STRESS AND STRAIN DISTRIBUTION IN THE CRUST-MANTLE TRANSITION ZONE BENEATH THE CONTINENTAL EXTENSION DOMAIN

GE LIN 1 Y. ZHANG 2 WEIMING FAN 1(1 Changsha Institute of Geotectonics, CAS, CHINA, 2 CSIRO Exploration and Mining, AUSTRALIA)

Stress distribution and deformation pattern in the continental lithosphere under the joint influence of regional extension and asthenospheric upwelling have been modeled using a finite difference computer code, FLAC. Our numerical experiments have demonstrated that the early stage of the deformation generated jointly by extension and upwelling is an important phase in which an adjustment of the stress field took place, mainly within the interior of the crust. This stress adjustment is reflected by the distribution of differential stresses. The stresses increase downward with depth in the crust, form a high gradient zone along the crust-mantle transition zone, and show much less variations in the mantle. As the deformation develops to some extent, the differential stresses maintain a pattern of progressively increasing with depth in the crust. The stress distribution in the lithospheric mantle domain is rather homogeneous.Strain occurred in the lithosphere is governed by the stress distribution within it. At the early stage, strain develops mainly in the interior of the lithospheric mantle, and displacement vectors show an overall increasing pattern from the crust downward to the mantle. With further deformation (i.e. regional extension and asthenospheric upwelling), displacement and strain patterns appear to be different between the crust and the mantle. Displacement vectors generally emanate downwards in the crust but upwards in the mantle, both pointing to the crust-mantle transition level. Material's movements converge towards the crust-mantle transition zone and then start to creep sideways horizontally. This leads to the extensional thinning of the crust and lithospheric mantle.In summary, this study suggests that the crust-mantle transition zone is an important demarcation layer between different stress and deformation fields in the continental lithosphere beneath the continental extension domain.