The time and depth of emplacing of the coupled crust-mantle heterogeneities: the possibility of whole-mantle convection.

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The general characteristic of the Earth lithosphere (tectosphere according to T.H.Jordan) is its lateral and vertical heterogeneity persistence in the crust and mantle. The heterogeneities are established by the geological and geophysical methods. The heterogeneities in the mantle are determined by methods of seismic tomography (Dziewonsky; Woodhouse, Dziewonsky, 1984; Zhang, Tanimoto, 1993; Fukao et al., 1994; Gu et al., 1998). The mantle heterogeneities are also researched by isotope-geochemical and geochronological methods.

Certain isotope-geochemical components: DMM, EMI, EMII, HIMU have been registered in the mantle of oceans and continents. These components were registered in the continental flood basalts and basalts of oceans.

Results of the research of the mantle xenoliths from kimberlites demonstrate that the old crustal cratons and their underplating mantle (root of the cratons) are coeval (1-3 Ga) (Pearson et al., 1995). In the same chronological interval the heterogeneities in the mantle of the oceans are forming (Faure, 1986; Zindler, Hart, 1986). Therefore, heterogeneities in the mantle under old cratons and in the mantle of the oceans are synchronous. The depth of these old heterogeneities is established by old geochronological dating of the kimberlits, carbonatites and lamproites, which are formed in the mantle at the depth of 440-660 km. These rocks and the rocks of the upper and lower crust have the same isotopic characteristics (Blyuman, 1998).

Therefore the time of emplacement of the coupled heterrogeneities in the crust and mantle of continents and oceans is coeval (1-3 Ga) and depth of their formation is equally great – 440-660 km. All these demonstrate that the lithosphere is very non-uniform and in this case processes of the whole-mantle convection are very restricted.