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Collision and mountain building

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Collisional processes began in the Central Tien Shan (CTS) in Oligocene $\sim$30 mln. years ago. Studies of the Oligocene–Quaternary molassa in intramountain basins as well as geomorphology of ridges showed that the CTS had risen to the Late Pliocene ($\sim$2 mln. years ago) from $\sim$0.3 km up to $\sim$1 km in average. The uplift was the isostatic effect of thickening of the crust because of the collisional shortening with average rate $\sim$2 mm/year. During the last 2 mln. years, the CTS has risen up to $\sim$3 km in average, i.e. to $\sim$2 km. Although the shortening has accelerated up to $\sim$5 mm/year, it has produced only $\leq$0.2 km of the rise. 1.2–1.5 km of the rise is the isostatic result of replacement of the former dense mantle lithosphere by the hot and lesser dense astenosphere mantle. The upper mantle density is decreased now under the CTS to 0.1–0.2 g/cm^3. $\sim$0.5 km of the uplift is a result of decreasing of density of the high-metamorphic metabasites in the crust–mantle boundary zone because of influence of the astenosphere mantle. So, the Late Pliocene–Quaternary uplift of the CTS is caused mostly by transformation of deep-seated rocks, but not by the collisional shortening. The same acceleration of uplift in Pliocene-Quaternary is fixed in the all Central Asia (Tarim, Tibet, the Himalayas, Kunlun and Pamirs and the Baikal region), where the the Upper Mantle density is also decreased, as well as in the Northeastern Siberia mountains, the Caucasus and Alps and even the areas outside the recent collisional belts like the Southern and Eastern Africa, Southern Arabia, Colorado Plateau and Anabar shield in the East Siberia platform. So, the Pliocene-Quaternary acceleration of vertical movements is manifested in different continents independently on plate interaction processes.