Origination of lithosphere folds as a result of stress field reorganisation

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The system of broad anticline-like structures observed in the Indian ocean (Zuber, 1987, JGR, 92), Australia (Stephenson, Lambeck, 1985, JGR, 90), Canada (Stephenson et al., 1990, Geology, 18), in the Central Asia (Nikishin et al., Tectonophysics, 1993, 226) and over the whole Eurasia territory (Nikishin et al., 1997, C.R.Acad.Sci.Paris, 324 IIa) were interpreted as whole lithosphere folds originated in response to raise of intraplate stresses. We investigate the possibility of origination of such structures in response to change in intraplate stress field by numerical modeling. We utilize the thin sheet approximation, in which governing equation are decomposed into 2 subsets: one accounting for in-plane stress distribution (thin-shell model) and second one responsible for bending of the lithosphere in response to applied horizontal loading. The flexural bending of the lithosphere depends on applied horizontal load, its effective elastic thickness (EET) and effective middle surface (EMS). The EET and EMS were computed from yield-strength envelopes which in turn depend on lithosphere structure, composition and thermal regime. The crustal structure were defined on the base of Crust 2.0 model. Lithosphere-asthenosphere boundary was determined from local isostatic constraint. Thermal model of oceanic lithosphere was computed from the model of cooling half-space, temperatures of continental lithosphere was considered linearly increasing from surface temperature to peridotite solidus temperature at the lithosphere-asthenosphere boundary. Variations of EMS for the Earth lithosphere reaches up to 50 km due to change in thermal regime and crustal thickness, these variations exert strong influence on lithosphere bending. The model of intraplate stress field is presented elsewhere (Koptev and Ershov, this meeting). The bending of the lithosphere in response to change of intraplate stress field results in origination of broad (wavelength 300 - 900 km) low-amplitude (up to several hundreds meters) whole lithosphere folds. Comparison of computed vertical movements with a map of present-day vertical movements shows interesting coincidences, allowing to interpret some present-day structures as a whole-lithosphere folds.