved efficient both in the interpretastion and balancing of the tectonic structures. On the other hand, such models are fully constrained by geometrical rules that do not take into account the rheology of the deforming rocks, the mechanical balance of the growing structures, the incremental evolution, and their interaction with surface processes. We approached the modelling of fault-related folds by developing a set of self-constraining algorithms that successfully reproduce the behaviour of natural rock multilayers undergoing faulting and folding. The rheology and thickness of each layer (both pre-growth and growth strata) are specified, with no geometrical constraints apart from initial layering and the shape of the faults. The shape of the fault, of the multilayer, and the mechanical behaviour of the deforming material then determine the shape of the folded hangingwall. A great variety of both compressional and extensional faultfold kinematics can be modelled, including growth faulting, synchronous faulting and re-faulting of deformed structures. Total brittle deformation intensity is computed during each iteration and can be displayed as a model output. We apply our modelling technique to both compressional and extensional fault-bend folding, and to extensional listric faults. In the first case, we demonstrate that upright and overturned anticlines can easily develop by simple-step fault-bend folding as a function of the initial cutoff angle. Such a result dramatically broadens the range of fold geometry suitable to be generated by fault-bend folding. The distribution of brittle deformation intensity across the faultbend anticlines shows higher values in the limbs, which contrast with slightly deformed crests. Examples from the Southern Apennines confirm the predicted fracturing spatial distribution. Models on extensional faulting show that the brittle deformation concentrates in well identified rock panels in the hangingwall. The developed algorithms have been successfully applied to pseudo 4D models. Results bear important implications for secondary permeability prediction both in oil research and development.