DYNAMIC MODELS OF FAULT-CONTROLLED BASIN FORMATION

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Two- and three-dimensional finite element models are used to study the formation of halfgrabens and pull-apart basins on a lithospheric scale. The numerical simulations use a dynamic modeling approach and aim towards an improved understanding of basin subsidence on the basis of rheology and forces. Thermal calculations consider, among others, temperature-dependent thermal conductivities and radiogenic heat production. Lithospheric deformation in the brittle domain is described by an elastic-perfectly plastic flow law, whereas ductile deformation is approximated by temperature- and strain rate - dependent creep laws. Thermal and mechanical calculations are based on geometrically identical finite element grids and are coupled via temperature and thermal stresses and via displaements. Pre-existing faults can be defined by contact elements which allow for differential movements between separatly meshed parts of the finite element model. The thermo-mechanical modeling approach is used to study quantitatively how subsidence history and basin geometry relate to the geometry and kinematics of the main basin-bounding faults. Modeling techniques are applied to the Saar-Nahe-Basin / SW-Germany and the Hanmer Basin / New Zealand.